

Canada – British Columbia Marine Protected Area Network Strategy





Cite as: Canada – British Columbia Marine Protected Area Network Strategy, 2012.

© Her Majesty the Queen in Right of Canada, 2012.

Cette publication est aussi disponible en français sous le titre [Guide de sécurité nautique].

Stratégie Canada – Colombie-Britannique pour le réseau d'Aires marines protégées.

Catalog No.: Fs23-585/2012E

ISBN: 978-1-100-21129-9

Layout and Design: Caribou Creative



Front Cover			Back Cover		
1	2	3	10	11	12
4	5	6	13	14	15
7	8	9	16	17	18

Photos: 1, 2, 3, 5, 6, 7, 8, 11, 12, 13, 16 © Charlie Short
 Photos: 4, 9, 10, 14, 15, 17, 18 © Doug Biffard

TABLE OF CONTENTS



Preface	1
1. Introduction	2
2. The Need to Plan MPA Networks	5
3. What is an MPA? What is an MPA Network?	7
4. Vision and Goals for a Network of Marine Protected Areas on the Pacific Coast of Canada	9
5. Planning Principles	14
6. Planning Regions for Marine Protected Area Networks	20
Figure 1. Major biogeographic units for the Canadian Pacific Ocean	21
7. Governance	23
8. Moving Forward	24
Appendix 1. Marine Ecosystem Stressors in the North East Pacific	28
Appendix 2. Protected Area Legislation in Pacific Canada	29
Appendix 3. International Union for the Conservation of Nature (IUCN) Guidelines for Applying Protected Area Management Categories	30
Background Documents and References	34



PHOTO: © CHARLIE SHORT



PHOTO: © DOUG BIFFARD



PHOTO: © CHARLIE SHORT

PREFACE

The governments of Canada and British Columbia are pleased to present the *Canada – British Columbia Marine Protected Area Network Strategy*. This Strategy is a vital part of our commitment to build a legacy of marine protected area (MPA) networks that will safeguard communities and complement more traditional management tools, making it more likely that future generations will inherit the beauty and productivity of our Pacific Ocean.

The Strategy has been developed jointly by federal and provincial agencies and reflects the need for governments to work together to achieve common marine protection and conservation goals. It also reflects extensive advice and feedback received over a ten month consultation period that began in November 2010. We heard from First Nations, local governments, communities, stakeholders, and the general public.

Three important elements are proposed:

1. **A joint federal-provincial approach:** All relevant federal and provincial agencies will work collaboratively to exercise their authorities to protect marine areas.
2. **Collaborative decision-making:** Government agencies will employ a collaborative decision-making process with First Nations from the onset of the planning process and throughout, respecting existing authorities and building on existing governance structures and processes.
3. **A participatory process:** Government agencies will provide meaningful opportunities for participation, consultation and information exchange with marine stakeholders, coastal communities and the public from early planning stages through to design and implementation.

The success of conserving and protecting special marine areas is a shared responsibility. We look forward to working with you to complete a network of marine protected areas for Canada's Pacific Coast.

1. INTRODUCTION

With approximately 36,000 km of shoreline, 6,500 islands and over 450,000 km² of internal and offshore marine waters, Pacific Canada is one of the most diverse and productive marine environments in the world. The ocean regulates temperature, shapes our climate and provides basic resources like food and water. It is a chief pillar of our wealth and economic well-being and a source of inspiration, rejuvenation and discovery. The importance of our ocean to British Columbians cannot be overstated — it is critical to our very existence and wellbeing. Whether you reside in BC's interior farmlands or mountains, in its cities or along the coast — you affect and are affected by the ocean. We want to protect its richness for present and future generations.

Sustainability of the world's oceans is increasingly becoming a critical concern, and the need to mitigate the impact of a multitude of stressors to our marine environments is becoming urgent (Appendix 1). Decades of scientific evidence documenting ecological, social and/or economic benefits of effectively managed MPAs demonstrates their importance as a management tool that can be applied to address multiple stressors and threats. Globally, not only have MPAs demonstrated positive ecological gains, they have also been shown to provide a venue for ocean users to have a voice in ocean management. Some of the common benefits tied to MPAs and networks are outlined in Sidebar 1.

Marine protected areas are well established in Pacific Canada. British Columbia's first protected area with a marine component was designated in 1911 (as part of Strathcona Provincial Park) and there are now over 185 MPAs protecting 28 percent of BC's coastline and 2.8 percent of Pacific Canada's Exclusive Economic Zone (EEZ).

Existing MPAs were designated under an ad-hoc approach using a variety of federal or provincial legislative tools and provide varying levels of protection to a range of different values. A systematic approach to network planning will enhance the capacity of existing and future MPAs to achieve multiple goals and objectives that no one single MPA could achieve.



SIDEBAR 1. BENEFITS OF MPAS AND MPA NETWORKS

ECOLOGICAL BENEFITS:

- Contribute to the protection of the structure, function and integrity of ecosystems by:
 - providing harvest refugia;
 - protecting habitats critical to lifecycle stages such as spawning, juvenile rearing and feeding;
 - complementing adjacent terrestrial protected areas for anadromous species (e.g., salmon);
 - protecting spawning stocks, spawning stock biomass and spawning aggregations to enhance or maintain reproductive capacity;
 - contributing to the restoration and recovery of species, habitat and ecosystems;
 - enhancing local and regional fish stocks through increased recruitment and spillover of adults and juveniles into adjacent areas; and
 - assisting in conservation-based fisheries management regimes.

SOCIAL, ECONOMIC AND CULTURAL BENEFITS:

- encouraging expansion of our knowledge and understanding of marine systems;
- ensuring a stable resource base for non-consumptive and sustainable consumptive activities including fishing, recreation and tourism;
- contributing to the coordination of ecosystem-based management of marine activities, thereby ensuring long-term economic opportunities for sustainable use;
- providing researchers, educators and policy makers with reference sites to serve as natural benchmarks;
- increasing the quality of life in surrounding communities; and
- protecting historical and contemporary culturally and spiritually significant sites.



PHOTO: © CHARLIE SHORT

2. THE NEED TO PLAN MPA NETWORKS

Several countries, coastal states and provinces have recognized the importance of MPAs, and have established policies, tools and commitments to enable MPA network planning and implementation. Systematic conservation planning is widely considered ‘good practice’ because it facilitates a transparent, inclusive and defensible planning process. In British Columbia, MPA network planning will play an important role in fulfilling government **mandates** that include conservation and protection of natural, historical and cultural values; sustainable resource management; creating and maintaining opportunities for commerce; and, enhancing economic and social wellness.

The role of MPAs in advancing progress towards meeting international, national and regional **commitments and agreements** is also driving governments’ desire to formalize their approach to network planning. Key commitments include, but are not limited to:

INTERNATIONAL: *2010 Conference of the Parties to the Convention on Biological Diversity* (CBD) commitment to “improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity”. As a signatory to the agreement, Canada has agreed to Target 11, which commits parties to conserve by 2020, “at least... 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services...through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures...”.

NATIONAL: *Canada’s Oceans Act* directs multi-agency collaboration and coordination on broad oceans management, including MPAs.

Canada’s Oceans Strategy provides the overall strategic framework for Canada’s oceans-related programs and policies and commits federal governments with complementary protected area mandates to identify areas of interest for MPAs.

REGIONAL: *2004 Memorandum of Understanding between Canada and British Columbia Respecting the Implementation of Canada’s Oceans Strategy on the Pacific Coast of Canada* provides for “further collaboration among the parties to advance the implementation of specific activities and objectives identified in *Canada’s Oceans Strategy* aimed at understanding and protecting the marine environment and supporting sustainable economic opportunities on the Pacific Coast of Canada”.

The *Canada-British Columbia Marine Protected Area Network Strategy* provides guidance for the design of a network of marine protected areas on the Pacific Coast of Canada to help achieve these and other important agreements. It outlines a vision and goals to help guide MPA establishment and regional planning initiatives and identifies ecological and social, economic and cultural design principles for the creation of effective, functional networks. It is a high level policy framework for guiding the process of establishing networks of MPAs in Pacific Canada; specific, detailed guidance related to the design, implementation and management of networks and marine protected areas at the site-level may be addressed in future documents (e.g., technical guidance, bioregional implementation plans).

The approach to network planning is meant to build collaboration and partnerships; it is not intended to fetter the statutory responsibility, authority, or interests and obligations of any governments to establish or manage such areas. A multi-agency, systematic approach will provide regional consistency for planning and establishing new MPAs for both near and offshore regions, a formal mechanism for coordinating a range of other management tools and improved delivery of commitments to protect marine biodiversity.

The Strategy is consistent with direction provided by the *National Framework for Canada's Network of Marine Protected Areas*, a document that presents the national approach of federal, provincial and territorial governments to MPA network design. Guided by the Canada-BC Strategy, network planning in the Pacific Region will support Canada's efforts to create a national network.



3. WHAT IS AN MPA? WHAT IS AN MPA NETWORK?

Between Canada and British Columbia, MPAs are defined depending on the legislative tool used for designation (Appendix 2). As a result of the diverse definitions in use, there are a number of different terms used to describe various kinds of MPAs in Canada and British Columbia, including national marine conservation areas, national parks, marine wildlife areas, marine protected areas, provincial parks, ecological reserves, conservancies and wildlife management areas.

For the purposes of this Strategy, the term ‘marine protected area’ will be used as a single, general umbrella term that is applied to the range of different marine habitat protection tools available under federal and provincial legislation. In addition, the International Union for the Conservation of Nature / World Commission on Protected Areas (IUCN/WCPA) 2008 definitions of a protected area and a protected area network have been adopted both nationally and regionally for developing networks of MPAs. These definitions are:

MARINE PROTECTED AREA:

“A clearly defined geographical space recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values”.

MARINE PROTECTED AREA NETWORK:

“A collection of individual marine protected areas that operates cooperatively and synergistically, at various spatial scales, and with a range of protection levels, in order to fulfill ecological aims more effectively and comprehensively than individual sites could alone.”

Marine protected area networks in British Columbia will embrace the full spectrum of MPA tools available to maximize protection of the range of different values provided by marine and coastal environments. As a result, MPAs will serve a range of functions and will appear in a wide array of sizes, shapes and designs and will offer a range of protection standards. However, to be considered for inclusion in a network, it must be demonstrated that a given MPA:

1. Meets the network definition of a marine protected area, including each of the key terms as described by the IUCN (Appendix 3);
2. Contributes to the Canada-BC MPA Network Strategy Goal #1; and
3. Has a management plan or protection guidance explicitly specified in supporting legislation or regulations and is being effectively managed for achievement of the MPA network goal(s).



PHOTO: © TRACY MCLEOD



PHOTO: © DOUG BIFFARD



PHOTO: © CHARLIE SHORT



PHOTO: © CHARLIE SHORT

4. VISION AND GOALS FOR A NETWORK OF MARINE PROTECTED AREAS ON THE PACIFIC COAST OF CANADA

Marine protected areas are an important conservation tool that, when used in conjunction with other management tools, can result in benefits for ecosystems, coastal communities and regional and national economies. The vision and goals of this Strategy will help British Columbia realize a future that includes a healthy ocean, sustainable marine-based economies and thriving coastal communities. They are consistent with and support guidance provided by the *National Framework for Canada's Network of Marine Protected Areas*.

VISION:

An ecologically comprehensive, resilient and representative network of marine protected areas that protects the biological diversity and health of the marine environment for present and future generations.

GOALS:

Under this Strategy, the establishment of a network of MPAs will serve six goals (described in greater detail below):

1. To protect and maintain marine biodiversity, ecological representation and special natural features.
2. To contribute to the conservation and protection of fishery resources and their habitats.
3. To maintain and facilitate opportunities for tourism and recreation.
4. To contribute to social, community, and economic certainty and stability.
5. To conserve and protect traditional use, cultural heritage and archaeological resources.
6. To provide opportunities for scientific research, education and awareness.

Goal 1 is of primary importance.

GOAL 1: TO PROTECT AND MAINTAIN MARINE BIODIVERSITY, ECOLOGICAL REPRESENTATION AND SPECIAL NATURAL FEATURES.

In addition to other resource management tools, MPAs can contribute to the maintenance of **biodiversity** and the protection of ecological processes and food web relationships. They can provide additional protection to endangered or threatened species, preventing species loss, and they can contribute to the protection of the diversity of marine habitats (i.e., **representative ecosystems**) and **special natural features**.

Biodiversity is defined as *the full range of variety and variability within and among living organisms and the ecological complexes of which they are a part*. It is expressed in the genetic variability within a species (such as different populations of the same species), in the number of different species and in the variety of ecosystems and habitats in near and offshore marine environments.

Ecological representation (or representativity) means *protecting relatively intact, naturally functioning examples of the full range of ecosystems and habitat diversity found within a given planning area*. Establishing a network of MPAs that captures examples of all habitat types will ensure that the finer-scale elements of biodiversity and physical characteristics are also protected.

Special natural features are *elements of the environment that are rare, outstanding or unique*. These areas may include stopover sites for migrating species, seabird colonies and their surrounding waters, areas with rare and unique capabilities for maintaining early-life stages of important fish and shellfish species, habitats for marine species at risk and habitats of high biodiversity such as estuaries or upwellings.

GOAL 2: TO CONTRIBUTE TO THE CONSERVATION AND PROTECTION OF FISHERY RESOURCES AND THEIR HABITATS.

Conserving and protecting fish stocks is critical for the sustainability and stability of British Columbia's commercial, recreational and aboriginal fisheries. It is increasingly apparent that social, economic and cultural values flow from productive marine ecosystems and that this contributes significantly to healthy coastal communities. MPAs give refuge to vulnerable species, thus helping to maintain species presence, age, size distribution and abundance.

GOAL 3: TO MAINTAIN AND FACILITATE OPPORTUNITIES FOR TOURISM AND RECREATION.

Marine protected areas are public investments. The importance of such investments are determined and maintained by the benefits they provide and how they are valued by the public. MPAs that offer a variety of recreational activities and learning experiences facilitate a personal connection between protected places and the people who visit them. These personal connections build and maintain the relevance of protected spaces for all who visit and use them.

Marine protected areas can enhance and support marine and coastal recreation and tourism opportunities, as well as the pursuit of activities of a spiritual or aesthetic nature. The protection of representative ecosystems and special recreation features will help to secure the wealth and range of recreational and tourism opportunities available in British Columbia and may provide new economic opportunities for coastal communities.

GOAL 4: TO CONTRIBUTE TO SOCIAL, COMMUNITY, AND ECONOMIC CERTAINTY AND STABILITY.

Common marine-based activities in British Columbia to be considered in MPA network design include: commercial wild-capture and aquaculture fisheries, transportation, shipping, energy generation and transmission, research and education. Some or all of these activities, when properly managed, may be compatible with an MPA depending on the level of protection required to meet site and network goals and objectives. In some MPAs conservation will be the primary focus for a restrictive access strategy, while in others, the most important objective may be the protection of traditional use, sustainable use, or a combination thereof. Through systematic planning, MPA networks will contribute to certainty of access and stability to those who rely on marine resources for social, cultural, or economic reasons.

GOAL 5: TO CONSERVE AND PROTECT TRADITIONAL USE, CULTURAL HERITAGE AND ARCHAEOLOGICAL RESOURCES.

Cultural resources are works of human origin, places that provide evidence of human activity or occupation or areas with spiritual or cultural value. Marine protected areas can be developed to conserve and protect marine areas with spiritual or cultural heritage value such as archaeological sites, shipwrecks and areas traditionally used by Aboriginal and non-Aboriginal communities. Recreation, tourism and education activities that are consistent with the objectives of an MPA may be permitted, facilitated or promoted, improving public awareness, understanding and appreciation of Canada's marine heritage.



PHOTO: © CHARLIE SHORT



PHOTO: © CHARLIE SHORT

GOAL 6: TO PROVIDE OPPORTUNITIES FOR SCIENTIFIC RESEARCH, EDUCATION AND AWARENESS.

Scientific knowledge of the marine environment lags significantly behind that for the terrestrial environment, which can affect the ability of marine managers to identify the merits of protection or management options. Marine protected areas provide increased opportunities for scientific research on topics such as species population dynamics, ecology and marine ecosystem structure and function, as well as provide opportunities for sharing traditional and local knowledge.

There is general recognition that proactive measures are necessary to protect and conserve marine areas to sustain resources for present and future generations. However, there is still a significant need for public education to instil greater awareness of the role everyone can play in the conservation of marine environments. Many MPAs will afford unique opportunities for public education because of their accessibility and potential to clearly demonstrate marine ecological characteristics and values.

OBJECTIVES:

The vision and goals establish the strategic framework to guide action to conserve British Columbia's marine biodiversity. They are high-level statements of general direction or intent and provide the umbrella for development of objectives that describe the desired outcomes or observable changes that represent achievement of stated goals. Specific, measurable, achievable, realistic and time-bounded (SMART) objectives will be identified at **smaller spatial scales** (Section 6) in an open, transparent and participatory manner, reflecting a balance in the needs of those involved in or affected by establishment and management of MPA networks. This approach will allow for the flexibility needed to develop objectives that derive from local conservation and sustainability concerns.

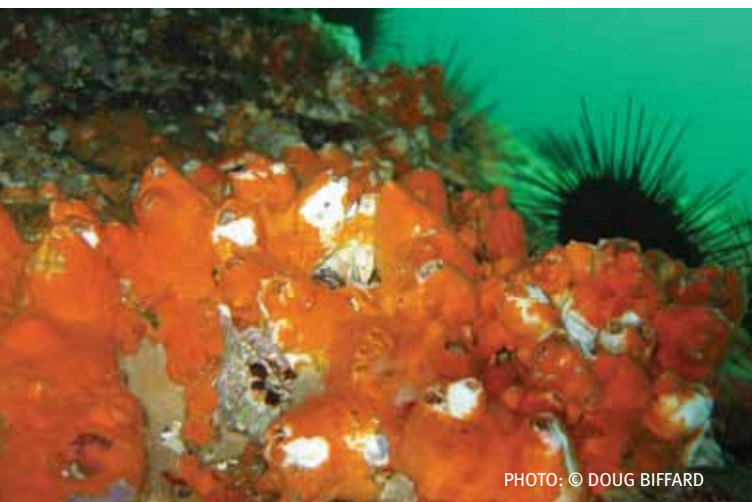


PHOTO: © DOUG BIFFARD



PHOTO: © DOUG BIFFARD

5. PLANNING PRINCIPLES

Marine protected area network planning is intended to contribute to sustainability in our marine environments. Achievement will require balancing the protection of ecological, social, economic, cultural and spiritual values. To that end, the 16 principles that will guide development of MPA networks are environmental, economic, social and cultural in nature. These principles draw from national and international best practices for systematic planning of MPAs and MPA networks.

ECOLOGICAL NETWORK DESIGN PRINCIPLES

1. INCLUDE THE FULL RANGE OF BIODIVERSITY PRESENT IN PACIFIC CANADA.

Representation & Replication: Represent each habitat type in the overall MPA network. For example, rocky reef habitat, eelgrass meadow, intertidal mudflat, persistent gyres or eddies, or representation within a hierarchy of ecological scales (e.g., representation of rocky reefs within a broader biogeographic classification).

The degree of replication should be assessed at a bioregional (or finer) scale(s) in an effort to safeguard against catastrophic events or disturbances and to build resilience in the overall MPA network.

2. ENSURE ECOLOGICALLY AND BIOLOGICALLY SIGNIFICANT AREAS ARE INCORPORATED.

Protection of Unique or Vulnerable Habitats: Design networks to include biophysically special and unique places.

Protection of Foraging or Breeding Grounds: Design networks to include important areas for breeding, feeding and high aggregation.

Protection of Source Populations: Design networks to include important sources of reproduction (e.g., nurseries, spawning areas, egg sources, etc.).

3. ENSURE ECOLOGICAL LINKAGES.

Connectivity: To the extent possible, consider the dispersal dynamics, the home range(s) of marine organisms, and the distribution of marine habitats, over space and time, especially when assessing replicates and when determining the spacing of individual MPA sites within the network.

4. MAINTAIN LONG-TERM PROTECTION.

The benefits of MPA networks may be realized in a few seasons or it may take several decades. Therefore, management measures should be implemented on a permanent basis to better realize the benefits of protection.

5. ENSURE MAXIMUM CONTRIBUTION OF INDIVIDUAL MPAS.

Size: Design individual MPAs to include sufficient area to meet the related site objectives and effectively contribute to network goals and bioregional objectives over the long term.

Spacing: Design MPA networks to reflect the spacing of habitats, cover the geographic range of habitats and facilitate ecological connectivity between sites. Spacing should be assessed at multiple scales (i.e., bioregionally and coast wide) to best facilitate connectivity.

Shape: Design the shape of individual MPAs to the degree possible to follow ecological boundaries, avoid fragmenting cohesive habitats and facilitate surveillance and enforcement.

SOCIAL, ECONOMIC AND CULTURAL NETWORK DESIGN PRINCIPLES

6. RECOGNIZE AND CONSIDER THE FULL RANGE OF USES, ACTIVITIES AND VALUES SUPPORTED BY MARINE ENVIRONMENTS.

Functional networks of MPAs will recognize the fundamental relationship between the environment and human activities, cultures and values, requiring an understanding of the value of ecosystem goods and services as well as the intensity and pattern of human uses across time and space. Integration of economic and social considerations in MPA network design should also include an evaluation of the costs of inaction or inertia. The costs of sustaining biodiversity and ecosystem services through protected area planning can be significantly lower than the costs of inaction.

7. MAXIMIZE THE POSITIVE.

Marine protected area network planning will include identification of opportunities to contribute positively to protection of sustainable socioeconomic activities and cultural and spiritual values. Socioeconomic data is typically incorporated in network design as a cost to be minimized, however, if the inclusion of a social, cultural or economic feature is desired in an MPA network (e.g., a traditional harvesting area, priority areas for fishing, a ship wreck, kayak routes, etc.), then it can be targeted for protection in the same way as biodiversity features. Protection of the feature must also contribute to the primary goal for BC's network of marine protected areas (i.e., to protect and maintain marine biodiversity, ecological representation and special natural features).



PHOTO: © DOUG BIFFARD



PHOTO: © DOUG BIFFARD



PHOTO: © CHARLIE SHORT

8. MINIMIZE THE NEGATIVE.

MPA network design should strive to minimize user conflict and balance conservation objectives with social and economic opportunities. Where there is a choice of several sites which if protected would add a similar ecosystem or habitat to the MPA network, the site(s) chosen should minimize adverse impacts on existing users.

Economic analyses can identify design measures that maximize conservation success while minimizing costs. For example, network design should take advantage of best available knowledge (e.g.: traditional, local and scientific), bio-economic models and decision support tools (e.g., MARXAN) to support MPA site selection in order to reduce potential conflicts and ensure more equitable distribution of the costs and benefits of conservation between communities and users. The availability of various designation options provides additional opportunity to customize the level of protection to achieve goals and objectives for an area while minimizing impact on human activities. The result should be a network that maximizes benefits and minimizes detrimental impacts, providing fair and equitable consideration of the effects on livelihoods while still achieving conservation goals.

9. ENHANCE MANAGEMENT EFFECTIVENESS AND COMPLIANCE TO MAXIMIZE BENEFITS AND MINIMIZE COSTS.

Marine protected areas networks will incorporate design elements that help to ensure effective and cost efficient management, enforcement and compliance to achieve network goals and safeguard the public's investment. Partnerships with and among First Nations, local authorities, stakeholders, coastal communities and resource users will be key to success.

GENERAL OPERATING PRINCIPLES

10. WORK WITH PEOPLE.

A consultative process that is balanced, open, inclusive, transparent and provides opportunities for meaningful involvement will be used to plan and implement bioregional networks. Federal and provincial governments will collaborate with First Nations and involve coastal communities, stakeholders and the public to identify, establish and manage MPA networks. Government agencies responsible for implementation will coordinate their efforts and ensure that the process and flow of information is transparent and accessible.

11. RESPECT FIRST NATIONS' TREATIES, TITLE, RIGHTS, ASPIRATIONS AND WORLD-VIEW.

First Nations' support and participation is an essential part of creating an effective MPA network. The special relationship between the Crown and First Nations will be provided for; both governments will respect the continued use of MPAs by First Nations for food, social and ceremonial purposes and other traditional practices, provided that these uses are consistent with the objectives for the MPA. The establishment of any MPA will not affect ongoing or future treaty negotiations or agreements and will seek to address opportunities for First Nations to benefit from MPAs.



PHOTO: © DOUG BIFFARD

12. FOSTER ECOSYSTEM BASED MANAGEMENT.

Marine protected area network planning will take into account the broader movement towards ecosystem-based management (EBM) of marine areas. EBM is an adaptive approach to managing human activities in a manner that ensures the coexistence of healthy, fully functioning ecosystems and human communities. The intent of EBM has been described as “to maintain those spatial and temporal characteristics of ecosystems such that component species and ecological processes can be sustained and human well-being supported and improved”.

13. APPLY ADAPTIVE MANAGEMENT.

Including adaptive strategies (i.e. learning by doing) in MPA network planning processes allows for adjustments in management approach and/or alterations to protected area boundaries as science evolves and the dynamics of the marine environment change. In addition, flexibility and adaptability will be required to effectively and efficiently consider the interests of marine resource users now and into the future.

14. BUILD ON EXISTING MPAS, OTHER MANAGEMENT TOOLS AND MARINE PLANNING INITIATIVES.

Marine protected areas will be established and operated in the context of broader marine management that includes a range of conservation tools and management techniques applied in adjacent marine and terrestrial areas (e.g., fisheries closures, shipping regulations, etc.). Governments will seek opportunities to capitalize on existing federal and provincial MPAs and other spatially defined conservation measures to achieve network goals and objectives.

15. INCLUDE A FULL RANGE OF PROTECTION LEVELS.

To balance protection of the full range of values that marine environments provide, MPA networks will include a range of protection standards that meet criteria described in the IUCN’s protected area categories I through VI (Appendix 3). This may require the introduction of management measures that could range from permanent limitations on specific human activities or restrictions adapted to seasons or species lifecycles, to promoting and facilitating specific human uses.

16. TAKE A PRECAUTIONARY APPROACH.

A lack of scientific certainty will not be used as a reason for postponing establishment of MPA networks as a tool to help mitigate or prevent serious damage to the marine environment.

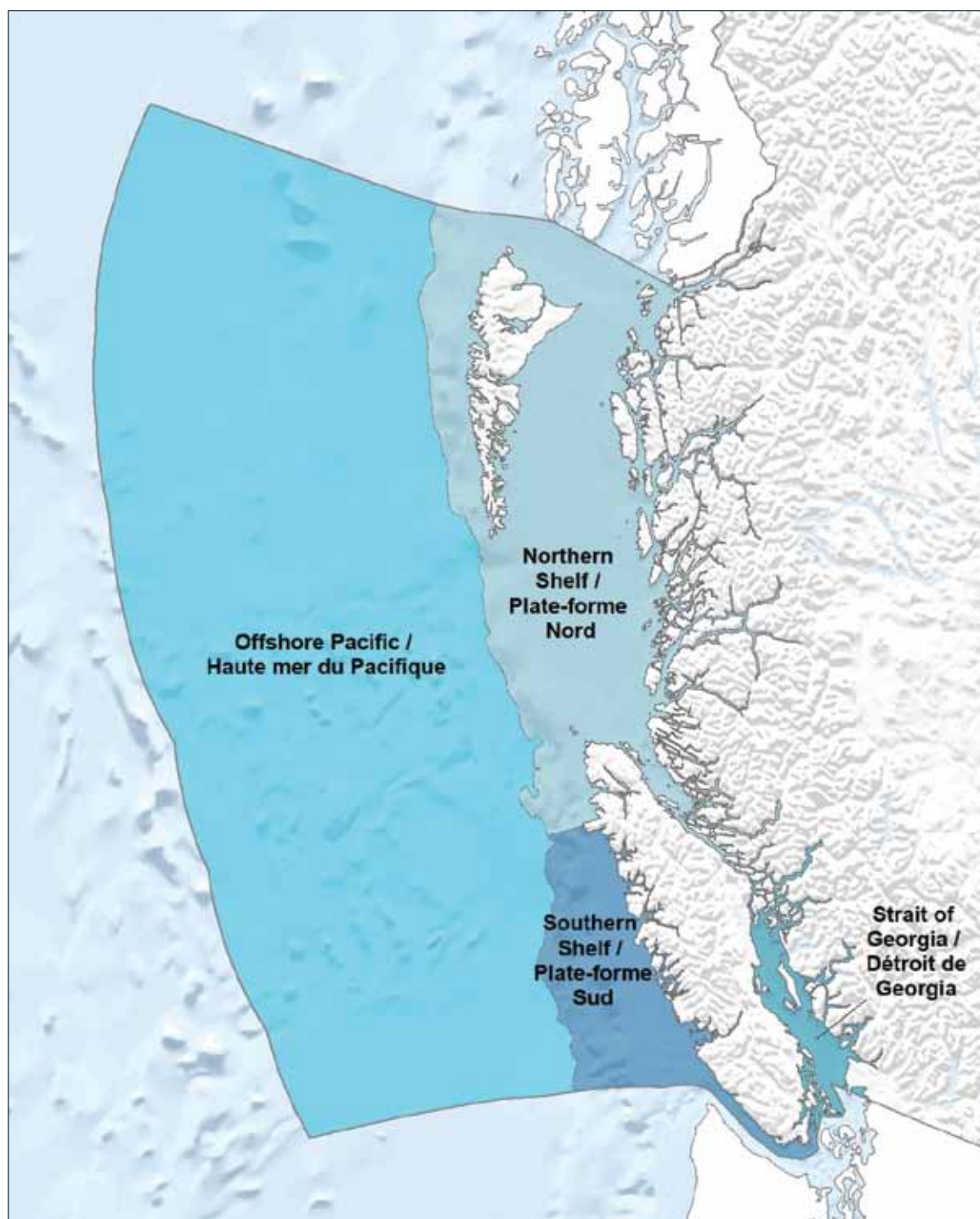
6. PLANNING REGIONS FOR MARINE PROTECTED AREA NETWORKS

Pacific Canada's network of MPAs will be composed of a number of smaller networks based on four high level spatial units or 'bioregions' that will share a common foundation, including a vision, goals and guiding principles. The details of the process for designing and implementing MPA networks may differ between bioregions to account for the unique ecological, socio-political, economic and cultural characteristics ascribed to different ecosystems and communities along BC's coast.

Four bioregions were identified for the Pacific Ocean (Figure 1) through a national science advisory process that considered oceanographic and bathymetric similarities, important factors in defining habitats and their species. They are:

1. a complex **Northern Shelf Zone** (including the Queen Charlotte Sound, the Hecate Strait, the west coast of Haida Gwaii, the Queen Charlotte Strait and Northwest Vancouver Island);
2. the **Strait of Georgia**;
3. a **Southern Shelf** (off West Vancouver Island, which includes the Strait of Juan de Fuca); and
4. a large **Offshore Pacific Zone** extending outward from the shelf break which includes the Alaska Gyre, the California Gyre and a transition zone.

FIGURE 1. MAJOR BIOGEOGRAPHIC UNITS FOR THE CANADIAN PACIFIC OCEAN



7. GOVERNANCE

Central to this strategy is the recognition that MPA networks must build upon both formal arrangements and informal interactions and norms between many different parties that are in place or developing on the Pacific Coast. Network planning must also recognize the legal obligations and commitments to First Nations in regards to decision-making (e.g., British Columbia’s *New Relationship* approach to shared decision-making).

Existing First Nations, local, provincial, or federal ocean and/or coastal management processes or integrated marine spatial planning initiatives can serve as a venue for discussion and/or collaborative recommendations related to the planning and implementation of bioregional MPA networks. New governance frameworks may need to be developed or modified where they do not exist or where they are not inclusive of key partners. Best practices related to transparency and accountability in engagement and decision-making will be critical to ensuring effective governance (Sidebar 2) of processes and outcomes.





SIDEBAR 2. WHAT IS (GOOD) GOVERNANCE?

GOVERNANCE...

- Is the formal and informal arrangements, structures and processes by which an organization (or initiative) is directed, controlled and held to account.
- Governance is about *where to go*, *who should be involved in deciding* and in what capacity.
- Models of governance include top–down, bottom–up, co-management and traditional management regimes.

GOOD GOVERNANCE...

- Is participatory, transparent, accountable, inclusive, resilient, effective, efficient, responsive and sustainable.
- Promotes fairness.
- Provides a long-term perspective grounded in historical, cultural and social complexities.

8. MOVING FORWARD

It is expected that all bioregional MPA network planning processes will unfold in a manner that leads to achievement of the goals and principles as outlined in this Strategy. However, a standardized, detailed implementation plan is not prescribed.

Implementation plans may be developed at the bioregional scale in collaboration with First Nations and with input from local governments and stakeholders to allow for the development of approaches that respect the unique ecological, socio-political, economic and cultural characteristics found in different regions of coastal British Columbia. Nevertheless, some consistency in MPA network planning across bioregions can be expected. Sidebar 3 summarizes the steps that should apply in every network planning process; they are based on international best practices and those outlined in the [*National Framework for Canada's Network of Marine Protected Areas*](#).

The *Canada-British Columbia Marine Protected Area Strategy* is an important first step towards safeguarding the broad range of values British Columbians place on our ocean. The governments of Canada and British Columbia look forward to collaborating with First Nations and working with local governments, stakeholders and the public to protect the quality and integrity of our marine environment while ensuring a sustainable economy.



PHOTO: © DOUG BIFFARD



PHOTO: © CHARLIE SHORT



SIDEBAR 3. PLANNING BIOREGIONAL MPA NETWORKS

IDENTIFY AND INVOLVE OTHERS

Collaboration with First Nations and involvement of local governments and stakeholders throughout all the steps involved in planning and implementation will be important to achieving the vision, goals and objectives of MPA networks. The extent to which local governments and stakeholders are involved will vary according to capacity and the local context. Existing governance structures should be adopted or expanded as appropriate.

IDENTIFY FUNDING REQUIREMENTS AND TIMELINES

Funding requirements should be identified at the bioregional or finer scale. Where possible, MPA network planning should be integrated with existing marine planning processes. Timelines for implementation will vary across the different bioregions depending on the resources required and available; the capacity and interests of First Nations, local governments, and stakeholders to become involved; the presence/absence of 'good governance' arrangements; the availability of information and work already underway or completed.

CLEARLY DEFINE ECOLOGICAL, ECONOMIC, SOCIAL AND CULTURAL BIOREGIONAL NETWORK OBJECTIVES

Network objectives that reflect ecological, social, economic, cultural and practical considerations should be developed in collaboration with local First Nations and with input from other invested and informed parties who are best placed to understand the characteristics and circumstances that are unique to each bioregion. Objectives should be easily understood, written in terms of what will be accomplished to attain a related goal, realistically achievable, time bound and measurable. It should be easy to associate objectives with management actions and measurable outcomes.

Additional consideration should be given to the network objectives of adjoining bioregions to ensure a measure of coast-wide consistency. This will enable coordinated identification of appropriate indicators for MPA network monitoring, thereby building collective understanding of how and why systems react to management actions or recover from stressors. Those involved in the planning process may also wish to define conservation targets that specify how much of each habitat, feature, function or value requires protection to achieve goals, relevant design principles and bioregional objectives.

REVIEW EXISTING MARINE PROTECTED AREAS AND IDENTIFY GAPS

An inventory of existing marine areas with some level of protection will be taken to determine whether they meet MPA network eligibility criteria and to assess the extent to which they already cover representative habitats and ecosystems. The different habitat types found in a bioregion can be identified and delineated using existing habitat classification schemes based on best available physical and biological information. The review should also include the identification of other area-based management tools in the marine environment that can contribute to network goals with enhanced management and/or boundary modification. This step should lead to the identification of adequately and under-represented habitat types and ecologically and biologically significant areas.

COMPILE BEST AVAILABLE SCIENTIFIC DATA AND TRADITIONAL AND LOCAL KNOWLEDGE

Marine protected areas network planning will be informed by information relating to ecological, environmental, social, cultural and economic aspects of the marine environment that is available without unreasonable cost, effort, or time. Standards should be developed to outline the quality requirements for the use of information in MPA planning. Important categories of spatial data may include:

- **Base maps:** study region boundary, nautical charts, shoreline features, etc.;
- **Physical and bathymetric:** depth contours, bathymetric imagery, submarine features, coastal watersheds, land cover, etc.;



PHOTO: © CHARLIE SHORT



PHOTO: © CHARLIE SHORT



PHOTO: © CHARLIE SHORT



PHOTO: © DOUG BIFFARD



PHOTO: © CHARLIE SHORT



PHOTO: © DOUG BIFFARD

- **Biological:** habitats, ecologically and biologically significant areas, species occurrences or distributions, threats assessment, etc.;
- **Cultural:** traditional harvest areas, historical sites, towns, harbours, ports, etc.;
- **Consumptive use:** existing and future commercial fishing areas, recreational fishing areas, aquaculture, etc.;
- **Non-consumptive use:** dive sites, kayaking areas, wildlife viewing, shipping lanes, etc.; and
- **Existing managed area:** MPAs, fishery closures, Rockfish Conservation Areas, etc.

IDENTIFY SITES AND RECOMMEND LEGISLATIVE TOOL(S) FOR AREA-BASED PROTECTION. DESIGNATE NEW MPAS AND AMEND EXISTING ONES AS APPROPRIATE

Giving consideration to current stressors and threats, every new MPA should be designated on the basis that it is representative of one or more habitats, ecosystems or ecologically and biologically significant areas or features in a manner consistent with the *Canada-BC MPA Network Strategy* planning principles. Recommendations will be made to Ministers for new MPAs (or amendments) following the statutory processes required to implement (or amend) the proposed legislative tool(s) and associated management measures.

MAINTAIN AND MONITOR THE MPA NETWORK

The agency(ies) supporting the designation or amendment of an MPA will be responsible for developing and implementing management plans, in collaboration with First Nations and with input from local governments, stakeholders and the public. At a minimum, management plans should clearly define the purpose of the MPA, its goals and objectives and the actions to be taken to achieve goals and objectives. Plans should be subject to periodic review to assess effectiveness of the management regime in place as well as the site's contribution to network goals and objectives. Managing authorities should work in partnership with First Nations and others to develop and employ appropriate scientific skills, tools and training to systematically monitor MPAs and MPA networks. Increased monitoring should lead to increased knowledge about MPAs and networks, which can then enable an adaptive management approach.

APPENDIX 1. MARINE ECOSYSTEM STRESSORS IN THE NORTH EAST PACIFIC

Marine ecosystems of Pacific Canada face several challenges including habitat alteration, resource use pressure, land and sea-based pollutants, invasive species and larger scale impacts related to global climate change. Cumulative effects of multiple stressors further compound the need to take conservation action. Examples of marine ecosystem stressors include, but are not limited to:

HABITAT ALTERATION

The alteration, deterioration or degradation of habitat has a significant impact on marine ecosystems. Habitats may be damaged through activities such as dredging and filling, ocean dumping, log storage, resource extraction, bottom fishing, anchoring, cable laying, developments, agriculture or aquaculture introductions, siltation from land based activities and altered freshwater inputs.

MARINE SPECIES HARVEST

Impacts of aquatic species harvest may include the removal of a species or group of species either through targeted fishing pressure or as by-catch, thus impacting multiple trophic levels; physical impacts to habitat associated with harvest techniques or gear or anchoring of vessels and impacts of lost 'ghost' gear.

POLLUTION

Sources of thermal, chemical and sound pollution include sedimentation, sewage, dredging, non-degradable litter (e.g. plastics), resource extraction, vessel emissions (including accidental spills) and organic deposition (e.g. freshwater, agriculture or aquaculture introductions). Impacts of pollution in the marine environment include habitat damage and loss, increased mortality and health risks to aquatic species and bioaccumulation of toxicity in the food chain.

AQUATIC INVASIVE SPECIES

The introduction of foreign or exotic marine species may alter the composition of biological communities on the Pacific Coast. Intertidal and coastal areas of Pacific Canada include invasive species such as tunicates and harmful marine algae. Some species were introduced at the turn of the century while others are a more recent invasion, such as the northward expansion of the green crab into BC's waters.

CLIMATE CHANGE AND OCEAN ACIDIFICATION

In the Strait of Georgia, sea surface temperatures have been increasing at a rate of 1°C over 90 years, based on lighthouse records gathered throughout southern British Columbia. Ocean warming in the Pacific Region may be a stressor for aquatic ecosystems through changes including altered oxygen concentrations, oceanographic conditions and primary productivity. Species assemblage changes may occur at multiple trophic levels and cold water species may have reduced survival or overall condition as well as changes to habitat range or depth strata that provide optimal conditions for survival.

In addition, a major reduction in the pH at the entrance to the Juan de Fuca Strait has recently been documented. Such changes reduce the availability of calcium carbonate for organisms to build hard shells (e.g. mussels, corals and some phytoplankton). In extreme cases, changes in ocean chemistry may corrode organisms' shells and skeletons.

APPENDIX 2. PROTECTED AREA LEGISLATION IN PACIFIC CANADA

GOVERNMENT OF CANADA LEGISLATION

Fisheries and Oceans Canada

- a. a “marine protected area” established under the *Oceans Act S.C.1996, c. 31*;

Parks Canada

- b. a “national marine conservation area” or “NMCA” established under the *Canada National Marine Conservation Areas Act S.C. 2002, c. 18* and includes an NMCA reserve where there are unresolved Aboriginal rights claims that have been accepted for negotiation by the Government of Canada;
- c. a “national park” with marine components established under the *Canada National Parks Act S.C. 2000, c. 32* and includes a national park reserve where there are unresolved Aboriginal rights claims that have been accepted for negotiation by the Government of Canada;

Environment Canada

- d. a protected marine area (known as a marine wildlife area) or “wildlife area” (known as a National Wildlife Area) established under the *Canada Wildlife Act R.S.C. 1985, c.W-9*;
- e. a “migratory bird sanctuary” established in the marine environment under the *Migratory Birds Convention Act, 1994 S.C. 1994, c.22*.

GOVERNMENT OF BRITISH COLUMBIA LEGISLATION

Ministry of Environment

- a. a “park”, “recreation area”, or “conservancy” established in a marine environment under the *Park Act [RSBC 1996] c. 344* or the *Protected Areas of British Columbia Act [SBC 2000] c. 17*;
- b. an “ecological reserve” established in a marine environment under the *Ecological Reserve Act [RSBC 1996] c. 103* or the *Protected Areas of British Columbia Act [SBC 2000] c. 17*;
- c. a “protected area” or “conservation study area” established in a marine environment under the *Environment and Land Use Act [RSBC 1996] c. 117*;

Ministry of Forests, Lands, and Natural Resource Operations

- d. a “land reserve” or “notation of interest” established over Crown land and water in a marine environment under the *Land Act [RSBC 1996] c. 245*;
- e. a “wildlife management area” established in the marine environment under the *Wildlife Act [RSBC 1996] c. 488*.

APPENDIX 3. INTERNATIONAL UNION FOR THE CONSERVATION OF NATURE (IUCN) GUIDELINES FOR APPLYING PROTECTED AREA MANAGEMENT CATEGORIES

WHAT IS THE IUCN?

Founded in 1948, **International Union for Conservation of Nature** (IUCN) brings together states, government agencies and a diverse range of non-governmental organizations in a unique world partnership with over 1000 members in all, spread across some 160 countries. As a union, IUCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. IUCN builds on the strengths of its members, networks and partners to enhance their capacity and to support global alliances to safeguard natural resources at local, regional and global levels. www.iucn.org

PROTECTED AREA MANAGEMENT CATEGORIES

The IUCN protected area management categories are a global framework, recognised by the Convention on Biological Diversity, for categorizing the variety of protected area management types. In applying the categories system, the first step is to determine whether or not the site meets the definition of a protected area and the second step is to decide on the most suitable category. Some protected areas will fall naturally into one or another category, but in other cases the distinctions will be less obvious and will require in-depth analysis of options. Because assignment of a category depends on the management objectives, it depends more on what the management authority intends for the site rather than on any strict and inviolable set of criteria.

Brief summaries of the protected area categories are given below; full descriptions can be found at: <http://data.iucn.org/dbtw-wpd/edocs/PAPS-016.pdf>.

CATEGORY Ia

Strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphological features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values. Such protected areas can serve as indispensable reference areas for scientific research and monitoring.

CATEGORY Ib

Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.

CATEGORY II

Large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.

CATEGORY III

Set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave or even a living component such as a specific coralline feature. They are generally quite small protected areas and often have high visitor value.

CATEGORY IV

Aim to protect particular species or habitats and management reflects this priority. Many category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.

CATEGORY V

Areas where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.

CATEGORY VI

Conserve ecosystems and habitats, together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area.

IUCN DEFINITION OF A PROTECTED AREA

“A clearly defined geographical space recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values”.

Key elements of the IUCN definition of an MPA are listed and described below.

CLEARLY DEFINED: implies a spatially defined area with agreed and demarcated borders. These borders can sometimes be defined by physical features that move over time (e.g., river banks) or by management actions (e.g., agreed no-take zones).

GEOGRAPHICAL SPACE: includes land, inland water, marine and coastal areas or a combination of two or more of these. ‘Space’ has three dimensions, e.g., as when the airspace above a protected area is protected from low-flying aircraft or in MPAs when a certain water depth is protected or the seabed is protected but water above is not. Conversely, subsurface areas sometimes are not protected (e.g., are open for mining).

RECOGNIZED: implies that protection can include a range of governance types declared by people as well as those identified by the state, but that such sites should be recognised in some way (in particular through listing on the World Database on Protected Areas – WDPA).

DEDICATED: implies specific binding commitment to conservation in the long term through, e.g., international conventions and agreements; national, provincial and local law; customary law; covenants of non-government organizations; private trusts and company policies and certification schemes.

MANAGED: assumes some active steps to conserve the natural (and possibly other) values for which the protected area was established; note that ‘managed’ can include a decision to leave the area untouched if this is the best conservation strategy.

LEGAL OR OTHER EFFECTIVE MEANS: means that protected areas must either be gazetted (that is, recognised under statutory civil law), recognised through an international convention or agreement or else managed through other effective but non-gazetted means, such as through recognised traditional rules under which community conserved areas operate or the policies of established non-governmental organisations.

TO ACHIEVE: implies some level of effectiveness. Although the category will be determined by objective, management effectiveness will progressively be recorded on the World Database on Protected Areas and over time will become an important contributory criterion in identification and recognition of protected areas.

LONG-TERM: protected areas should be managed in perpetuity and not as short term or a temporary management strategy.

CONSERVATION: refers to the *in situ* maintenance of ecosystems and natural and semi-natural habitats and of viable populations of species in their natural surroundings.

NATURE: always refers to biodiversity at the genetic, species and ecosystem level and often also refers to geodiversity, landform and broader natural values.

ASSOCIATED ECOSYSTEM SERVICES: ecosystem services that are related to but do not interfere with the aim of nature conservation (e.g., provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other nonmaterial benefits).

CULTURAL VALUES: includes those that do not interfere with the conservation outcome (all cultural values in a protected area should meet this criterion), including in particular those that contribute to conservation outcomes (e.g., traditional management practices on which key species have become reliant) and those that are themselves under threat.

BACKGROUND DOCUMENTS AND REFERENCES

- Angulo-Valdes, J.A. and B.G. Hatcher. 2010. *A new typology of benefits derived from marine protected areas*. Marine Policy, 34: 635–644.
- Beamish, R. J., J. R. King and G. A. McFarlane. 2009. Canada. Pages 14-55 in R. J. Beamish, editor. *Impacts of climate and climate change on the key species in the fisheries in the North Pacific*. PICES Scientific Report No. 35. PICES Working Group on Climate Change, Shifts in Fish Populations, and Fisheries Management. North Pacific Marine Science Organization (PICES), Secretariat, Sidney BC.
- Beattie, A, U.R. Sumaila, V. Christense and D. Pauly. 2002. *A model for the bioeconomic evaluation of marine protected area size and placement in the North Sea*. Natural Resource Modelling, 15(4): 413-437.
- Blyth-Skyrme, R.E., M.J. Kaiser, J.G. Hiddink, G. Edwards-Jones and P.J.B. Hart. 2005. *Conservation Benefits of Temperate Marine Protected Areas: Variation among Fish Species*. Conservation Biology, 20(3): 811-820.
- California Department of Fish & Game. 2008. *California Marine Life Protection Act: California Master Plan for Marine Protected Areas*. Revised Draft Master Plan, January 2008.
- Chiappone, M., H. Dienes, D. Swanson and S. Miller. 2005. *Impacts of lost fishing gear on coral reef sessile invertebrates in the Florida Keys National Marine Sanctuary*. Biological Conservation, 121:221-230.
- Department of Fisheries and Oceans Canada (DFO). 2009. *Development of a Framework and Principles for the Biogeographic Classification of Canadian Marine Areas*. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/056. (Accessed at: http://www.dfo-mpo.gc.ca/CSAS/Csas/Publications/SAR-AS/2009/2009_056_e.htm)
- Department of Fisheries and Oceans Canada (DFO). 2006. Impacts of trawl gears and scallop dredges on benthic habitats, populations and communities. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2006/025. (Accessed at: http://www.dfo-mpo.gc.ca/csas/Csas/status/2006/SAR-AS2006_025_E.pdf)
- Department of Fisheries and Oceans Canada (DFO). 2005. *Canada's Federal Marine Protected Areas Strategy*. DFO/2005-799. Cat. No. FS23-478/2005. ISBN 0-662-69076-1.
- Department of Justice (DOJ). 1996. Oceans Act. (Accessed at: <http://laws.justice.gc.ca/en/showtdm/cs/O-2.4>)
- Dudley, N. (ed.) 2008. *Guidelines for Applying Protected Area Management Categories*. Gland, Switzerland: IUCN. x 86pp. (<http://data.iucn.org/dbtw-wpd/edocs/PAPS-016.pdf>)
- Dudley, N. and J. Parish. 2006. *Closing the Gap. Creating Ecologically Representative Protected Area Systems: A Guide to Conducting the Gap Assessments of Protected Area Systems for the Convention on Biological Diversity*. Secretariat of the Convention on Biological Diversity, Montreal, Technical Series no. 24, vi + 108 pages.
- Government of British Columbia - Ministry of Environment. 2006. *Alive and Inseparable: British Columbia's Coastal Environment*. 335 pp. (http://www.env.gov.bc.ca/soe/bcce/images/bcce_report.pdf)
- Government of Canada. 2011. *National Framework for Canada's Network of Marine Protected Areas*. Fisheries and Oceans Canada, Ottawa. 31 pp. (<http://www.dfompo.gc.ca/oceans/publications/dmpaf-czpm/docs/framework-cadre2011-eng.pdf>)
- Governments of Canada & British Columbia, 1998. *Marine Protected Areas: A Strategy for Canada's Pacific Coast – Discussion Paper*.
- Grant, S.C.H. and P.S. Ross. 2002. *Southern resident killer whales at risk: Toxic chemicals in the British Columbia and Washington environment*. Can. Tech. Rep. Fish. Aquat. Sci. 2412: xii + 111 p.
- GS Gislason & Associates Ltd. 2007. *Economic Contribution of the Oceans Sector in British Columbia*. Report prepared for Canada/ British Columbia Oceans Coordinating Committee. 77 pp.
- Halpern, B.S. 2003. *The impact of marine reserves: do reserves work and does reserve size matter?* Ecological Applications, 13: S117-S137.
- IUCN World Commission on Protected Areas (IUCN-WCPA). 2008. *Establishing Marine Protected Area Networks – Making It Happen*. Washington, D.C.: IUCN-WCPA, National Oceanic and Atmospheric Administration and The Nature Conservancy. 118 p.

- Johannessen, D.I., J.S. Macdonald, K.A. Harris and P.S. Ross. 2007. *Marine environmental quality in the Pacific North Coast Integrated Management Area (PNCIMA), British Columbia, Canada: A summary of contaminant sources, types and risks*. Can. Tech. Rep. Fish. Aquat. Sci. 2716: xi + 53 p.
- Klein, C.J., A. Chan, A. Cundiff, N. Gardner, Y. Hrovat, L. Kircher, A. Scholz, B. Kendall and S. Airame. 2008. *Striking a balance between biodiversity conservation and socioeconomic viability in the design of marine protected areas*. Conservation Biology, 22: 691-600.
- Laffoley, D. d'A., (ed). 2008. Towards Networks of Marine Protected Areas. *The MPA Plan of Action for IUCN's World Commission on Protected Areas*. IUCN WCPA, Gland, Switzerland. 28 pp.
- Lester, S.E., B.S. Halpern, K. Grorud-Colvert, J. Lubchenco, B.I. Ruttenberg, S.D. Gaines, S. Airamé and R.R. Warner. 2009. *Biological effects within no-take marine reserves: a global synthesis*. Marine Ecology Progress Series, 384: 33-46.
- McCook, L.J., T. Ayling, M. Cappel, J.H. Choat, R.D. Evans, D.M. Freitas, M. Heupel, T.P. Hughes, G.P. Jones, B. Mapstone, H. Marsh, M. Mills, F.J. Molly, C.R. Pitcher, R.L. Pressey, G.R. Russ, S. Sutton, H. Sweatman, R. Tobin, D.R. Wachenfeld and D.H. Williamson. 2010. *Adaptive Management of the Great Barrier Reef: A globally significant demonstration of the benefits of networks of networks of marine reserves*. Proceeding of the National Academy of Sciences, 107(1): 1-8.
- Molloy, P.P., I.B. McLean and I.M. Cote. 2009. *Effects of marine reserve age on fish populations: a global meta-analysis*. Journal of Applied Ecology, 46: 743-751.
- MPA Decision Support Tool, 2010. <https://apps.gov.bc.ca/pub/mpna/home.do>
- Orr, J.C., V.J. Fabry, O. Aumont, L. Bopp, S.C. Doney, R.A. Feely, A. Gnanadesikan, N. Gruber, A. Ishida, F. Joos, R.M. Key, K. Lindsay, E. Maier-Reimer, R. Matear, P. Monfray, A. Mouchet, R.G. Najjar, G-K. Plattner, K.B. Rodgers, C.L. Sabine, J.L. Sarmiento, R. Schlitzer, R.D. Slater, I.J. Totterdell, M-F. Weirig, Y. Yamanaka, and A. Yool. 2005. *Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms*. Nature, 43, 681-686.
- Rio Declaration on Environment and Development, 1992.
<http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=78&ArticleID=1163>
- Roberts, C., G. Branch, R. Bustamante, J.C. Castilla, J. Dugan, B. Halpern, H. Leslie, K. Lafferty, J. Lubchenco, D. McArdle, M. Ruckelshaus and R. Warner. 2003. *Application of ecological criteria in selecting marine reserves and developing reserve networks*. Ecological Applications, 13: S215-S228.
- Sala, E., O. Aburto-Oropeza, G. Paredes, I. Parra, J. C. Barrera and P. K. Dayton. 2002. *A general model for designing networks of marine reserves*. Science, 298 (5600): 1991-1993.
- Smith, J.L., K. Lewis and J. Laughren. 2006. *A Policy and Planning Framework for Marine Protected Area Networks in Canada's Oceans*. WWF-Canada: Halifax. 105 pp.
- Stokstad, Erik. 2010. *Science meets Politics Off California's Coast*. Science, 327: 1574 – 1575.
- Tognelli, M.F., M. Fernandez and P.A. Marquet. 2009. *Assessing the performance of the existing and proposed network of marine protected area to conserve marine biodiversity in Chile*. Biological Conservation, 142: 3147-3153.
- WCPA/IUCN. 2007. *Establishing networks of marine protected areas: A guide for developing national and regional capacity for building MPA networks*. Non-technical summary report. (Accessed at: <http://www.medpan.org/upload/893.pdf>)
- Wielgus, J., E. Sala and L.R. Gerber. 2008. *Assessing the ecological and economic benefits of a no-take marine reserve*. Ecological Economics, 67: 32-40.
- Wootton, J. T., C. A. Pfister and J. D. Forester. 2008. *Dynamic patterns and ecological impacts of declining ocean pH in a high-resolution multi-year dataset*. Proceedings of the National Academy of Sciences of the United States of America, 105:18848-18853.

