

# Science-based Guidelines for Marine Protected Areas and MPA Networks in Canada



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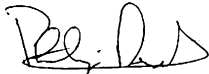
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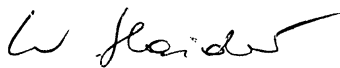
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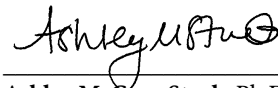
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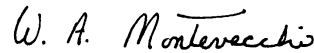
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## FOREWORD

The conservation of Canada's ocean ecosystems is an issue of critical importance. A key tool in this effort is marine protected areas (MPAs). Canada is currently developing a bioregional network approach to MPA establishment. There is great hope that, done well, this new approach will help Canada expand effectively and efficiently its protection of marine ecosystems, which currently amounts to less than 1% of our national ocean territory.

The Canadian Parks and Wilderness Society (CPAWS) convened an independent scientific team from academic institutions across Canada to develop a set of guidelines. These scientists contributed their expertise in the natural and social sciences relevant to conservation and marine protected areas. The scientific team convened for two 2-day workshops in Vancouver in January and April 2011, supported by a team of CPAWS staff from across Canada, and worked over a five-month period to develop these guidelines.

The purpose of this document is to provide guidelines for effective networks of MPAs throughout Canada's three oceans. The approach is based on scientific understanding of marine ecosystems and of human interactions with them, integrating knowledge from the biophysical and social sciences. The guidelines also reflect the prominent place of Canada's Aboriginal peoples in the stewardship of our oceans.

The guidelines are organized into four thematic categories: ecological criteria; social, cultural and economic considerations; MPAs in context; and governance. Within each category several guidelines are presented, typically with a definition, rationale, and references.

Our intended audiences for this document are MPA practitioners, managers, policy- and decision-makers, Aboriginal leaders and organizations, marine conservationists, fishermen, and other stakeholders.

We extend our heartfelt appreciation for the time and energy that the scientific team dedicated over the past five months to this task: Kai Chan, Isabelle Côté, Philip Dearden, Elizabeth De Santo, Marie-Josée Fortin, Frédéric Guichard, Wolfgang Haider, Glen Jamieson, Donald Kramer, Ashley McCrea-Strub, William Montevicchi, Monica Mulrennan, John Roff and Anne Salomon.

We very much appreciate the thorough and thoughtful comments provided by Mr. Jeff Ardron, Dr. Natalie Ban and Dr. Rosaline Canessa in their reviews of the guidelines.

With many thanks to the CPAWS team who provided technical and other support: Leah Honka, Alison Woodley, and Rodrigo Menafrá. We thank also Julie Gardner for her skilled workshop facilitation and assistance with collation of numerous drafts of the guidelines.

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Sabine Jessen  
Vancouver, British Columbia  
6 May 2011

# 1 | INTRODUCTION

# 1

Global ocean health is in decline due to a variety of human activities such as fishing, shipping, and offshore oil and gas exploration and production. The impacts of these activities, including declines in fish stocks, pollution, and invasive species, are being compounded by the multiple manifestations of climate change and ocean acidification. These pressures on ocean ecosystems are evident in Canada. With the longest coastline in the world and a larger marine jurisdiction than any other country, Canada has strong maritime traditions in three oceans—the Atlantic, the Pacific and the Arctic. Canadians therefore have a special responsibility to assume leadership in ocean science, stewardship, and conservation.

Sustaining ocean health requires ecosystem-based approaches to management. Marine protected areas (MPAs) are a central tool in an ecosystem-based approach. In 1999 the International Union for Conservation of Nature (IUCN) defined an MPA as, “any area of intertidal or sub-tidal terrain, together with its overlying water 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.” In 2008, to clarify that the purpose of protected areas needs to be conservation-focused, the IUCN adopted a new general definition that applies to marine, terrestrial and freshwater environments:

*A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. (Dudley 2008)*

Within this general definition, the strictness of protection can vary extensively from one MPA to another, and among zones of an individual MPA. MPAs or zones from which extractive activities are strictly prohibited are generally referred to as no-take reserves.

Canada has made many national and international commitments to complete a national network of MPAs, including the 2002 World Summit on Sustainable Development, the 2004 United Nations Convention on Biological Diversity (CBD) Programme of Work on Protected Areas, and subsequent CBD decisions in 2006, 2008, and 2010. Recognizing the importance of healthy oceans, Canada has also made considerable effort to develop a policy framework to establish a comprehensive system of MPAs (DFO 2005, 2008, 2010a,b,c, DFO and WWF 2009). Nevertheless, MPA development in Canada, with protection of less than 1% of the country’s Exclusive Economic Zone, is lagging far behind its urgent need and behind that of many other countries.

***As scientists with expertise and experience in marine conservation, we are concerned that the planning and management of MPAs in Canada currently is not incorporating key lessons from conservation science.*** Effective progress in MPA development will depend on the incisive use of pertinent scientific information. Empirical research from Australia, the United States and elsewhere has demonstrated the myriad benefits that accrue from well-designed MPAs, and especially from no-take reserves. Such benefits include the protection of biodiversity, enhancement of ecosystem resilience and support of ecosystems services that stem from healthy marine ecosystems. These services include coastal protection, provision of nursery areas for many marine species, nutrient cycling and filtration of wastes, and carbon storage for climate regulation. Direct economic benefits also accrue in and around MPAs through increased tourism and recreation opportunities and often fisheries enhancement. MPAs also provide key ecological benchmarks to assist the gauging of environmental change, by providing sites protected from some human influences.

This extensive international scientific research is highly relevant to Canadian marine policy and for shaping expectations of MPAs, ***but the way in which Canadian policy and legislation is currently being implemented is unlikely to realize these benefits.*** As Canada develops and implements a policy framework for MPA networks, we hope these guidelines will help to support an effective path forward.

To increase the probability of long-term success, MPAs need to be embedded in a network of interconnected protected areas. In an effective network, protected critical habitats are connected by the movement of nutrients and organisms between areas, allowing the preservation of natural processes and allowing for spatial shifts

caused by climate change and other emerging environmental stressors. Networks can thus become much more than the sum of their individual components.

Our purpose in this document is to provide guidelines for effective networks of MPAs throughout Canada's three oceans.<sup>1</sup> We base our approach on scientific understanding of marine ecosystems and of human interactions with them, integrating knowledge from the biophysical and social sciences. The guidelines also reflect the prominent place of Canada's Aboriginal peoples in the stewardship of our oceans.

These guidelines affirm that in order to achieve the full benefit of MPAs in Canada, the protection of healthy marine ecosystems must be the priority, and a number of specific requirements must be met, including:

- **creating no-take reserves spanning no less than 30% of each bioregion in Canadian waters;**
- **excluding industrial uses and developments, including exploration for and extraction of non-renewable resources, dredging, dumping, and destructive fishing practices, particularly bottom trawling;**
- **planning and implementing MPAs as part of effective networks and comprehensive oceans management; and**
- **respecting the rights and interests of Aboriginal peoples.**

If the above and other requirements outlined in this report are met, MPAs can contribute to the protection of marine species, subspecies, biological communities and habitats, as well as ecological and evolutionary processes; and they can support sustainable relationships of people with oceans, including a sustained flow of benefits. Also relevant to the development of MPA networks is the need for just treatment of current and future people, and of non-human organisms and natural entities.

A major threat to the long-term future of the oceans is climate change. Climate change is already exacerbating the negative effects of fishing in some areas. The manifestations of such change are numerous and include rising sea levels and temperatures, more frequent or intense storm events and changing ocean circulation patterns. Some of these effects are already evident. The excessive anthropogenic carbon emissions behind climate change are also increasing ocean acidification. However, even if carbon emissions were halted tomorrow, the trends associated with global climate change, would continue for decades. Hence, in the short to medium term, marine ecosystem resilience needs to be bolstered by strategic approaches to planning and management. Thus the recommendations in this document incorporate guidelines that are aimed at mitigating and adapting to the impacts of climate change.

Given that the necessary legislative tools are currently in place, **Canada has the opportunity and the responsibility to take a leadership role in marine stewardship and protection.** These guidelines have been prepared with the goal of helping to realize this responsibility.

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<sup>1</sup> While Canadian MPA network policy includes the Great Lakes, these guidelines only consider marine ecosystems. Nevertheless, many of the guidelines may be applicable to the freshwater ecosystems of the Great Lakes bioregion.

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## 2 | ECOLOGICAL CRITERIA FOR MPA SITES AND NETWORKS

The design of functional networks of MPAs requires the initial identification of a broad set of sites of bioregional importance. Sites can be deemed important according to a number of ecological criteria, outlined below, or because they have cultural, historical and/or spiritual significance (Section 3). A subset of sites are then assembled into a bioregional network, which will function as an interconnected, synergistic entity if site selection achieves or enhances certain properties, such as connectivity and representativity.

### 2.1 Site characterization

Much research has been aimed at identifying the characteristics of sites that, if protected, would result in effective protection of large amounts or particularly important components of biodiversity. While there is not equivalent evidence for all characteristics, the features explained below are those most likely to lead to success in ensuring the long-term functioning of marine ecosystems and their key components. All of these features have been, in some form, adopted as essential to the identification of ecologically or biologically significant areas (EBSAs) in marine environments by the Convention on Biological Diversity (Decision IX/20). The definitions used here are based on those of the CBD but have been expanded for added clarity.



#### 1. Guideline: Characterize all areas of the seascape according to key ecological criteria to allow the identification of ecologically or biologically significant areas

##### Uniqueness, rarity or special character

###### *Definitions:*

Sites may be unique, rare or special at various spatial scales due to the habitat types, oceanographic or geological features, or specific organisms occurring there. Thus, *uniqueness* can mean that there is a single example or population in a bioregion or, at larger scales, that there are a few examples or populations in Canada but none anywhere else. *Rarity* indicates that the characteristic of interest occurs only in a few locations in a bioregion or is endemic to Canadian waters (it does *not* mean having low abundance across a broad geographic range). *Rarity* and *uniqueness* may be natural or the result of human impact on similar ecosystems, processes, features or types of organisms in other locations. *Special character* relates to key roles in the lives of organisms (e.g. spawning grounds, migratory stopover locations).

###### *Rationale:*

Areas with unique, rare or special characters are valuable because they are not replaceable, and their loss would be permanent leading to a significant reduction in marine biological diversity. The larger the spatial scale at which a characteristic is unique, rare or special, the higher the priority for protection because the effect of their loss would be much greater. Higher priority for protection should be given for higher numbers of rare, unique and special characteristics. Uniqueness and rarity can be assessed at multiple levels:

(a) *Genes, populations, species.* Uniqueness and rarity at these levels of biological diversity and organization are important to protect because they represent genetic pools that reflect long evolutionary histories and/or future evolutionary potential.

(b) *Habitat types.* Some habitat types such as hydrothermal vents and seamounts are the sites of particular ecological processes and species assemblages.

(c) *Geological/oceanographic features/processes.* Certain geological or oceanographic features are essential to support associated biological communities. Examples include areas of upwelling, permanent polynyas,

continental shelf edges, and deep sea trenches. Areas that offer thermal refugia (e.g. cold-water upwellings) may be important in the context of warming sea temperatures.

(d) *Special biological function.* Some populations depend on specific areas to complete critical parts of their life cycle. Examples include breeding grounds, spawning and nursery areas, juvenile habitat and stopover sites along migratory routes.

(e) *Threatened, vulnerable species and habitats.* Areas that contain significant populations of species that are threatened, vulnerable or declining in Canada need protection to ensure the protection, recovery and restoration of such species.

References:

DFO 2004, UNEP-CBD 2008.

## Productivity

### *Definition:*

Productivity refers to the rate at which plants and animals and their populations grow. It depends on environmental conditions, especially nutrient availability, and factors that promote survival and reduce mortality.

### *Rationale:*

Areas with comparatively high natural biological productivity, such as sites of permanent fronts and upwellings, hydrothermal vents, seamounts and polynyas, play important roles in maintaining populations and fuelling ecosystems. Such areas, which typically encompass viable populations that have a full array of size/age classes, may support productive fisheries in adjacent areas by serving as sources of nutrients and of new members to the population via juvenile and adult dispersal.

References:

Salomon et al. 2006, UNEP-CBD 2008.

## Biological diversity

### *Definition:*

Biological diversity refers to the variety of ecosystems, habitats, communities, species, or the genetic diversity in an area. For example, seamounts, fronts and convergence zones, cold-water coral and deep-water sponge communities all contain particularly large numbers of species. Because of the strong association between species and habitats, habitats often provide a useful proxy for species richness when detailed information is lacking.

### *Rationale:*

High biodiversity is essential for the maintenance of evolutionary potential of species, the resilience of marine ecosystems in the face of environmental change and their ability to deliver ecosystem services. Sites with high diversity allow protection of more features with equivalent effort. At the network level, however, some sites with low diversity might be important to assure adequate representation of the full range of diversity.

References:

UNEP-CBD 2008, Worm et al. 2006.

## Degree of naturalness/human impact

### *Definition:*

Naturalness refers to the extent to which an area is undisturbed by human activity or introduced species. Some human activities, such as some subsistence harvests, light recreational use and ecotourism, can have low impact and areas allowing such activities can retain a high degree of naturalness. On the other hand, intensive harvesting, heavy marine traffic, dumping and pollutant discharge, dredging, oil and gas and mineral

exploration and development, and high densities of invasive species have a high impact and often result in habitat degradation.

**Rationale:**

More natural areas are characterized by population and community structures, ecosystem processes and functions that resemble those of pristine marine ecosystems (though it is unlikely that any pristine marine ecosystems remain). As such, more natural areas can act as reference sites or natural archives to assess habitat recovery and decline. Natural sites may be more resilient and can act as sources of organisms to rebuild populations in adjacent disturbed and degraded sites. In areas of high overall naturalness, it may be valuable to protect sites that are at high risk of human impact.

References:

Game et al. 2008, UNEP-CBD 2008.

### **Sensitivity/resistance to disturbance**

**Definition:**

Ecological sensitivity refers to the extent to which a habitat type or an ecosystem changes following a disturbance. It is the opposite of ecological resistance. The likelihood, frequency and magnitude of both natural and human disturbances need to be considered.

**Rationale:**

Removing or lessening some human-made disturbances through protection is expected to reduce the cumulative impact of multiple disturbances and the risk of synergistic interactions among disturbances. This is particularly important for ecologically sensitive areas where the cumulative impact of disturbances will elicit a proportionally greater change (usually seen as a loss of species or function) than in more ecologically resistant areas. The identification of ecologically resistant areas with respect to the impacts of climate change is critical for comparative assessments of sensitive areas.

Functional redundancy, i.e. the presence of several species that perform similar functions in an area, can confer resistance because if one species is lost, its role can be fulfilled by another species. Thus, relatively simple marine communities, such as those found in polar areas, are predicted to be more ecologically sensitive. Similarly, deep-water coral and sponge reefs are likely to be sensitive to disturbance because of the heavy reliance of those communities on a few species that provide essential habitat structure.

References:

Halpern et al. 2007, 2008, UNEP-CBD 2008.

### **Potential for recovery from disturbance**

**Definition:**

Recovery potential refers to the time taken by a disturbed area to return either naturally or following a management intervention to a state of high naturalness. For example, an area that has species with small body size and early age of maturity can recover more quickly than when such species are absent. Highly productive areas and those without chronic degradation (such as heavy metal deposits or oil damage) have greater recovery potential.

**Rationale:**

Population viability and ecosystem function can be maintained or enhanced only when ecosystems have time to recover between disturbance events. Protection removes many chronic disturbances that degrade ecosystems, which can lengthen the time window for recovery between acute disturbances. Populations, habitat types and

ecosystems with low recovery potential, and/or facing the effects of several disturbances, will need more time under protection to achieve noticeable effects.

References:  
Palumbi et al. 2008.

## 2.2 Assembling sites into functional networks

It is well recognized that marine protection cannot be satisfactorily achieved by protecting individual sites alone because many processes require functional connections between sites to operate over large scales. Moreover, while individual sites are usually selected on the basis of one or a few features, sites should collectively be representative of Canadian marine ecosystems and processes.

A bioregional perspective is the appropriate scale in the development of a network. Twelve marine bioregions and one Great Lakes bioregion have been identified in Canadian waters on the basis of oceanographic and bathymetric similarities (see map Appendix 4). Using site-level scores and decision tools (Section 4.2), a network of MPAs that meets to the greatest extent possible the guidelines outlined below should be implemented for each bioregion. Bioregional networks must recognize the changes to natural processes and human use that will result from rapid climate change.

Reference:  
DFO 2009.

### 2. Guideline: Create no-take reserves

*Definition:*

No-take reserves are MPAs or zones in larger MPAs in which all forms of renewable and non-renewable resource extraction and industrial activity are excluded.<sup>2</sup>

*Specific recommendation: At least 30% of each bioregion should be within no-take reserves.*

Within each MPA, the proportion of area under strict protection can vary according to specific conservation objectives, but a minimum of 30% of each bioregion should be within no-take reserves.

*Rationale:*

No-take reserves are more effective at delivering a wide range of benefits than MPAs that offer lesser levels of protection. Numerous studies of a variety of marine species in a variety of ecosystems suggest that the full realization of the benefits of protection in terms of conservation and fisheries requires that at least 30% of an bioregion be strictly protected. As a result, this figure was included in one of the key recommendations for MPAs at the IUCN World Parks Congress in 2003.

References:  
Ballantine 1997, Bohnsack et al. 2004, Gell and Roberts 2003, Fraschetti et al. 2009, Lester and Halpern 2008.

### 3. Guideline: Provide adequate representation of habitat types and sites with unique, rare and special character

*Definition:*

A network is representative when it consists of areas that reasonably reflect the full range of habitat types and of sites with unique, rare and special character sites found within a bioregion.

*Specific recommendation:*

Every broad-scale habitat type present in a bioregion must be represented in that bioregion's network. At least

<sup>2</sup> Food, social and ceremonial use by Canada's Aboriginal peoples can be excluded only with the agreement of the relevant Aboriginal rights-holders.

## 2

30% of the area of each habitat type should be placed in no-take reserves. For some particularly significant or particularly degraded habitat types, a larger proportion of the habitat area present may need to be protected to achieve conservation goals. All unique sites and most rare and special character sites must be protected. It may be appropriate in some special circumstances, to redistribute the proportions of habitat protected (within the overall context of protecting 30% of each bioregion (Guideline 2)) to ensure adequate protection of high-priority habitats, even if this reduces the representation of a particular habitat below 30%.

**Rationale:**

Different habitat types harbour distinct assemblages of species. It follows that unless some proportion of each and every broad-scale habitat type is protected, there is a risk that significant elements of biodiversity will remain unprotected. Thus, every habitat type should be given protection. Protecting areas that contain transition zones will be particularly important to allow for shifts in species distribution as a result of climate change.

Increasing the area of each habitat type under protection will also increase, but at a declining pace, the proportion of species characteristic of that habitat type that are protected. For example, it has been estimated that protecting 10-40% of each type of marine habitat (for which data were available) in the UK would protect 70-80% of the species present in these habitat types. Protecting 30% of the area of each habitat type within a bioregion will therefore capture a substantial amount of habitat-specific diversity.

Sites with unique, rare or special character are, by definition, unlikely to be naturally replicated within a bioregion. All such sites should therefore be protected to preserve the biotic and abiotic features that give these sites their unique, rare or special status.

**References:**

Beger et al. 2003, Fraschetti et al. 2009, Gladstone 2007, Rondinini 2010, UNEP-CBD 2008



#### 4. Guideline: Ensure connectivity among MPAs

**Definition:**

Connectivity refers to linkages between geographically separate areas, which occur as a result of the movement of individual larvae, juveniles and adults (e.g. through passive dispersal in currents, active dispersal and migration), and of organic and inorganic matter (e.g. nutrients). Within networks of MPAs, connectivity can refer to movement among protected areas or between protected and unprotected areas. Network design influences connectivity through spacing between individual MPAs, taking into account current speeds and directions and relevant features of local sites. The maintenance of connectivity in a network may require the protection of 'stepping stone' areas, i.e. areas that play key roles in dispersal or migration, for example by providing a resting or refuelling habitat (termed staging areas in bird migrations) or appropriate habitat patches amid areas of mostly unsuitable habitat for species with limited planktonic dispersal capacity. Stepping stone areas may meet few, if any, of the ecological criteria described in Section 2.1 but are crucial to species persistence and the ecological integrity of a bioregion.

**Specific recommendation:**

The appropriate distance between MPAs in a network depends on the scale of dispersal of the species of concern in that network. All MPAs (including stepping stones) should generally be within » 20 km to » 200 km from the nearest MPA in the network.

**Rationale:**

In a functional network, individual sites can benefit one another because they are linked by a flow of dispersing or migrating organisms (eggs, juveniles or adults). At a population level, these connections mean that local populations that have declined or become extirpated might be restored by immigrants from elsewhere. At a genetic level, connectivity means a constant renewal of genetic diversity, which is important for evolutionary potential and population persistence. Connectivity has direct implications for fisheries: when animals move

from protected areas, the resulting spillover effects can benefit local fisheries. Distances should usually vary between approximately 20 and 200 km between MPAs encompasses the potential larval dispersal distance of a large number of coastal marine species with planktonic larvae.

References:

Cowen et al. 2007, Gaines et al. 2010, Halpern 2003, Hamilton et al. 2010, O'Connor et al. 2007, UNEP-CBD 2008.



## 5. Guideline: Create large MPAs

**Definition:**

Size refers to the spatial area given a particular level of protection. In some situations, shape is also relevant.

**Specific recommendation:**

The actual size and boundary locations of sites within a network should be determined by the size and location of the features and ecological processes they are meant to protect. This will vary among sites within a bioregion and from one region to another. An average MPA size of 10-20 km (in the smallest dimension) is recommended, in recognition of the fact that very small MPAs may be effective in some circumstances but that in general, MPA sites should be larger rather than smaller, with shapes that minimize the amount of edge.

**Rationale:**

Larger areas generally hold larger populations or larger fragments of habitats, which makes them less vulnerable to environmental variability, climate change and human influences. Larger areas may also accelerate some population recovery processes. Furthermore, larger areas have larger ratios of area to edge so that more of the protected area is distant from unprotected areas. This minimizes disturbances from outside and reduces the probability that mobile species will stay out of the protected area and be exposed to capture or disturbance. Given the mobility of most coastal species, reserves of several kms to tens of kms alongshore extending offshore to cover local migrations should be sufficient. For example, a minimum functional MPA size was estimated for British Columbia lingcod *Ophiodon elongatus* to be about 74 km wide. Commercially important pelagic species will require even larger MPAs (recommended minimum diameters of 30 km – 60 km), because of their higher mobility. Small MPAs can be effective for species with restricted dispersal and movement.

References:

Carr et al. 2003, Gaines et al. 2010, Jamieson and Dixon 2001, Halpern et al. 2006, Lester et al. 2009, Roberts et al. 2010, UNEP-CBD 2008.

## 6. Guideline: Ensure multiple representation of protected habitat types and features

**Definition:**

Multiple representation refers to the inclusion of a given feature (species, habitat type and ecological processes) in several protected sites in each bioregional network.

**Specific recommendation:**

Networks should contain at least two, spatially well-separated examples of each habitat type and at least three to five examples of all rare or special character sites (when their natural abundance allows it). Some features may require more replication than others, depending on their inherent variability or vulnerability to disturbance (i.e., exposure and sensitivity to and potential to recover from impacts).

**Rationale:**

Multiple representation is needed to reduce the risk that a given habitat type or the species it contains could be lost, for example owing to a single natural or human-generated disaster. Because many damaging events are



spatially localized, risk is spread more effectively when multiply represented sites are farther apart. Replication across environmental gradients will ensure the protection of at least some sites that are resistant to the impacts of climate change.

## References:

Salm et al. 2006, UNEP-CBD 2008.

## 2.3 Planning for climate change

Networks of MPAs must be designed today while keeping in mind that the seascape of tomorrow will be vastly altered by climate change. Species distributions will shift in response to temperature increase and the area of various coastal ecosystems may increase or decrease in response to sea level rise. In addition, changes in global circulation patterns, frequency and intensity of storms, and dissolved oxygen levels will affect the distribution of species and habitats, and change patterns of connectivity among populations. Ocean acidification, caused by excessive carbon emissions, is expected to affect many populations of marine organisms.

Several of the guidelines presented in this document will provide some network resilience to future impacts of climate change. Foremost among these is the necessity for **large, strictly protected areas**. Within these areas, populations will exhibit extended age structures, with many large individuals that have high reproductive potential. The risk of synergies will also be reduced within these no-take reserves because there are a more limited number of disturbances.

How connectivity will change among MPAs may be difficult to predict. However, it is expected that warmer sea temperatures will speed up larval development time, resulting in shorter dispersal distance for organisms with planktonic larvae and a possible breakdown of connectivity among MPAs that are located at the current limit of dispersal distances. A climate-wise approach would therefore be to designate **more, closely spaced MPAs rather than fewer, widely separated MPAs** to preserve connections among MPAs in the face of changing temperatures and current patterns.

Protecting areas that contain **transition zones** will be particularly important to allow for shifts in species distribution as a result of climate change.

Finally, the oceans and coastal ecosystems are the largest sink of anthropogenically emitted carbon, and as such play a crucial role in mitigating climate change. Estuarine ecosystems such as seagrass meadows and saltmarshes are particularly effective at sequestering “blue” carbon. The **protection of large areas (i.e. more than 30%) of ecosystems that are efficient carbon sinks** is essential in planning for a warmer future.

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Campbell 2011, Harley et al. 2006, McLeod et al. 2009, O'Connor et al. 2007

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### 3 | SOCIAL, CULTURAL AND ECONOMIC CONSIDERATIONS FOR MPA SITES AND NETWORKS

While ecosystem protection needs to be prioritized in the design of MPA networks, social, cultural and economic concerns shape the performance of MPAs and are fundamental pillars for conservation planning and implementation of MPA networks. MPAs are ultimately part of systems with both ecological and human dimensions. Viewing these dimensions as linked will help to inform the selection and design of MPAs. The involvement of local communities, fishermen, recreational users, and other stakeholders in the planning of MPAs will help to ensure that their concerns are considered, and that MPAs are effectively managed over the long term. The social, cultural and economic guidelines below identify considerations for the planning and management of MPAs that should be integrated and considered.

Reference:

Gleason et al. 2010, Pollnac et al. 2010, Scholz 2004.

#### 3.1 Site characterization

The design of functional networks of MPAs requires the initial identification of all sites of bioregional importance, both for ecological reasons as noted in Section 2, and/or because they have cultural, historical and/or spiritual significance.



#### 7. Guideline: Identify culturally, historically and spiritually significant areas

Many coastal and marine areas include culturally, historically and spiritually significant sites as well as environments and resources that underpin traditional and on-going use of these areas. Many of these sites are a reflection of the extensive, interconnected usage of land and sea that permeates the lives of coastal residents.

Aboriginal peoples may value sites and areas for their cultural and spiritual values, see themselves as responsible for their maintenance, and increasingly seek ways to enhance their protection. Sites may also include natural features such as rock bluffs, pictographs, petroglyphs, canoe blanks, middens, canoe runs, platforms of houses and fishing weirs.

References:

Chan et al. (in press), Gardner 2009, Hamilton and Wilson n.d, Mulrennan and Scott 2001, Mulrennan et al. 2009, Turner 1995.



#### 8. Guideline: Identify community-based MPA initiatives and integrate local knowledge

##### *Definition:*

Community-based MPA initiatives often involve the establishment of MPAs to protect specific resources with a desired outcome of enhancing local opportunities in the form of increased fish catches and alternative economic activities, or to address specific community cultural and identity values.

##### *Rationale:*

Community-based initiatives can be incorporated into the MPA network as a way to address socioeconomic concerns and may be an important tool for managing specific marine resources. Local resource users may have an intimate understanding of the local environment and thus areas potentially important for conservation. For this reason, there is value in integrating community-based initiatives and local knowledge with scientific knowledge when selecting sites during MPA planning. Greater community acceptance may result from this integrative approach.

Greater community acceptance may result from this integrative approach.

References:

Ban et al 2009, Christie et al 2002.

### 3.2 Assembling sites into functional networks

Once sites have been identified (Sections 2.1 and 3.1), the process of assembling sites into functional networks will require, in addition to meeting ecological requirements (Section 2.2), consideration of existing uses and activities, identification of a range of values associated with specific marine environments, and measures to address impacts on social and economic values.



#### 9. Guideline: Inventory current uses and activities

*Definition:*

Typical marine-based activities in Canada include commercial fishing, aquaculture, recreational and sport fishing, and many motorized and non-motorized recreation activities, such as cruising, kayaking, wildlife viewing, and scuba diving. Industrial uses include shipping, oil and gas exploration and development, renewable energies such as wind and wave, and cable and pipeline laying.

*Rationale:*

For example, Ban and Alder (2008) showed that at least 83% of the British Columbia continental shelf and slope is currently used by humans for activities such as commercial and recreational fishing, transportation, and infrastructure.

Identifying the location and intensity of current recreational, commercial and industrial activities in a region is an important step in effective marine management and critical during the design of MPA networks. It will be important to obtain fine-resolution data and consider these activities and the use values associated with marine environments with respect to the overall ecological goals. For example, the incorporation of fine-resolution commercial fishing data (Section 5.3) in the MPA design process can lead to more efficient MPA designs and reduced impacts on the fishing industry, without compromising ecological objectives.

Marine-use information should be shared between sectors during the stakeholder engagement process (Section 5.6)

References:

Ban and Alder 2008, Klein et al. 2008, Pinfold 2009, Rees et al. 2010, Richardson et al. 2006



#### 10. Guideline: Identify opportunities for alternative uses / compatible activities within networks of MPAs

*Definition:*

Certain activities such as tourism and recreation, non-invasive scientific research and education, are potentially compatible with the ecological objectives of an MPA network and may help to reduce human pressure on marine environments. For example, *ecotourism* is often defined as tourism that is nature-based, geared towards sustainable outcomes, involves education and interpretation, and is often community led. Coastal marine ecotourism is an economic sector that depends on a healthy marine environment, and may include whale watching, sightseeing, diving and kayaking, as well as sailing, cruising and visiting beaches and other marine locations. Coastal tourism can include recreational fishing, which should not be permitted in no-take reserves, but could potentially be allowed in other zones of an MPA.

**Rationale:**

One of the primary purposes of MPAs is to ensure protection from unsustainable extractive activities. Restrictions on fisheries or other consumptive uses may initially impact local economies. However, by working with stakeholders and communities the economic impacts can be offset with the introduction of less damaging, non-extractive activities within certain zones of an MPA. For example, MPA establishment can positively affect the local economy by enhancing tourism opportunities.

A recent global evaluation of the effectiveness of coral reef MPAs in meeting their conservation and socio-economic objectives found that the large majority of MPAs had experienced increases in tourism and local employment since establishment. Several MPAs, such as Race Rocks and the Southern Strait of Georgia in British Columbia, as well as regions like the Bay of Fundy and Gulf of St. Lawrence where MPAs are being identified, include critical habitat for whales and other marine life and generate income and employment through tourism activities. Coastal marine tourism activities in Canada generated an expenditure of CAD\$3,093 million by residents and non-residents in 2006 (Pinfold 2009:19).

The protection and preservation of a region often enhances the attractiveness of the area to tourists. Through well-managed ecotourism healthy ecosystems can provide benefits to local economies, and offset potential losses due to area closures. Furthermore, promoting low-impact tourism may provide long-term benefits and direct funds to help offset the management costs for maintaining the MPA. The provision of alternative employment opportunities in ecotourism can also improve stakeholder support for MPAs.

The extent to which commercial ecotourism and research are allowed in MPAs should be addressed in each MPA's management plan. MPA planners and managers should assess potential visitor impacts to MPAs in order to adopt management techniques that encourage the development of tourism activities that are compatible with the ecological objectives of the MPA network. For example, guidelines for marine wildlife interactions have been developed by Pacific Whale Watch Association and endorsed by DFO and Parks Canada.<sup>3</sup> The Saguenay-St. Lawrence Marine Park has also developed whale watching guidelines in collaboration with the local whale watching industry.

**References:**

Harriot 2002, Hargreaves-Allen et al. 2011, Garrod and Wilson 2004, McCrone 2001, Sanchiricho et al. 2002, Scholz 2004, Wells et al. 2007.



## 11. Guideline: Protect and enhance recreational sites and opportunities

**Definition:**

In addition to its value for biological productivity and fishery resources, the marine and coastal environment in Canada is highly valued for both passive and active recreation including cruising, sailing, kayaking, surfing, wildlife viewing, scuba diving and sport fishing. Recreation may rely on the same resources as coastal marine tourism, but is pursued by local and regional residents, or day visitors, who do not rely on the commercial tourism sector. It is difficult to separate tourism and recreation clearly, and appropriate distinctions may differ by region, and by specific activities.

**Rationale:**

Direct experiences with wildlife and natural environments can help foster environmental awareness and appreciation, and stimulate physical and mental health. MPAs provide a unique opportunity for visitors to experience and learn about marine heritage and enjoy the marine environment in its natural state. The notion of healthy ecosystems is inferred by the status of an MPA, and is attractive to recreational users of the marine environment. The mostly non-consumptive nature of recreational uses often has few negative effects on MPAs and may be complementary with individual MPA objectives. As is the case for areas suited to ecotourism

3 <http://www.pac.dfo-mpo.gc.ca/fm-gp/species-especies/mammals-mammiferes/view-observer-eng.htm>

opportunities, the availability of recreational sites and provision of recreational opportunities may provide economic benefits to local communities. Recreational uses that are consistent with the long-term protection of marine environments should be maintained and encouraged within networks of MPAs.

References:

Maller et al. 2009, Parks Canada 1994, Parks Victoria 2003, Sanchiricho et al 2002.



## 12. Guideline: Protect spiritual sites and values in the marine environment

**Definition:**

Spiritual values of protected areas “...inspire humans to relate with reverence to the sacredness of nature” (Harmon 2004:10). Protected areas may include sites that have special spiritual significance to people and communities. These sites have non-material values that are often shared by groups and may be culturally defined. Individual spiritual values also exist and relate more to a connection to the natural environment and sense of inspiration and well-being. Specific sites of spiritual value exist as do spiritual values for the broader seascape.

**Rationale:**

Marine ecosystems are increasingly valued for more than direct human uses, and recognized for their value in contributing to human well-being. It is often through direct experiences in nature that people benefit in terms of physical, emotional and spiritual well-being.

While spiritual values of sites are important to include in the decision making and design processes of MPA networks, accounting for non-material values can be challenging and requires the incorporation of local and traditional knowledge (Section 5.7).

References:

Harmon 2004, Mallararch (ed.) 2008, Verschuuren 2006, Wild and Mcleod (eds.)2008.



## 13. Guideline: Develop a displacement policy

**Definitions:**

The *displacement* of specific user groups from MPAs and especially no-take reserves, may have physical, economic and sociocultural implications. Another way to consider this issue is through the lens of the reallocation of rights within MPAs, which has both procedural and substantive aspects. Procedural aspects relate to governance and decision making processes, while from a substantive perspective, “...MPAs reallocate pre-existing rights governing resource access and use.” (Mascia and Claus 2009:17). Rights may be both formal and informal and occur on a variety of spatial scales. Mascia and Claus (2009) identified five types of rights (access, withdrawal, management, exclusion and alienation) that should be assessed through a five step process, in order to understand and address the potential social impacts of MPA establishment.

Once the displacement implications are identified, governments can develop approaches to assist with mitigating adverse impacts. According to (Macintosh et al. 2010:581) these can include:

- *Compensation*, which can be defined as “assistance aimed at making up for harm or loss.”
- *Structural Adjustment* or “assistance to help affected parties adjust to the new management arrangements.”

**Rationale:**

In designing MPAs and MPA networks, the process outlined in these guidelines seeks to reduce impacts on existing users. However, it will not always be possible to avoid such impacts completely, given the extent and variety of human uses. Where MPA establishment affects existing users, it is important to ensure fairness and equity. This requires that a compensation and/or displacement policy be developed by government to address the social and economic impacts of MPA establishment.

When establishing MPAs, in some situations certain uses will need to be reduced or eliminated. If such a situation arises, relocation of such uses to other areas may be considered. However, if a resource use, such as

fishing becomes concentrated in a smaller area, this may result in resource depletion, leading to potential social, economic and ecological impacts.

In order to address these situations, compensation for discontinuation of these activities should be part of the decision process. Having a displacement policy that includes measures (for example, compensation) to help to increase stakeholder support for MPAs and MPA networks, and their compliance with restrictions.

In Australia, Commonwealth and state governments have developed various types of assistance regimes to address the impacts of MPA establishment. Perhaps best known, and also controversial, is the structural adjustment package for the re-zoning of the Great Barrier Reef (GBR) Marine Park, which ballooned from AU\$10.2 million to a final estimate of AU\$250 million. There are many lessons to be learned from the experience with this program, especially in light of the stakeholder view that the program did not meet their needs. Key elements to consider are: a strict limit on funding, and well-defined principles, guidelines and criteria for assistance eligibility. However, as reviewers of the GBR experience have noted, regardless of the care taken in designing the program and its administration, "...there will always be a temptation for governments to use assistance programs to solve their own political problems and quell industry and community concerns." (Macintosh et al. 2010:587).

References:

Agardy et al. 2011, Gunn et al. 2010, Macintosh et al. 2010, Mascia and Claus 2009, Sen 2010.



## 14. Guideline: Incorporate existence values into MPA decision making

### *Definition:*

People may value ecosystems for their very existence, even if they will never visit them, and may derive satisfaction from knowing that an area is protected for future generations. MPAs in Canada are established for the benefit of all Canadian people [see *Canada Oceans Act*].

### *Rationale:*

Existence values are challenging to determine, but should be considered in the design of MPAs. If they are ignored, activities and uses which are associated with a market value will inevitably be overemphasized. Local and regional populations are likely to have different existence values than those of the national population. Given the complexity of the marine and coastal environment, existence value will vary as a function of environmental quality. The value of unprotected oceans territory will differ from the value of an MPA, and within an MPA the value of a no-take reserve will exceed the value of non-reserve areas that permit various uses.

While these issues appear complex, separate studies on existence value for each MPA are not necessary. The economic concept of benefit transfer allows the values determined in a study in one location to be "borrowed" for another location by adhering to certain assumptions. While the uncertainties associated with such a transfer may be too large if they involve values from an Australian or even a US site, one national Canadian study of existence value of MPAs with some regional test sites should provide the appropriate or rudimentary information for Canadian MPA network planning. Such information is of particular importance if planning / management / decision tools are also to consider a wider suite of economic values.

References:

Bohnsack et al. 2004, Harmon 2004, Rollins and Lyke 1998, Wallmo and Edwards 2008.

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## 4 | MPAS IN CONTEXT

MPAs are affected by what happens outside, as well as inside, their boundaries. As a result, the achievement of MPA conservation goals may rely on sustaining habitats, or ecological or biophysical processes that extend outside the boundaries of MPAs (such as through recruitment or productivity dependencies), including in adjacent terrestrial ecosystems.

It also follows that successful MPA planning and management must be embedded in broader planning and management processes. A regional ecosystem based management approach is key to ensuring that MPAs and MPA networks achieve their conservation goals, and that they in turn contribute to overall improvements in ecosystem health.

In addition, marine spatial planning, undertaken at a broader regional scale, will ensure that MPAs and MPA networks are planned in such a way as to protect the areas of most significance and importance from a conservation perspective, while at the same time avoiding areas of high use.

### 4.1 Marine Spatial Planning and Ecosystem-Based Management

#### 15. Guideline: Implement MPA networks through marine spatial planning (MSP) embedded in ocean-wide ecosystem-based management (EBM)

*Definition:*

Ecosystem based management (EBM) “is an attempt to integrate the full spectrum of goals, management entities, and constituents within that region to design a management strategy that explicitly considers the necessary tradeoffs among various activities and services” (Halpern et al. 2010:18312). As a system-wide approach, EBM considers interactions among ecosystem components and sectors, together with the cumulative impacts of oceans uses.

Marine spatial planning (MSP) refers to a process for analyzing and allocating ocean space for a variety of uses in order to achieve ecological, economic and social management objectives.

*Rationale:*

An opportunity exists in Canada through integrated oceans planning processes to plan for bioregional MPA networks. Currently five integrated oceans planning processes are underway (Pacific North Coast, Beaufort Sea, Placentia Bay/Grand Banks, Gulf of St. Lawrence and Eastern Scotian Shelf) and others are being considered in the future for the remaining large ocean areas in Canada. If marine spatial planning (MSP) is implemented as part of these processes, an important outcome should be MPA networks that would be planned in the context of human uses.

As bioregional planning takes place, it will need to work on multiple scales supported by appropriate nested levels of governance structures and processes. Explicit consideration should be given to how political jurisdictions align and overlap with bioregional boundaries/networks and appropriate arrangements established to ensure adequate cooperation in these areas. In addition, specific measures will be needed to ensure that the boundaries between bioregions are considered.

Because MPAs are intimately connected to surrounding areas, the ability of MPAs in achieving conservation outcomes and benefits to people will depend upon a seamless integration of MPA networks into broader planning and EBM, which inherently recognizes connections, cumulative impacts, the inevitability of change, and the necessity of learning and adaptation.

As part of the bioregional planning process there is an opportunity to ensure that the location of MPAs with



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harvesting restrictions does not disproportionately impact particular communities or specific fisheries. For example, First Nation-driven coastal planning on the west coast is focusing on the scale of traditional territories in the consideration of protected area replication—which is consistent with larval dynamics of some important species.

References:

Christensen et al. 1996, Halpern et al. 2008, Levin et al. 2009, McLeod et al. 2005, McLeod and Leslie 2009, POC 2003, USCOP 2004.



**16. Guideline: Conduct a stressors/threats assessment that considers cumulative impacts**

*Definition:*

Information gathered from the scientific literature, stakeholders and experts can help identify potential threats to marine ecosystems from human activities. This process relies on spatial and temporal data regarding current activities occurring on Canada’s coasts (Section 3.2).

*Rationale:*

The marine environment is heavily impacted by a suite of human activities. In order to address threats outside of MPA boundaries the relationship between human activities and stressors on marine ecosystems should be quantified. A recent study (Ban et al. 2010) suggests that MPAs in British Columbia currently do not fully address the overall impacts of human activities.

A detailed threats assessment, which considers multiple activities and cumulative impacts, can help address potential threats to MPAs and conservation objectives. Scientific advice is crucial to understanding the relationship between human activities and ecosystem stressors as well as the potential resilience of ecosystems to varying levels and types of impacts. Such an assessment can help guide MPA network design and also management strategies for protection and threat mitigation.

References:

Ban et al. 2010, Halpern et al. 2007, 2008, 2009.



**17. Guideline: Evaluate threats in relation to Limits of Acceptable Change (LAC)**

*Definition:*

The Limits of Acceptable Change (LAC) is an adaptive management process that refers to the maximum amount of human-induced change that is acceptable in order to prevent significant adverse environmental or social effects during resource use. The objective of the LAC process is to manage change—not prevent it—by deciding which management actions are needed to maintain or enhance desired conditions.

The LAC process consists of selecting key indicators of acceptable resource and social conditions, defining qualitative standards to measure indicators, applying different standards to resource and social conditions and implementing management actions to maintain desired conditions over time.

*Rationale:*

The LAC process attempts to answer how much impact is acceptable? For whom? And what measures should be implemented to avoid unacceptable impacts? This compromise must be developed through a collaborative process in which the resultant decisions reflect the input of numerous stakeholders.

A pilot project in British Columbia (Vold et al. 2008) tested the applicability of the LAC approach for tourism and recreation management in British Columbia, it resulted in a positive evaluation of the LAC as a sound and useful framework, which allowed active networking and communication among participants. Roman et al. (2007) arrived at acceptability values and a zoning scheme for snorkeling tourism at the Koh Chan National Marine Park in Thailand, based on social surveys that assessed visitor perceptions and satisfaction with conditions encountered on snorkeling tours. Another experience provided a valuable reference for the

management of large-scale aquaculture in New Zealand (Zeldis et al. 2006). The study found the LAC to be a transparent process to set trigger points and proposed management responses. Indicators for environmental conditions and associated trigger levels were agreed in advance of development. Management responses should these trigger levels be exceeded were clearly delineated, thus providing certainty for participating stakeholders.

References:

Cole and Stankey 1998, McCool and Cole 1997, Roman et al. 2007, Vold et al. 2008, Zeldis et al. 2006

## 4.2 Systematic Conservation Planning

The conservation literature continues to demonstrate the benefits of a systematic approach to conservation planning. This framework comprises many steps, ranging from scoping to maintenance and monitoring, several of which are detailed elsewhere in this report, but here the focus is on a systematic process for integrating the various ecological criteria and socioeconomic considerations to ensure that the resulting network satisfies the objectives of an MPA network. This stage is greatly enabled by decision-support tools and a process for involving stakeholders and constituents in the evaluation of alternative networks. This may require an iterative process whereby technical methods and participant processes are integrated.

References:

Ban et al. 2009, Craighead et al. (in press), Margules and Pressey 2000, Margules and Sarkar 2007, Pressey and Bottrill 2009.

### 18. Guideline: Employ decision-support tools that enable the integration of the various ecological criteria and socio-economic considerations to achieve MPA network objectives.

Choosing the most appropriate methodology depends on the underlying goals for establishing the network of MPAs. Clearly defining the purpose and the overall conservation goals is an important first step that must not be overlooked.

Systematic network design in conservation planning offers a great advance over previous unsystematic methods based on the simple selection of high scoring sites: it enables and depends upon the evaluation of alternative networks based on network-level considerations (see Sections 2.2 and 3.2), and the evaluation of each site's contribution to the broader network's overall representation and maintenance of key elements. Because of the complexity of this task—the importance of any individual MPA depends on other MPAs in a network—systematic network design generally relies upon algorithm-based decision support tools. One of the most commonly utilized tools is Marxan which is both well supported and regularly updated. Marine Map has also been used in MPA network planning as a web-based tool designed to facilitate stakeholder involvement and collaboration in the design of MPA networks.

References:

Ball and Possingham 2000, Game et al. 2008, Gleason et al. 2010. [www.marinemap.org/marinemap](http://www.marinemap.org/marinemap)

### 19. Guideline: Embed tools in processes to integrate socio-cultural and economic considerations.

Tools such as Marxan can incorporate some socio-cultural and economic considerations, such as social and economic costs and benefits associated with ecosystem services in the optimization process. Other socio-cultural and economic considerations will require other tools and/or participatory processes to account for them effectively in network design. Accordingly, designing an effective MPA network will require an interplay between technical processes and stakeholder involvement.

References:

Ardron et al. 2010, Ban et al. 2009, Chan et al. (in press), Evans et al. 2004, Game et al. 2008, Klein et al. 2008, Watts et al. 2009.



## 4.3 Ecological and Social Uncertainties, and the Limits of Analysis



### 20. Guideline: Characterize uncertainties comprehensively, and proceed even without certainty

Data and analysis should be central to decision-making, but it is critical to note that uncertainties are pervasive and unavoidable, but not paralyzing. Ecological and social outcomes and associated values will remain uncertain because seascapes are complex systems with multiple interacting human and ecological components. Accordingly, attributing the causes of an observed pattern is complicated by the many possible factors operating at numerous interacting scales. Similarly, and connected to this, *prediction* of future outcomes—particularly in the long-term—is currently impossible, and model outputs should be considered *projections*. Projections from modeling can provide some understanding of which outcomes are more likely than others—given a large number of assumptions—but the assumptions themselves are uncertain and subject to change over time. Since the purpose of MPAs is explicitly long-term, these uncertainties should not cripple design and implementation.

An associated issue is that uncertainties are rarely characterized fully: many significant uncertainties are implicitly built into analyses and models through structural assumptions. Such hidden uncertainties impede learning and decision-making by providing false senses of security and obscuring the nature and sources of uncertainty. Accordingly, MPA implementation and management should follow an adaptive approach (Section 4.4) beginning with a comprehensive assessment of uncertainty, such that structured learning can enable enhancement of MPA effectiveness.

References:

Cressie et al. 2009, Lee 1999, Levin 1992, Walters 2002



### 21. Guideline: Recognize limitations of economic valuation and cost-benefit analysis

**Definition:**

Economic valuation is the quantification, in monetary terms, of costs and benefits. Cost-benefit analysis is the weighing of total expected costs and benefits associated with one or more actions. Valuation and cost-benefit analysis have been granted a place of considerable authority within environmental law and policy in Canada and elsewhere. For example, the Treasury Board of Canada requires cost-benefit assessments as part of the Regulatory Impact Assessment Statement process, when considering the impacts of regulatory change at the national level.

**Rationale:**

Cost-benefit analysis can provide a convenient yet incomplete frame for integrating many types of data to evaluate the merits of alternative designs for MPAs or MPA networks. Because such analyses rely upon economic valuation, it is critical to recognize that valuation cannot comprehensively represent all values for at least three reasons:

1. Valuation of costs and benefits relies fundamentally upon an understanding of how the implementation of MPAs will result in ecological changes, and how those ecological changes will result in changes to benefits to people. As noted in the guideline above, our ability to project such changes is imperfect.
2. Economic valuation is limited in its ability to represent value where marketed goods and services do not already exist.
3. Many costs and benefits are of a non-material nature (e.g. cultural and ecological integrity) and so are not appropriately valued in economic terms. Whether to create an MPA is fundamentally an issue of what is morally right and what we want as a society, and moral questions cannot be solved by economic valuation.

Economic valuation is of great utility for particular questions—e.g. helping determine which configuration of a planned MPA is likely to yield the lowest economic costs and the greatest economic benefits—but it should

not be used as the sole tool for determining whether the full suite of benefits of an MPA outweigh the full set of costs. For valuation purposes, economic methodologies should generally be used in conjunction with approaches from other social sciences.

References:

Chan et al. in press, EPA 2009, Gregory 1993, NRC 2005, Rudd 2007, Sagoff 1998.

## 4.4 Goals, Objectives, and Adaptive Management for MPAs

### 22. Guideline: Adopt an adaptive management framework with explicit and achievable objectives

*Definition:*

Each individual MPA and the MPA network should have explicitly stated and achievable conservation objectives and targets which structure all stages from design through to management. For individual MPAs, management plans will specify the desired objectives for a given protected area, the action steps necessary to achieve those objectives, clearly defined agency responsibilities, compliance regimes and performance measures, adequate funding sources, and measures that can be implemented. These plans also act as an accountability mechanism and a learning tool: clearly defined goals and objectives, together with measurable criteria can be used to evaluate MPA effectiveness.

Adaptive management is a structured, iterative process of decision-making under uncertainty, where management actions and monitoring activities are designed to reduce key uncertainties, thereby enhancing future decision-making.

*Rationale:*

Protected areas are embedded within complex and changing ecological and socio-cultural contexts. MPA planners and managers face a high degree of uncertainty in planning and decision-making. An adaptive approach is needed to effectively manage MPAs, comprising an integrated, iterative cycle of planning, management, monitoring and reporting, all tied to clearly defined and measurable conservation objectives. An integrated adaptive approach should be intentionally designed to include clearly identified goals and objectives, strategies to achieve these, and on-going measurement of results that are publicly reported, and that inform future management through learning.

MPAs in Canada currently allow multiple use of a large proportion of the designated area. For desired conservation results to be achieved it is essential that ecologically sustainable management practices be implemented that are explicit, measurable and adaptive. For renewable resource extraction and other activities considerable research may be required to define the use levels that are sustainable under the mandate of the relevant legislation and prime direction for implementing the precautionary principle.

References:

Hockings et al. 2006, Lundquist and Granek 2005, Parks Canada 2008, Walters 2002.

### 23. Guideline: Shift the burden of proof

*Definition:*

Shifting the burden of proof is a risk averse or precautionary approach that requires ecosystems and resources to be protected from activities until it is demonstrated that the activities are unlikely to result in substantial harm.

*Rationale:*

This concept was proposed by Dayton (1998) in the context of fisheries management, and is applicable in the case of MPAs where some uses will continue to occur, for example through a zoning approach, and in determining the appropriate boundaries for MPAs. By shifting the burden of proof in favour of conservation,

the onus would be on users to conduct the studies and demonstrate that their activities will have either no impact or acceptable levels of impact prior to their activities being allowed. Given that fish and other marine organisms and resources are publicly owned, those who profit from them should demonstrate that they will not pose harm to marine ecosystems. This has been suggested as a principle of sustainable oceans governance (Costanza et al. 1998). In order to be precautionary, there is a need to determine the “metric on which a decision is based and the level (or standard) of proof that the metric must meet” (Gerrodette et al. 2002: 658). Charles (2002) has documented the challenges in fisheries management in Canada when the burden of proof is either misunderstood or not placed in favour of conservation.

References:

Agardy 2000, Bohnsack et al. 2004, Charles 2002, Costanza et al. 1998, Dayton 1998, Gerrodette et al. 2002.



## 24. Guideline: Link MPA planning, establishment, management and monitoring processes

In order to ensure that objectives and targets are met, MPA managers should be brought into planning and establishment processes to ensure continuity between phases. In addition, management needs should be considered during the process of establishing an MPA to ensure that decisions and understandings made during the establishment process are compatible with, and enable, effective MPA management.

MPA networks and individual units must be supported by a monitoring assessment and report system focused on achievement of biodiversity, socio-economic and cultural objectives, outcomes and management effectiveness from the outset. The emphasis in monitoring should be on feasibility, including affordability and logistical considerations as well as on scientific credibility, and it should complement any existing data collection programs. The key focus of monitoring programs must be the links to the stated objectives of the MPA. Involving local people in the design and implementation of monitoring programs brings many benefits.

References:

Crawford et al. 2004, Day 2008, Dearden and Topelko 2006.

## 4.5 Interim protection measures



### 25. Guideline: Provide interim protection for candidate MPAs

#### *Definition:*

Interim protection is a mechanism to protect the values of a proposed MPA site to ensure that ecological and cultural values are secured while planning and establishment processes are initiated and completed. Interim protection could be achieved through a number of mechanisms, including fishery regulations, shipping regulations, and agreements with other governments and/or stakeholders.

#### *Rationale:*

While providing interim protection for proposed terrestrial protected areas early in the establishment process is widely accepted and implemented in Canada (e.g. national parks, NWT Protected Areas Strategy), this mechanism has been less widely applied in the establishment of MPAs. Interim protection has been implemented through fisheries closures to protect cold-water corals in the Gully MPA, NS, and glass sponge reefs in the Hecate Strait, BC. In the latter case, interim protection from bottom trawling has been on-going for more than a decade while an Ocean’s Act MPA is being planned. However, these examples are the exception rather than the norm in Canada.

Internationally, the need for interim protection for proposed MPAs has been noted, such as for establishing MPAs on the high seas. In Canada it generally takes many years—even decades—for proposed MPAs to move through the establishment process and be designated in law. Meanwhile, there is a significant risk that the values that are identified for protection could be compromised. A policy framework exists to enable interim protection

for Oceans Act MPA areas of interest, including a commitment to monitor the ecological integrity of areas of interest and to manage according to the Precautionary Principle.

A suite of legislative and non-legislative tools exist in Canada that could be used to provide interim protection, including fisheries and vessel operation restrictions, voluntary agreements, and many others. A 2008 report prepared for WWF Canada and CPAWS described 28 different measures (17 legislative and 11 non-legislative) that could be used to provide interim protection for marine areas of high conservation value. In some cases, multiple tools will need to be applied to achieve effective interim protection.

Reference:

Breeze and Fenton 2007, DFO 2007, DFO 1999, Laffoley 2005, WWF Canada and CPAWS 2008.

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## 5 | MPA GOVERNANCE

*Governance* refers to the formal and informal arrangements, institutions and norms that determine how environments and resources are utilized. It includes laws and regulations, in addition to a variety of other decision-making processes, such as public consultations, stakeholder involvement, negotiation, mediation, and conflict resolution. As such, it is important to distinguish *Government* from *Governance*; “governance is not the sole purview of the state through government, but rather emerges from the interactions of many actors, including local communities, private actors, companies and not-for-profit organizations” (Lebel et al. 2006: 3).

A shift from Government (or ‘top down’ traditional approaches where the state relies on its formal political hierarchy and problem-solving structures to Governance “does not necessarily mean that the role of the state has diminished or even decreased” (Holmgren et al. 2010: 424). However, the role of government has changed in recent years towards being more of a collaborator and partner, facilitating the involvement of multiple societal players in developing and implementing solutions.

The implementation of environmental policy is carried out by a number of policy instruments, including institutional, regulatory, economic and informational methods. These include a range of different measures from the more traditional measures regularly undertaken by the state, to the more norm-building measures that are more accessible to other actors. To have a beneficial impact, a policy instrument must have a strong foundation in the values and opinions of the public. The legitimacy of a policy is linked to values such as flexibility, efficiency, cost-effectiveness, communication and equality. There is also, according to Nilsson (2003: 2), “a positive correlation between the existence of effective democratic institutions and successful policy reforms.” Finally, good governance has been associated with attributes such as “participation, representation, deliberation, accountability, empowerment, social justice and organizational features such as being multilayered and polycentric” (Lebel et al. 2006: 3).

There is increasing consensus that the cause of environmental degradation and resource depletion is institutional and that if “we get the right rules and governance structures, natural resources will be used wisely and conservation goals will be met” (Acheson 2006: 118). That is, individual and collective aims and interests in environmental management and protection will be affected by the extent to which various actors and stakeholders perceive that state and governance measures are supporting “good governance.”

Several attributes of “good” governance relevant to the Canadian MPA Governance context have been identified and are presented below in terms of guidelines:

- Commitment
- Accountability
- Transparency
- Cooperation
- Aboriginal partnerships
- Stakeholder engagement
- Knowledge and social learning
- Public awareness and support

See Appendix 1 for details of Government (federal and provincial) policy relating to MPAs.

#### References:

Acheson 2006, Appelstrand 2002, Bellefontaine et al. 2010, Berge 2002, Bryant and Wilson 1998, Carlsson and Sandström 2008, Clausen and McAllister 2001, Dearden et al. 2005, Holmgren et al. 2010, Juda 1999, Lebel et al. 2006, Lockwood et al. 2009, Lockwood 2010, Lockwood and Davidson 2010, Nilsson 2003, Young 2002.

## 5.1 Commitment

### *Definition:*

*Commitment* is the act of meeting a promise or obligation to a particular course of action. In the context of the establishment and management of MPA sites and networks, commitment is required at a variety of levels within government and society—from elected officials to government managers to stakeholders and the public. The three Canadian federal MPA legislations (Appendix 1) and relevant provincial and territorial legislation, should be amended to include these prohibitions.

Adequate funding is an essential component of this commitment and is required to support all phases of proposal, planning and preparation for the establishment, implementation and enforcement of MPA management objectives and regulations; this includes costs associated with project proposal, development of a legal framework for designation, development of a management plan, outreach to local community and stakeholder groups, community and stakeholder compensation schemes (including alternative-income generating activities and fishermen buy-out), ecological and socio-economic research, management and enforcement training, and infrastructure (including buildings, equipment, and site delineation). Subsequent to the establishment of MPA sites, long-term funding must be available to support maintenance and management, including staff expenses, maintenance of buildings and equipment, fuel, education and outreach, and recurrent capital expenses. The amount of funding necessary for the initial establishment and long-term management of an MPA may be estimated using models developed by McCrea-Strub et al. (2011) and Balmford et al. (2004), respectively.

### *Rationale:*

Strong political commitment can lead to a strong national or regional mandate for MPA implementation, which in turn can translate into adequate resources, consistent policy over time and compatible policy development by other agencies (e.g. in California, Governor Schwarzenegger's executive mandate for MPAs, and the Great Barrier Reef rezoning experience). On-going commitment is also necessary to support: effective coordination and continuity among and within government agencies; a fair and inclusive process of strong stakeholder involvement; coordination of knowledge inputs; effective opportunities for public engagement; and the maintenance of momentum towards MPA establishment. It is essential for staying the course despite organized resistance from some sectors.

### **26. Guideline: Develop a national MPA network action plan that includes a commitment to precise timelines and milestones**

Canada must live up to its international commitments to complete a national network of MPAs. Marine ecosystems are degrading in all of Canada's oceans and are subject to many stressors. It is critical that the Government of Canada follows through on commitments regarding the completion of a national network; this should be done in a timely manner, with a plan that includes milestones and timelines.

### **27. Guideline: Include provisions for strict protection and strong prohibitions in Canadian MPA legislation**

A legislative commitment to strict protection in a minimum of 30% of all habitats in all marine bioregions in Canada would provide the greatest assurance that all bioregional MPA network planning processes achieve this target. At the next opportunity to update the Oceans Act, this guideline should be incorporated as the clear target for Canada's MPA network overall. In addition, this should be incorporated in the legislation of each type of MPA in Canada—Oceans Act MPAs, National Marine Conservation Areas, and National Wildlife Areas, as well as provincial and territorial statutes.



Human activities that could negatively affect ecosystem health and productivity are not compatible with the conservation and protection goals of MPAs. Industrial uses and developments, including exploration for and extraction of non-renewable resources, dredging, dumping, and destructive fishing practices, particularly bottom trawling, should be prohibited in all MPAs. The three Canadian federal MPA legislations (see Appendix 1) and relevant provincial and territorial legislation, should be amended to include these prohibitions. While legislative renewal is underway, these prohibitions should be incorporated into the MPA network framework and other policy instruments related to MPAs in Canada.



## 28. Guideline: Provide adequate funding to support MPA site and network development

Implementation of a national network of MPAs is fundamentally a government responsibility that should be funded through the federal budget, and where appropriate through the budgetary processes of the provinces and territories, recognizing their important roles in the MPA process and their protected area designations. In some cases, public/private partnerships may help to facilitate the timely completion of the network, as is currently the case for the Pacific North Coast Integrated Management Area (PNCIMA) region.

Funding commitments should be adequate for MPA site and network establishment and implementation as well as their long-term adaptive management. Budgets should be committed up-front, and include provisions for stakeholder participation in establishment and management processes as well as enforcement.

Greatest cost efficiency per unit area may be achieved for larger MPAs established in a relatively short period of time (provided the establishment phase is long enough to ensure future effectiveness). Research also indicates that management costs for single large no-take reserves are much less than for multiple-use designations of the same area, due to the costs associated with compliance.

### References:

Balmford et al. 2004, Ban et al. 2011, Jessen 2011, McCrea-Strub et al. 2011.

## 5.2 Accountability

### *Definition:*

*Accountability* refers to obligations imposed on authorities to provide information and explain decisions and actions or inactions as well as whether they can be sanctioned if those explanations are unsatisfactory. Accountability includes downward as well as upward accountability; that is, in addition to being accountable upward to central state authorities, authorities are also accountable downward to the resource users. In addition to vertical relationships (downward and upward), accountability applies to horizontal relationships; for example between federal government agencies responsible for marine conservation.

### *Rationale:*

The institutional culture of government has been described as “risk averse and tied to accountability regimes that stifle innovation and discourage shared decision making” (Bellefontaine et al. 2010:5). These regimes are linked to a legacy of “top-down” management (and associated upward accountability) which runs counter to, and has limited experience with, horizontal accountability. However, the role of government is changing with collaborative relationships providing opportunities for the government to take a more active and effective position in governance.



## 29. Guideline: Provide regular public reporting on progress in MPA network completion

In order to instil public and stakeholder confidence in the MPA process it will be important to monitor and publicly report on progress on the bioregional networks. This should include the implementation by the Government of Canada of an annual reporting mechanism on progress. The California Marine Life Protection

Act Process provides a possible model for public reporting and information availability, as does the *Canada National Parks Act*. The latter requires a number of regular reports to Parliament, including the tabling of park management plans, State of the Parks reports every two years, and a biannual Minister's Round Table.

Ensuring that stakeholders and the public are informed as to “what is at stake in decision-making, who is responsible for what, how their performance can be evaluated, and how the responsible actors can be made accountable” (as well as how and why certain decisions have been or are taken is to key to building confidence in public processes. Public opportunities to demand accountability should be accessible and effective, and accountability should link to a clearly defined and appropriate system of rewards and sanctions.

### 30. Guideline: Establish an independent scientific advisory process

An independent science advisory process and panel comprised of natural and social scientists should be established to incorporate scientific rigour into the planning and management of MPAs and MPA networks. MPA site and network proposals should be weighed against guidelines by this independent panel to determine whether and to what extent the guidelines are being met. All bioregional MPA network processes should be required to use guidelines in the design of these networks.

An example of such an advisory process exists in the UK, which established an independent Science Advisory Panel. The Panel provides “...an expert and impartial scientific view on whether proposals meet the criteria set out in the SNCB [Statutory Nature Conservation Body] Ecological Network guidance.” (DEFRA 2010: 7). In addition, the process provides for other specialist advice on the assessment of socio-economic information and the Impact Assessment process.

#### References:

Agrawal and Ribot 1999, Bellefontaine et al. 2010, Borrini-Feyerabend et al. 2006, Cash et al. 2003, DEFRA 2010, Ellsworth and Jones-Walters 2005, Ribot 2002.

## 5.3 Transparency

### Definition:

Transparency refers to the visibility of decision-making processes, the clarity of the communication of the rationale for decisions, the availability of information about the performance of the decision maker(s), and the openness of decision-making to public input and oversight. Transparency and openness are essential to ensuring that decisions are fair, equitable and in the interest of the common good.

### Rationale:

Transparent participation processes that provide comprehensive, accurate and up-to-date information to communities and user groups, including communication through advisory councils and other mechanisms such as websites and other electronic media, is crucial at all stages of MPA planning and management. Transparent decision making ensures that participants have access to an adequate amount and quality of information and knowledge and that open lines of communication with all parties are established. Greater transparency also makes government officials and policy makers more accountable (Section 5.2), while at the same time enhancing public participation and building trust/social capital between different actors. This in turn can lead to an ‘upward spiral’ ‘of cooperation and confidence that cooperation will be reciprocated amongst MPA users, while erosion of trust through lack of transparency, equity, enforcement, etc. can lead to a ‘downward spiral.’”

### 31. Guideline: Provide adequate, accurate and timely information to stakeholders

The Government of Canada should provide comprehensive, accurate and up-to-date information to stakeholders and Aboriginal communities and organizations, including details of the potential benefits and costs of MPAs as well as restrictions on certain uses. It should also support the dissemination of relevant scientific information,

local knowledge and spatial data, and make priority data available early in the process (e.g. habitat and socioeconomic data).



### 32. Guideline: Improve public access to fishing data in Canada

In order to plan for MPAs and MPA networks and to consider potential conflicts between proposed MPAs and important fishing areas, it is critical that both ecological and socioeconomic information is made publicly available to all stakeholders. Only in this way can potential conflicts between uses and conservation be addressed in an open and transparent manner. Currently, access to fishing data in Canada is limited due to confidentiality rules under the Access to Information Act, which leads to data being summarized into grids of either 4x4 km or 10x10 km, depending on whether at least three boats have been fishing in an area. Where there are less than three boats, the data are summarized.

In a study conducted by Ecotrust Canada (2008), many problems were identified with access to socioeconomic and scientific data from DFO, including the lack of a coherent policy on data access, and consistent and fair application of privacy rules. They note that "...the stakes go beyond the health of the fish stocks themselves to fundamental issues of who controls and benefits from a public resource."



### 33. Guideline: Provide public access opportunities to information, meetings, and decisions

The federal government should ensure that information is widely available and that meetings to discuss and make decisions on MPAs and MPA networks are open and accessible to all parties. In order to ensure transparency of decisions, discussions should be available over the internet; time should be allotted on agendas for public comment on the process; public submission of ideas and concerns should be facilitated; and publicly-accessible websites with agendas, materials and reference documents should be created and regularly up-dated. The ideas and concerns of the public and stakeholders should also be documented and made available with explanations, where possible, for how these ideas and concerns have been considered in decisions.

*References:*

Ban et al. 2009, DEFRA 2010, Ecotrust Canada 2008, Gleason et al. 2010, Jones et al. 2011, Osmond et al. 2010, Ostrom 1999, University of Queensland Ecology Centre 2009, World Resources Institute 2003.

## 5.4 Cooperation

*Definition:*

*Cooperation* refers to the legal or other official basis for cooperation between federal, provincial and territorial, and local authorities and between agencies/enforcement units to address cross-jurisdictional and cross-sectoral issues and conflicts. Intergovernmental cooperation in the context of environmental protection and resource management in Canada increasingly involves shared authority with Aboriginal peoples. Given the significance of this dimension of Canadian governance, a separate section (Section 5.5) addressing Aboriginal Partnerships is provided below.

*Rationale:*

Jurisdictional complexity related to overlapping federal department mandates and provincial interests in marine environmental management makes jurisdictional responsibility difficult to pinpoint. As a result, establishing mechanisms to ensure effective cooperation (and enforcement) between different levels of government both within and between regions is paramount. However, there may arise issues/areas of marine management with unintended 'gaps', which can be addressed on a case-by-case basis. Such arrangements could include establishing advisory, supervisory, or oversight bodies, coordinating commissions, cooperation protocols, joint policy statements, or other special arrangements.



### 34. Guideline: Ensure effective internal and cross departmental collaboration

Ensure cross-department/agency collaboration that is supported by clear communication and sharing of information (including information relating to enforcement of MPAs in different regions). Prevent and address, as much as possible, unintended gaps in jurisdiction over marine management issues by setting up appropriate bodies or mechanisms.

More specifically, enhanced levels of cooperation between different branches of DFO and between DFO, Parks Canada, and Environment Canada for coordinating and enforcing the Federal Network of MPAs will be necessary. While lead responsibility has been given to DFO for both ocean health and fisheries, ensuring greater levels of communication and information sharing (1) between branches within DFO and (2) between DFO and other agencies is essential to a more effective and integrated management approach. This has been a key challenge to Canada's progress on MPAs to date.

**References:**

De Santo and Jones 2007, De Santo 2010, DFO 2009, Gromack et al. 2010, Jessen 2011, UNEP-WCMC 2008.

## 5.5 Aboriginal Partnerships

**Definition:**

*Aboriginal rights* refer to a spectrum of rights that extend from non site specific Aboriginal rights (i.e. rights that are not tied to a particular place), to site-specific Aboriginal rights and, finally, to Aboriginal title—the highest form of Aboriginal rights (See Appendix 2). Aboriginal and treaty rights are “recognized and affirmed” by Section 35(1) of the *Constitution Act*, 1982. Several important legal decisions have helped define and clarify these rights in recent decades. More importantly because Aboriginal rights are constitutionally protected, any federal or provincial legislation that unjustifiably infringes those rights is of no force or effect. As a result, any decision or legislation that establishes an MPA may be struck down if the government establishing the MPA cannot meet the justification test. For this reason, it is important to include First Nations in a meaningful way in the process for establishing MPAs.

See Appendix 2 for a detailed description of Aboriginal Rights and Title.

**Rationale:**

According to Peepre and Dearden (2002:324) Aboriginal Peoples have been the “most dominant force influencing the establishment of national parks over the last decade”, accounting for the protection of more than half of the land area in Canada's national park system.

Aboriginal peoples also have a profound cultural, economic and physical relationship with the marine environment that stems from time immemorial. Their traditional and ongoing connections to marine environments and resources are thus pivotal to future marine conservation management arrangements, including MPAs, for several reasons.

First, Aboriginal rights are protected by the Canadian Constitution and confirmed by Canada's Courts, and some Aboriginal communities are concerned with potential restrictions that MPAs might place on their rights concerning marine resources. The strength of these rights, the fiduciary obligations of the federal government to Aboriginal peoples, and the ‘honour of the Crown’ that applies even where a claim of Aboriginal title has not been confirmed through negotiation or court determination, mean that the creation and management of MPAs must involve collaborative relationships with Aboriginal communities.

Second, many Aboriginal communities possess detailed knowledge representing generations of observation and experimentation about the marine plants and animals, weather, snow and ice conditions, and so forth. This knowledge, together with the worldviews and customary institutions of management within which they are

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embedded, contributes to understanding many aspects of marine ecosystems and to the identification of locally-appropriate management and protection regimes.

Third, First Nations are a level of government with influence over decisions on marine planning and management. Meaningful partnerships with Aboriginal people which respect and build upon local institutions and place-based knowledge are more responsive to local social and environmental contexts and offer more rational, cost-effective approaches to management by ensuring local legitimacy and cooperation.

Fourth, Aboriginal concerns about maintaining the quality of home marine environments may represent one of the few and possibly the strongest bases for limiting and controlling offshore development activities into the future. With their close connection to place, Aboriginal communities are particularly concerned about the status of and threats to marine resources.

MPA advocates can maximize the potential for earning support for MPAs from Aboriginal peoples and for effective collaboration with Aboriginal peoples by working authentically towards addressing interests related to Aboriginal rights and title.



**35. Guideline: Clarify how MPA creation and management interacts with existing Aboriginal rights and title**

Clarify from the outset how MPA creation and management interacts with existing Aboriginal rights and title. In particular, confirm that Aboriginal rights to food, social and ceremonial harvesting apply within all MPAs, unless a particular Aboriginal group or community chooses not to exercise these rights in support of fully protected areas. In the case of existing land claims agreements that have provisions for the offshore, ensure that the design and implementation of the proposed MPA is consistent with specific provisions of these agreements (e.g. wildlife co-management boards). In the case of uncertainty regarding offshore title, ensure that interim agreements protect Aboriginal interests, state in the agreement for the MPA that Aboriginal rights are recognized, and where Aboriginal rights remain unresolved designate the MPA as a reserve, subject to (“without prejudice” to) treaty negotiation.



**36. Guideline: Respect Aboriginal institutions**

Build upon and support continued and enhanced local management embedded within customary institutions for land and sea stewardship and community governance. Clarify how these existing institutions would interface with regulatory and management arrangements for the MPA.

Where land claims agreements exist, it is vital that the designated institutions be involved in the development of the MPA network, and specific provisions, like the Inuit Impact Benefit Agreements of the Nunavut Land Claim, be honoured.

Respect Aboriginal aspirations, existing institutions and local conditions in MPA establishment. The direct participation of Elders, hunters, trappers and fishermen and other community members and leaders in identifying priorities, concerns and needs should be enlisted in mapping, life histories, traditional resource use and similar projects (Section 5.7).



**37. Guideline: Establish meaningful Aboriginal engagement**

Establish meaningful engagements with individual Aboriginal communities at the earliest possible opportunity. This should involve open communication with the elected leadership and community members, including Elders, hunters, trappers and fishermen as well as women and youth. MPA projects should not proceed without the consent of affected aboriginal groups, including consent from and within local and regional levels. Ensure that timeframes, venues and decision-making processes are locally appropriate and legitimate. Engage with

Aboriginal nations and organizations at the policy and network design level—not just the site level. Involve the entire community—but especially those individuals and families whose traditional territories are directly involved—in the identification of areas of importance and the establishment of boundaries.

References:

Berkes et al. 2007, Daoust et al. 2010, Dearden and Langdon 2008, Gardner 2009, Gladu et al. 2003, Mulrennan et al. 2009, Peepre and Dearden 2002, Vierros et al. 2010.

## 5.6 Stakeholder Engagement

### *Definitions:*

The term *stakeholders* refers to those individuals and groups who have an interest in or are affected by an existing or proposed governing planning process; stakeholders who are identified by the urgency of their concerns, the legitimacy of their interests or the power they hold will be clear candidates to become involved in the decision-making process. A wide range of stakeholders have an interest in marine resources for use or conservation, including commercial and recreational fisherman, non-consumptive users, conservation organizations, industry users (shipping, energy, etc.), and local communities.

*Stakeholder engagement* refers to the involvement of key individuals and groups in the governing planning process and the mechanisms used to facilitate their participation.

### *Rationale:*

The development and implementation of MPAs can be a long and arduous process often hindered by resource conflicts among different user groups with divergent views and interests. Broad engagement of diverse stakeholder groups is required during the identification, selection, design and management stages to ensure that local knowledge is incorporated and that existing uses and potential threats are considered throughout the planning process. This engagement helps provide a framework for strong stakeholder participation, acceptance, support and consensus around conservation objectives of the MPA. Consequently, the involvement of stakeholders, from the early planning stages through to design and implementation, encourages a sense of ownership and commitment that can foster acceptance from local communities, long-term support and assistance with implementation and enforcement.

Meaningful participation leads to improved information exchange, greater accountability of experts and authorities, confidence in the decision-making process and collaboration among different stakeholder groups that result in collectively acceptable and successful conservation outcomes.

Although the most suitable approach to stakeholder engagement will be context and/or site specific, several guidelines for best practices have been suggested in the literature. It is generally acknowledged that stakeholder participation should be institutionalized as part of the planning process through governance structures and processes that support collaborative planning and decision-making.

### **38. Guideline: Establish clear terms of reference, including the scope of stakeholder involvement and influence**

Participation of stakeholders should be based on a thorough stakeholder analysis and a clear systematic selection process; selection criteria should emphasize clear expression of interest, knowledge of the region, commitment to completing the process and consideration of vulnerable or marginalized stakeholder groups.

Ensure clear, shared understanding of the potential impact of stakeholder input on MPA planning or decision outcomes. Manage participant expectations from the outset to match the actual level of influence on policy development, whether aiming for information sharing, consultation or full co-management.

At the beginning of the process, agree on steps, rules of procedure, timelines and accountability of the participants. Provide each stakeholder group involved in planning and implementation with a clearly



defined role. Adopt a set of ground rules for constructive interaction, e.g. a code of conduct. Emphasize clear communication, trust building, respect, and collaborative problem solving.



### 39. Guideline: Use professional third party facilitation

Professional facilitation by a neutral third party should be used whenever possible to guide the stakeholder process and when necessary to aid difficult or conflicting processes. Employ neutral and widely respected panels as an arbitration mechanism.



### 40. Guideline: Aim to achieve realistic levels of support and acceptance

Despite the strong support for meaningful participation processes described above, many practitioners acknowledge that the standard of full consensus or virtually unanimous support for an MPA is a target that is not realistic or achievable. Even the most collaborative approaches should not be expected to achieve full agreement. Political leadership is required to move the process forward despite some opposition, understanding that in the long term, everyone stands to gain from an effective network of MPAs.

Recognize that full consensus is not always possible. Work towards achieving realistic levels of support and acceptance through a meaningful participation process that adheres to all of the above guidelines. Ensure that stakeholders feel they have been heard even if some disagreement remains. Accept as adequate a level of support that is reasonable relative to the diversity of opinion in the array of parties/interests consulted.

**References:**

Agardy et al. 2011, Chan, et al. in press, Charles and Wilson 2009, Dalton 2005, DEFRA 2010, Gardner et al. 2008, Gleason et al. 2010, Gray et al. 2010, Grimble and Wellard 1997, Heck et al. 2011a and b, Jentoft et al. 2007, Jones et al. 2011, Kessler 2004, Lundquist and Graneck 2005, Osmond et al. 2010, Reed 2008, University of Queensland Ecology Centre 2009.

## 5.7 Knowledge and Social Learning

**Definitions:**

*Knowledge* can be defined as “socially mediated information” and cannot be separated from the application, use and development of the information (Weber and Khademian 2008:338). An essential ingredient of good governance is a process for citizens, experts and managers to co-produce and use knowledge to address complex problems. The process of transferring, receiving and integrating knowledge recognizes that each participant in the process understands the problem and identifies potential solutions based on their own experience. The challenge is to use the various forms of knowledge to develop a common base for the process, a key aspect of developing adaptive capacity.

“*Local Ecological Knowledge* (LEK) refers to a body of knowledge held by a specific group of people about their local ecosystems. It is often site specific and can be a mixture of practical and scientific knowledge” (Scholz et al. 2004: 336).

*Aboriginal Knowledge* (also referred to as indigenous knowledge or traditional ecological knowledge) is a cumulative body of knowledge, practice and belief handed down through generations by cultural transmission. It is based in the experience of people who have come to know an area by living in it, using and managing its resources for generations (Berkes et al. 2001).

*Social learning* refers to the processes of learning among individuals or groups of people who seek to improve a common situation and take action collectively (Bandura 1977). The concept assumes an iterative feedback between learners and their environment consistent with the idea of “managing to learn in order to learn how to manage” (Pahl-Wostl 2006). In this sense, social learning is a form of adaptive management, or ‘learning-by-doing.’

**Rationale:**

To facilitate well-informed, cooperative planning and management, the best-available knowledge and information must be readily available to the institutions and stakeholders involved. It is increasingly recognized that drawing on Aboriginal knowledge and LEK as well as sound science can bring more informed decisions that serve local people and ecosystems better.

Aboriginal people have unique knowledge about ocean systems. Local observations can provide much information, and many aboriginal experts recognize and monitor various environmental signals over time in a way that enables detection of long-term trends and assessment of aspects of the ecosystem. MPA management can benefit greatly from insights based in traditional knowledge, values and practices, and there is a need for MPA scientists to spend time with local communities and learn to share knowledge. With care, indigenous knowledge can be blended with science towards MPA planning and management, as has been done in fisheries settings (e.g. the Haida have based sockeye fishery management on modern stock assessment data along with Haida knowledge of the sockeye run).

Uncertainties and ambiguities can present major barriers to effective environmental management. Uncertainties usually relate to gaps in the knowledge base and can generally be addressed by gathering new knowledge, including knowledge from alternative sources such as Aboriginal and local knowledge. Ambiguities, on the other hand, are due to multiple perspectives or frames of reference; despite receiving far less attention than uncertainties, ambiguities due to multiple perspectives or frames of reference are known to be critical in environmental management contexts, particularly when uncertainties in both the factual knowledge base and decision stakes are high. Processes of social learning are not focused on achieving a consensus but on recognizing differences in opinion in order to deal with them constructively by engaging in collective learning and decision processes.

#### 41. Guideline: Provide up-to-date and comprehensive, accessible data

MPA design, planning, and management should be informed by scientific studies, including from both the social and natural sciences, as well as from local sources and Aboriginal Knowledge. Publically-funded information should be made readily available by the appropriate governmental agencies, and data collected from privately-funded studies should be made available via the purchase of access rights or information-sharing agreements. The information should be up-to-date, provided early in the process and be as comprehensive as possible, ideally providing data regarding biophysical, ecological, and socioeconomic factors.

The availability of relevant social and economic information should be identified at the outset, and strategies developed to address gaps in this information. Processes elsewhere have shown that relevant information needs to be provided on several scales, i.e. local, regional, provincial, national, and different data creating and gathering strategies should be devised.

Stakeholders and local resource users can be valuable sources of information and knowledge on the ecology of marine and coastal ecosystems, as well as the spatial and temporal use patterns of marine resources. The incorporation of local knowledge can focus limited scientific resources and be useful during the decision-making and marine planning process to fill gaps in scientific data.

#### 42. Guideline: Respect and build upon Aboriginal knowledge

Aboriginal Elders, as well as hunters, fishermen and other resource users can provide valuable knowledge and insights on the status of marine wildlife populations and environmental conditions. Many have developed highly effective regimes of customary resource use and management, often involving elaborate systems of social coordination to ensure optimal harvests while maintaining the long-term stability of wildlife populations. Respect and build upon Aboriginal knowledge, values and practices for resource management and environmental protection, in dialogue and partnership with relevant federal and provincial mandates and



responsibilities. Ensure that appropriate ethical considerations are taken and protocols followed in the accessing, use and communication of Aboriginal knowledge.



### 43. Guideline: Create opportunities for constructive dialogue and shared learning

Shared or social learning emphasizes the importance of dialogue and negotiation between groups to better understand different points of view, and to develop processes for collective action and reflection over time. As such, opportunities for groups to communicate different points of view and engage in constructive dialogue and shared learning should be created and maintained; this would include collective learning about mutual dependencies and interactions, possible scenarios for future MPAs, and the identification of barriers for change and possible solutions to overcome them. Provide a forum for exchanging information not only about resources but also about stakeholders themselves.

*References:*

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## 5.8 Public Awareness and Support

*Definition:*

Gaining public acceptance is an all-encompassing process that includes learning more about the local community and determining the expectations of the people who will be involved in management or stewardship of the area, and the broader public which values conservation and the marine environment. In this case, building public awareness and acceptance ultimately translates to gaining support for the establishment and continued protection of the marine environment, including enhanced compliance with MPA regulations.

*Rationale:*

Involving the public helps to enhance stewardship and lend support to resource management decisions after investing time in the process.

Societal participation and education are important in achieving improved marine governance. However there is still little consideration of how to engage the general public in the support of marine conservation and management. The behavioral and lifestyle choices made by individuals contribute to the degradation of the marine environment, thus engaging individuals as policy actors could reduce negative impacts on marine ecosystems. It is important to recognize the public as players in the development and implementation of marine policy and 'marine citizenship' as a mechanism to promote successful management and protection. Volunteer programs, particularly in the areas of monitoring and surveillance, provide additional ways to engage the public, particularly local community members.

A number of polls in Canada have documented strong public support for fully protected no-take MPAs on both the east and west coasts. However, the public believes that governments have already protected about 20% of the marine environment, when in fact less than 1% currently has any form of protection. Furthermore, the majority of MPAs that fall into this 1% protected are still open in some way to commercial fishing (that is, they are not no-take areas). In addition, residents are prepared to live with the short-term costs that may come with restricting human activities in the ocean. A 2007 poll of more a thousand British Columbians revealed that 90% support the need for more MPAs and on average people want 60-70 percent of the ocean protected, where protected was defined as areas where industrial activity is strictly prohibited.

#### 44. Guideline: Foster stewardship of the marine environment

Stewardship of the marine environment can be fostered by providing educational opportunities which will increase awareness and encourage the responsible use of resources. Provide targeted marine education through expanded informal learning opportunities (visitor centres, interpretation etc.); marine focused television programs; and improve availability of information

Highlighting the importance of a marine region for recreation and livelihood and making marine issues relevant and real for day to day life, and identifying the personal actions that people can take, and educating and empowering people, will increase their sense of responsibility for the ocean.

#### 45. Guideline: Build public awareness and support to encourage compliance

A valuable spinoff of enhanced public stewardship of the marine environment can be increased levels of compliance with MPA regulations. Traditional 'top down' modes of protection, focused on externally designed and enforced systems of rules and regulations, tend to be costly, alienate local populations, and result in relatively few detections. By building awareness in local populations and visitors of the need for protection and assisting local communities in deriving benefits from the MPA, 'soft' approaches to enforcement can be fostered whereby the public, alongside stakeholders and local communities act as a 'fence' for the MPA in discouraging illegal activities.

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# APPENDIX 1: CANADIAN GOVERNANCE CONTEXT

## International Commitments to MPAs

Canada has made many international commitments to complete a national network of MPAs including the 2002 World Summit on Sustainable Development, and the 2004 United Nations Convention on Biological Diversity Program of Work on Protected Areas and subsequent CBD decisions in 2006, 2008, and 2010.

The 2010 CBD target is:

*Target 11:* By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascapes.

Also, the maintenance of respectful relations with Aboriginal peoples is consistent with Canada's international obligations, including the United Nations Declaration on the Rights of Indigenous Peoples, article 27 of the International Covenant on Civil and Political Rights, International Labour Organization Convention No. 169, and the International Conventions on Biological Diversity.

## Federal and Provincial

Legislative authority for MPAs is shared on between the federal government and provincial and territorial governments. At the federal level Fisheries and Oceans Canada (DFO), Parks Canada, and Environment Canada, each has a mandate for a different kind of MPA. Various types of protected area designations exist at the provincial and territorial level for the establishment of MPAs. Canada's Oceans Act tasks the Minister of Fisheries and Oceans to lead and coordinate the development and implementation of a national network of MPAs on behalf of the Government of Canada.

Canada has approximately eight federal and 40 provincial/territorial legislative or regulatory tools for establishing protected areas with a marine component, including those located within the Great Lakes.

## Policy Context

In 2010, the Fisheries and Oceans Canada released a Draft Framework for a National Network of Marine Protected Areas, that was developed in collaboration with other federal agencies and provincial and territorial governments. The framework is being finalized after a public comment period.

In order to facilitate cooperation between the Federal Government and the Province of British Columbia, a 2004 Memorandum of Understanding Respecting the Implementation of Canada's Oceans Strategy on the Pacific Coast of Canada was signed (<http://www.dfo-mpo.gc.ca/oceans/publications/bc-cb/index-eng.asp>) This instrument established cooperation between Canada and British Columbia and an agreement to develop subsidiary MOUs in several areas, including coordinating the establishment of MPAs on the Pacific coast. While the MOU was never signed by the governments and is no longer being used as a framework for cooperative relationships, a joint British Columbia Canada MPA strategy has been developed, although not yet publicly available.

The provinces of Nova Scotia and Newfoundland & Labrador have embarked on the development of coastal and ocean management strategies with the objective of providing a long-term road map to managing coastal and marine resources. These initiatives include references to the state of coastal and marine resources, key threats and current provincial protected areas strategies, while making the linkages with existing federal coastal and ocean management processes. In NL the province aims to expand the current protected areas network to include representative portions of all natural regions, including coastal areas.

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Nova Scotia released its State of the Coast report as a precursor to a Sustainable Coastal Development Strategy, expected by Spring 2011, which will likely address the need for greater protection of coastal ecosystems and habitats in NS.

Additionally, the Province of Nova Scotia and the Government of Canada signed a Memorandum of Understanding on March 23<sup>rd</sup>, 2011 with the purpose of advancing collaboration in coastal and ocean management priorities. The MOU is to be implemented through the Regional Committee for Coastal and Oceans Management, a senior executive forum for Federal and Provincial Governments. Subsidiary agreements, working groups and /or other instruments will be developed to address:

- The implementation of Nova Scotia's Sustainable Coastal Development Strategy
- Integrated coastal and ocean management and marine conservation tools development
- Collecting, managing and sharing of information, including access to information by non-government users
- Development of a coastal research network to advance natural and social science, policy and legal research

## APPENDIX 2: ABORIGINAL RIGHTS AND TITLE

Aboriginal rights are recognized and affirmed by Section 35(1) of the Constitution Act 1982. Two categories of Aboriginal rights exist. When an Aboriginal group has exercised exclusive occupation and use of a territory from the moment European sovereignty was exerted to the present, their rights to that territory amount to outright title. Other Aboriginal rights may nevertheless exist apart from a demonstration of Aboriginal title, if these are anchored in distinctive and enduring practices, traditions and customs.

In 1990 the Supreme Court of Canada ruled in the landmark *Sparrow* decision that constitutionally protected Aboriginal rights to fish for food, social and ceremonial purposes may not be interfered with by legislation or regulation except where required to fulfill the responsibility of the state to conserve. Subsequent decisions (e.g. *Van der Peet* 1996, *NTC Smokehouse* 1996, *Gladstone* 1996) have further clarified the nature of these rights, particularly with respect to fisheries.

The 1997 *Delgamuukw* case provided the first comprehensive statement by the Supreme Court of Canada on the content of Aboriginal title, confirming that Aboriginal title is “right in the land itself, not just the right to hunt, fish and trap.” It clarified that Aboriginal title is a collective right to the exclusive use and occupation of the land for purposes not restricted to traditional activities (e.g. aboriginal groups could undertake development of resources on lands to which they have title, provided it does not interrupt the fundamental character of their cultural relations to the land) (McNeil 2006). At the same time, the Crown has the right to undertake development on Aboriginal title lands, but any infringement by the Crown must be supported by “a compelling and substantive legislative objective” and must involve prior consultation with the Aboriginal group, may require compensation, and in some cases may require consent of the Aboriginal title holders (Christy, 2006; Slattery 2009).

According to Brown and Reynolds (2004) there is no apparent legal basis for thinking that Aboriginal title is inapplicable to the offshore (including the water column, seabed and subsoil). The principles established in *Delgamuukw* are recognised as relevant, as are legal precedents from foreign jurisdictions such as the United States, Australia and New Zealand (Pannell, 1998; Sharp 1998, 2002). It is an entrenched habit in European legal traditions to regard ownership of seas as a Crown prerogative, which may entail greater resistance to the notion of Aboriginal title at sea than on land (Mulrennan and Scott 2000). For this reason negotiations concerning the offshore have tended to focus on co-management arrangements for marine resources, together with a share of various benefits and revenues, rather than the kind of collective fee title ownership negotiable on terrestrial portions of Aboriginal territory (Scott and Mulrennan 2010).

The approach taken on the issue of sea space by the Federal Comprehensive Land Claims process has evolved over recent decades (White 2002). Earlier land settlement agreements such as the *Inuvialuit Final Agreement* (1984) required the extinguishment of Aboriginal claims to sea spaces. The *Labrador Inuit Land Claims Agreement* (2004) provides some limited recognition of sea rights. However, the *Nunavik Inuit Land Claims Agreement* (2006) and *Eeyou Marine Region Agreement* (2010) have gone substantially further in settling land and resource rights over the islands and marine waters of James Bay, Hudson Bay, Hudson Strait and Ungava Bay, as well as northern Labrador. Canada retains jurisdiction over the marine waters and ownership of the seabed while the Cree and Inuit gain ownership of 80% of the offshore islands, including rights to the surface and subsurface. The agreements also include annual royalties from the Government of Canada based on resource development in these marine areas as well as arrangements for co-management boards to manage and regulate wildlife in the offshore, and provisions for MPA development.

On the west coast, close to half of the Statements of Intent filed by First Nations with the British Columbia Treaty Commission include descriptions of sea spaces as part of their traditional territories (Brown and Reynolds 2004). A number of First Nations, including the Haida, Lax Kw'allams<sup>31</sup> and Nuu-chah-nuulth, have initiated court proceedings concerning Aboriginal title to the sea and related fishing rights. These cases have included claims of infringement of rights and title, claims to fishing rights, title to fisheries resource harvesting sites, fishing territory and rights to harvest fish for commercial purposes (Gardner 2009).

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## APPENDIX 3: AUTHORS

The following scientists contributed to the document and reached consensus on the guidelines as a whole:

### Dr. Kai Chan

Kai Chan is an associate professor and Canada Research Chair (tier 2) at the Institute for Resources, Environment and Sustainability at the University of British Columbia. His training spans conservation biology, ecology, evolutionary biology, policy, and ethics. Kai combines these perspectives in a research program on social-ecological interactions (including human impacts on ecosystem components and processes, and ecosystem services to benefit people) to inform applied environmental ethics and ecosystem-based management. Kai leads the Conservation Collaboration in Interdisciplinary Study of Ecosystems ([www.conciseresearch.net](http://www.conciseresearch.net)); he is a director on the board of the Canadian Parks and Wilderness Society's British Columbia chapter (CPAWS-BC) and a senior fellow of the Environmental Leadership Program.



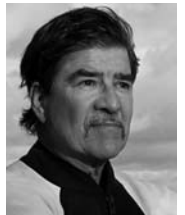
### Dr. Isabelle Côté

Isabelle Côté is a professor in the Biology Department at Simon Fraser University and leads the Tropical Marine Ecology Research Group. Her applied marine ecology and conservation research comprises three focal areas: marine protected areas, reconstructing patterns of ecological change on coral reefs and the invasion of Caribbean reefs by Indo-Pacific lionfish. Isabelle is currently part of a Royal Society of Canada expert panel focused on issues related to climate change, overfishing and marine biodiversity.



### Dr. Philip Dearden

Philip Dearden is leader of the MPA Research Group within the Geography Department at the University of Victoria. His research focuses on the establishment and management of protected areas with topics ranging from natural science (ex. seagrass ecology, whale shark monitoring, coral reef assessments) to social science (ex. economic impacts of diving, MPA governance, Indigenous perspectives) and the relationship between them. He is Chair of the Marine Protected Area Working Group of the Ocean Management Research Network and also served as the Co-Chair of Parks Canada's NMCA Science Advisory Network.



### Dr. Elizabeth De Santo

Elizabeth De Santo is an Assistant Professor in the Marine Affairs Program at Dalhousie University. Her research interests encompass environmental politics, marine conservation and governance, environmental law, and improving the science/policy interface in environmental decision-making. She is particularly interested in spatial approaches to management, including MPAs and marine spatial planning. She is a co-author of the recently released UNEP-funded project on MPA Governance that examined case studies from over 20 countries.



### Dr. Marie-Josée Fortin

Marie-Josée Fortin is a Professor of Ecology and Evolutionary Biology at the University of Toronto. She is an ecologist by training with four main research areas: spatial ecology, forest ecology, landscape ecology and spatial statistics. Her research program studies the effects of global changes (land use and climate) on species spatial dynamics at the landscape and the geographical range levels both in multiuse forested ecosystems and aquatic networks to maintain biodiversity and species conservation.





### **Dr. Frédéric Guichard**

Frédéric Guichard is an Associate Professor in the Biology Department at McGill University. He is interested in studying how large scale patterns of biological diversity develop and are maintained from local interactions among individuals; how biological diversity is influenced by global changes; the role of biological diversity for community structure and dynamics; and how environmental complexity interact with biotic processes to maintain variability and diversity in communities. Much of his research is focused on understanding how diversity and other properties of marine communities emerge from local interactions among individuals.



### **Dr. Wolfgang Haider**

Wolfgang Haider is a Professor in the School for Resource and Environmental Management at Simon Fraser University. He is interested in social science survey methods, quantitative analysis, and trade-off modelling, as they relate to decision making in resource management. Most of his work focuses on protected areas management, outdoor recreation and recreational fishing, resource-based tourism, land use planning, and landscape perception. Many of his research applications include discrete choice experiments, which permit the explicit modelling of trade-offs for a large number of land use or recreation alternatives, including currently non-existing options.



### **Dr. Glen Jamieson**

Glen Jamieson is a retired research scientist from Fisheries and Oceans Canada, Pacific Biological Station. He is interested in conservation biology issues, specifically marine protected areas, research in support of ecosystem-based management, invasive species and critical habitat definition for Species at Risk. He was involved in identifying ecologically and biologically significant areas (EBSAs) in Pacific Canada, and expects that many of these may ultimately become regional MPAs. Other work has focused on marine biogeoclimatic zone classification and locating high-density coral and hexactinellid sponge locations. Glen is currently an affiliate faculty member in both the Department of Geography, University of Victoria, and the Fisheries Centre at the University of BC.



### **Dr. Donald Kramer**

Don Kramer is a Professor Emeritus and former Chair of Biology at McGill University. His research focuses on the behavioural ecology of space use and movement, including habitat selection, frequency- and density-dependent distributions, predation risk and predator avoidance, and resource defense. Among other topics, he and his students have studied the behaviour and ecology of marine fishes in the Caribbean and Atlantic, including factors influencing emigration from reserves into harvested areas.



### **Dr. Ashley McCrea-Strub**

Ashley McCrea-Strub is a postdoctoral-fellow with the Sea Around Us Project at the University of British Columbia, and is working with Dr. Daniel Pauly and other project members. She earned her PhD in Marine Biology and Fisheries from the Rosenstiel School of Marine and Atmospheric Science at the University of Miami in Florida. Her dissertation research focused on the use of multispecies modeling frameworks to evaluate dynamic interactions between predator and prey populations, and to understand the influence of fisheries and environmental temperature change on predator-prey and food chain communities. Currently, her research focuses on quantification of the global financial cost of marine protected areas and evaluation of changes in mean trophic level following the establishment of no-take marine reserves.

**Dr. William Montevecchi**

Bill Montevecchi is a Professor of Biological and Ocean Sciences at Memorial University. He is engaged in a long-term interdisciplinary ecosystem research program focused on the behavioural ecology of marine and terrestrial birds. With a conservation focus, his research explores multi-species interactions in dynamic Low Arctic and Boreal ecosystems and assesses the use of animal responses as indicators of prey and ecosystem conditions. He collaborates with oceanographers, fisheries research scientists and seabird biologists from across Canada, the USA, Europe, Australia and Africa.



**Dr. Monica Mulrennan**

Monica Mulrennan is an Associate Professor in Geography at Concordia University. Her research interests focus on indigenous peoples and their use and management of coastal and marine environments. More specifically, she is interested in local ecological knowledge, community-based management, protected area development, human adaptations to environmental change, and small boat fisheries development. Monica is current Chair of the Indigenous Peoples Working Group (IPWG), a specialty group of the Canadian Association of Geographers.



**Dr. John Roff**

John Roff is the Canada Research Chair in Conservation and Environment and was a Professor of Environmental Science and Coastal Oceanography at Acadia University. He has had extensive research experience in aquatic environments, from the tropics to the Canadian Arctic and is an internationally recognized authority on marine conservation planning. John was also the past Editor of the Canadian Journal of Fisheries and Aquatic Sciences. His present research is primarily focused on developing practical frameworks for marine conservation based on ecological principles, and analyses of geophysical parameters, biological community structure, and habitat and ecosystem level processes.



**Dr. Anne Salomon**

Anne Salomon is an Assistant Professor in the School of Resource and Environmental Management at Simon Fraser University. Broadly, Anne is interested in the cascading effects of predator depletion on marine food webs, marine reserve design and evaluation, climate change impacts on coastal ocean ecosystems, alternative state dynamics, and the resilience of social-ecological systems. Ultimately, Anne strives to engage coastal communities and government agencies in collaborative research and encourage constructive dialogue among stakeholders to navigate the tradeoffs between coastal conservation and resource use.



## CPAWS Team:



### **Sabine Jessen, National Manager of Oceans and Freshwater Lakes, CPAWS**

Sabine Jessen is the National Manager of the Oceans and Great Freshwater Lakes Program for the Canadian Parks and Wilderness Society. Since 1993 she has focused on establishing marine protected areas and advancing ecosystem based management on the British Columbia coast, and has been working on a national level to advance conservation of Canada's oceans and great freshwater lakes. Sabine has extensive experience in the fields of resource, coastal zone and environmental management. Sabine served on the Minister's Advisory Council on Oceans currently serves on the boards of West Coast Aquatic and the Coastal Zone Canada Association. Sabine is currently enrolled as a PhD student at Simon Fraser University where she is doing an international comparative study on marine protected areas. Sabine is an Adjunct Professor in the School of Resource and Environmental Management at Simon Fraser University (SFU) and she is currently doing an international comparative study on MPAs for her PhD in the SFU Geography Department.



### **Leah Honka, Marine Conservation Assistant, CPAWS-BC**

Leah Honka has a Bachelors of Science from Simon Fraser University, specializing in Environmental Sciences. Throughout her degree, Leah was involved in several field research studies from the biogeochemistry of lakes in the Mackenzie Delta, to tropical rainforest ecology in Costa Rica. More recently, Leah has gained extensive experience in the marine environment on the west coast of Canada as a whale watching guide, fisheries observer and salmon researcher in the Broughton Archipelago. At CPAWS, Leah has been working with the national manager of the oceans program researching for scientific advisory reports and organizing marine conservation initiatives, workshops and public events. Leah plans to go on to graduate school and study marine sciences.



### **Alison Woodley, National Conservation Director, CPAWS**

Alison Woodley has more than two decades of experience in the conservation field, including eight years as CPAWS' National Manager of the Protected Areas Program, and Northern Conservation Specialist. She coordinated CPAWS' nation-wide campaign to protect the South Nahanni Watershed, and contributed to many other national park and northern campaigns. Alison holds a Masters in Geography from the University of Waterloo, specializing in parks and protected areas and community-based tourism planning.



### **Rodrigo Menafrá, Marine Conservation Coordinator, CPAWS-NS**

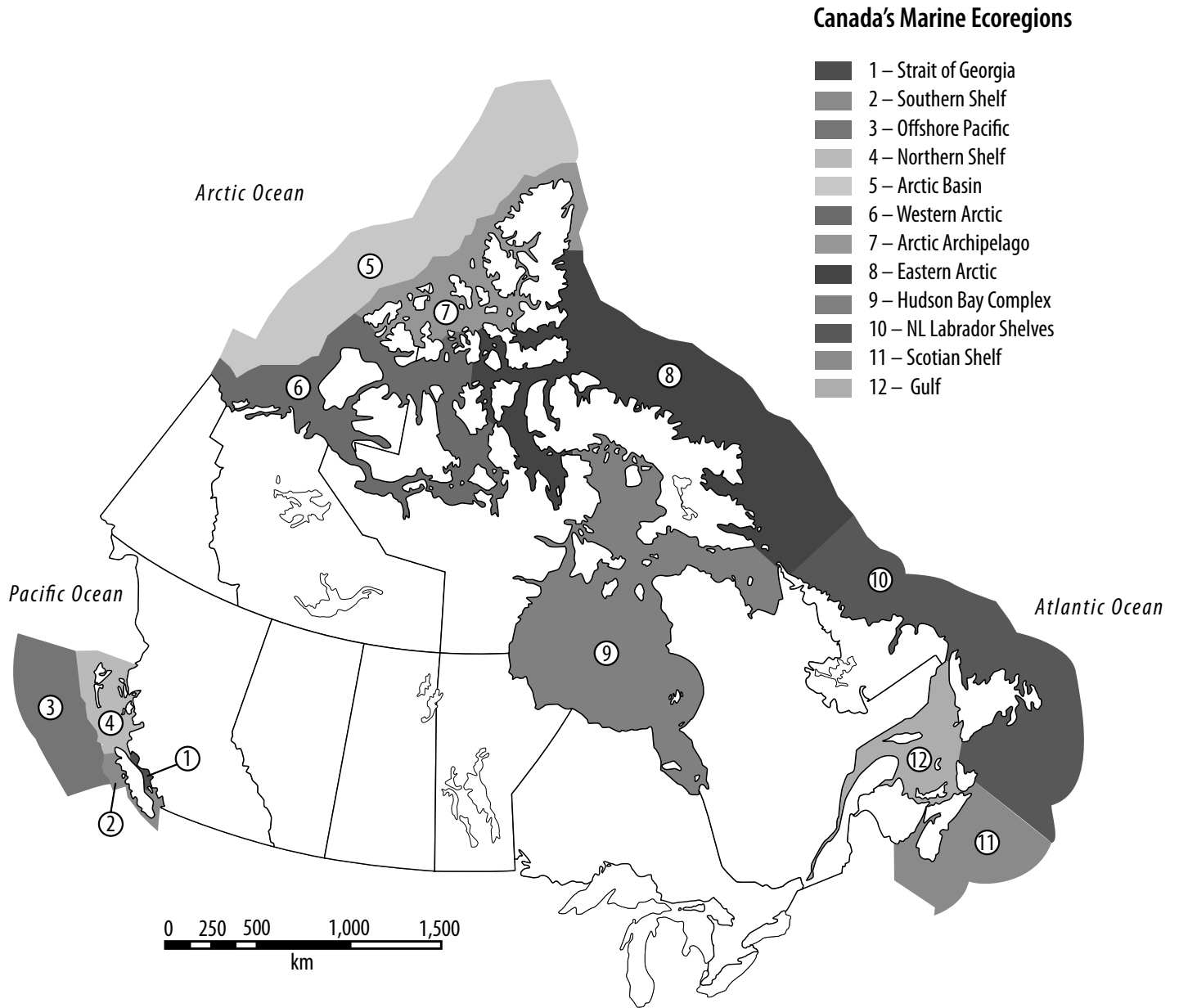
Rodrigo Menafrá has a Bachelor of Sciences degree in Marine Biology and Ecology from the Florida Institute of Technology and a Masters in Marine Management from the Marine Affairs Program at Dalhousie University. He has over ten years of experience on coastal and marine conservation and management, having participated in numerous interdisciplinary, multi-stakeholder projects and activities in Uruguay, Iceland and Canada with emphasis on coastal policy, marine conservation, protected areas and artisanal fisheries. Since 2009, has acted as Marine Conservation Coordinator for CPAWS Nova Scotia, promoting the creation of marine protected areas in the region, with a particular focus on near-shore protection.



### **Dr. Julie Gardner, Dovetail Consulting**

Julie Gardner specializes in marine conservation, protected area policy and governance, First Nations land use planning, community-based volunteer stewardship, public participation, collaborative processes and program evaluation. Currently, she is an Adjunct Professor in the School of Community and Regional Planning at the University of British Columbia and a member of two World Conservation Union Commissions. Julie has developed a reputation for her consistently high standard of work as a researcher, evaluator, writer and facilitator.

# APPENDIX 4: CANADA'S MARINE ECOREGIONS



## APPENDIX 5: GUIDELINES

### ECOLOGICAL CRITERIA FOR MPA SITES AND NETWORKS

#### Site characterization page 8

1. Guideline: Characterize all areas of the seascape according to key ecological criteria to allow the identification of ecologically or biologically significant areas

*Uniqueness, rarity or special character*

*Productivity*

*Biological diversity*

*Degree of naturalness/human impact*

*Sensitivity/resistance to disturbance*

*Potential for recovery from disturbance*

#### Assembling sites into functional networks page 11

2. Guideline: Create no-take reserves

*At least 30% of each bioregion should be within no-take reserves*

3. Guideline: Provide adequate representation of habitat types and sites with unique, rare and special character

*At least 30% of the area of each habitat type in a bioregion should be placed in no-take reserves. For some particularly significant or particularly degraded habitat types, a larger proportion of the habitat area present may need to be protected to achieve conservation goals. All unique sites and most rare and special character sites must be protected.*

4. Guideline: Ensure connectivity among MPAs

*The appropriate distance between MPAs in a network depends on the scale of dispersal of the species of concern in that network. Distances should usually vary between approximately 20 km and 200 km.*

5. Guideline: Create large MPAs

*An average MPA size of at least 10-20 km in diameter (or in the smallest dimension) in recognition of the fact that very small MPAs may be effective in some circumstances but that in general MPA sites should be larger rather than smaller, with shapes that minimize the amount of edge.*

6. Guideline: Ensure multiple representation of protected habitat types and features

*Networks should contain at least two, spatially well-separated examples of each habitat type and at least three to five examples of all rare or special character sites (when their natural abundance allows it). Some features may require more replication than others, depending on their inherent variability or vulnerability to disturbance.*

#### Planning for climate change page 14

*Bioregional networks must recognize changes to natural processes and human use that will result from rapid climate change. This requires: large, strictly protected areas, more, closely spaced MPAs, and the inclusion of transition zones. In addition, there is a need to include large areas that can serve as carbon sinks, such as seagrass meadows and saltmarshes.*

## **SOCIAL, CULTURAL AND ECONOMIC CONSIDERATIONS FOR MPA SITES AND NETWORKS**

### **Site characterization page 16**

7. Guideline: Identify culturally, historically and spiritually significant areas
8. Guideline: Identify community-based MPA initiatives and integrate local knowledge

### **Assembling sites into functional networks page 17**

9. Guideline: Inventory current uses and activities
10. Guideline: Identify opportunities for alternative uses / compatible activities within networks of MPAs
11. Guideline: Protect and enhance recreational sites and opportunities
12. Guideline: Protect spiritual sites and values in the marine environment
13. Guideline: Develop a displacement policy and measures
14. Guideline: Incorporate existence values into MPA decision making

## **MPAS IN CONTEXT**

### **Marine Spatial Planning and Ecosystem-Based Management page 23**

15. Guideline: Implement MPA networks through marine spatial planning (MSP) embedded in ocean-wide ecosystem-based management (EBM)
16. Guideline: Conduct a stressors/threats assessment that considers cumulative impacts
17. Guideline: Evaluate threats in relation to Limits of Acceptable Change (LAC)

### **Systematic Conservation Planning page 25**

18. Guideline: Employ a decision-support tools that enable the integration of the various ecological criteria and socio-economic considerations to achieve MPA objectives.
19. Guideline: Embed tools in processes to integrate socio-cultural and economic considerations.

### **Ecological and Social Uncertainties, and the Limits of Analysis page 26**

20. Guideline: Characterize uncertainties comprehensively, and proceed without certainty
21. Guideline: Recognize limitations of economic valuation and cost-benefit analysis

### **Goals, Objectives, and Adaptive Management for MPAs page 27**

22. Guideline: Adopt an adaptive management framework with explicit and achievable objectives
23. Guideline: Shift the burden of proof
24. Guideline: Link MPA planning, establishment, management and monitoring processes

### **Interim protection measures page 28**

25. Guideline: Provide interim protection for candidate MPAs

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## **MPA GOVERNANCE**

### **Commitment page 33**

- 26. Guideline: Develop a national MPA network action plan that includes a commitment to precise timelines and milestones
- 27. Guideline: Include provisions for strict protection and strong prohibitions in Canadian MPA legislation
- 28. Guideline: Provide adequate funding to support MPA site and network development

### **Accountability page 34**

- 29. Guideline: Provide regular public reporting on progress in MPA network completion
- 30. Guideline: Establish an independent scientific advisory process

### **Transparency page 35**

- 31. Guideline: Provide adequate, accurate and timely information to stakeholders
- 32. Guideline: Improve public access to fishing data in Canada
- 33. Guideline: Provide public access opportunities to information, meetings, and decisions

### **Cooperation page 36**

- 34. Guideline: Ensure effective internal and cross departmental collaboration

### **Aboriginal Partnerships page 37**

- 35. Guideline: Clarify how MPA creation and management interacts with existing Aboriginal rights and title
- 36. Guideline: Respect Aboriginal institutions
- 37. Guideline: Establish meaningful Aboriginal engagement

### **Stakeholder Engagement page 39**

- 38. Guideline: Establish clear terms of reference, including the scope of stakeholder involvement and influence
- 39. Guideline: Use professional third party facilitation
- 40. Guideline: Aim to achieve realistic levels of support and acceptance

### **Knowledge and Social Learning page 40**

- 41. Guideline: Provide up-to-date and comprehensive, accessible data
- 42. Guideline: Respect and build upon Aboriginal knowledge
- 43. Guideline: Create opportunities for constructive dialogue and shared learning

### **Public Awareness and Support page 42**

- 44. Guideline: Foster stewardship of the marine environment
- 45. Guideline: Build public awareness and support to encourage compliance



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