A practical Approach to Ecosystem-based Management
The Canadian experience

Open-ended Informal Consultative Process
on Oceans and the Law of the Sea
New York, June 2006

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The Story line

- Application of ecosystem approach does not have to be complex
- Several different ways of getting there, Canada is using two concurrent approaches
- Lessons have been learned and shared
- Ecosystem approaches can work internationally, a work plan is needed.

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Oceans responsibilities are shared

- Federal system – shared distribution of powers for ocean issues:
  - Lead responsibility with national government
  - but, strong provincial role
  - multiple federal agencies with ocean-related mandates
- National legislation and policy calls for a collaborative approach amongst all parties

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Legislative and policy context

- Oceans Act (1996)
  - "Conservation, based on an ecosystem approach, is of fundamental importance to maintaining biological diversity and productivity in the marine environment"
- Canada's Oceans Strategy and IM Policy (2002)
  - IM planning will require the design of ecosystem-based and socio-economic objectives, related management actions and measurable indicators…
- Canada's Oceans Action Plan (2005/2007)
  - Health of Oceans key component

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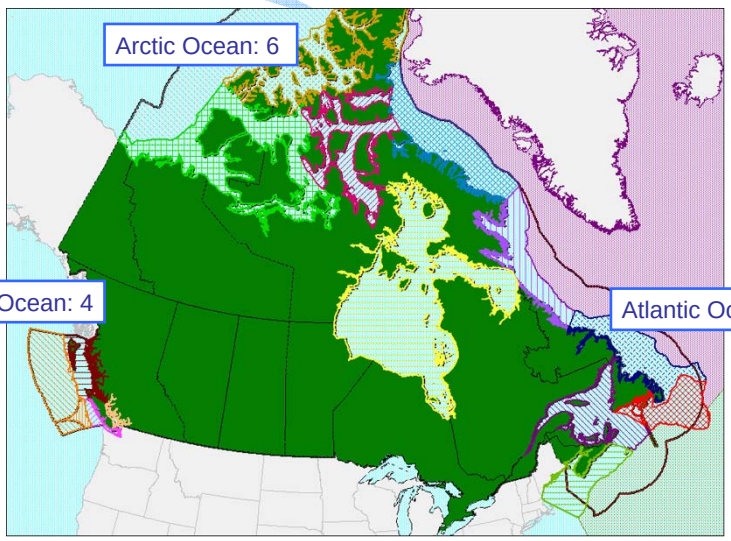
Marine **Ecoregions**



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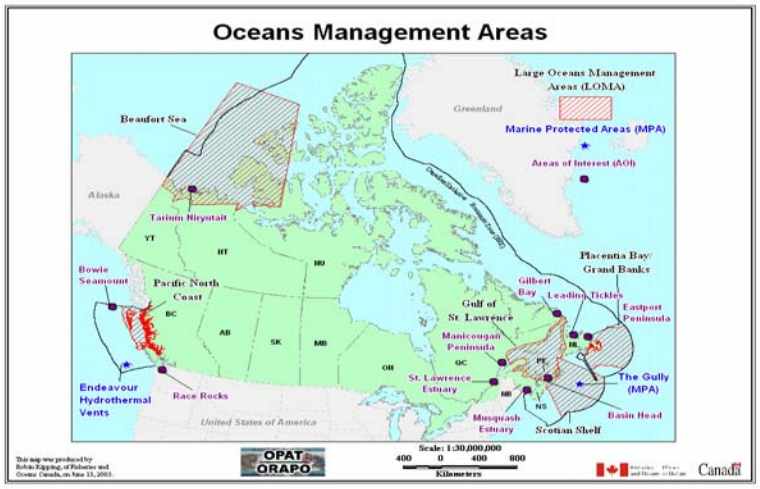
LOMA Planning Areas



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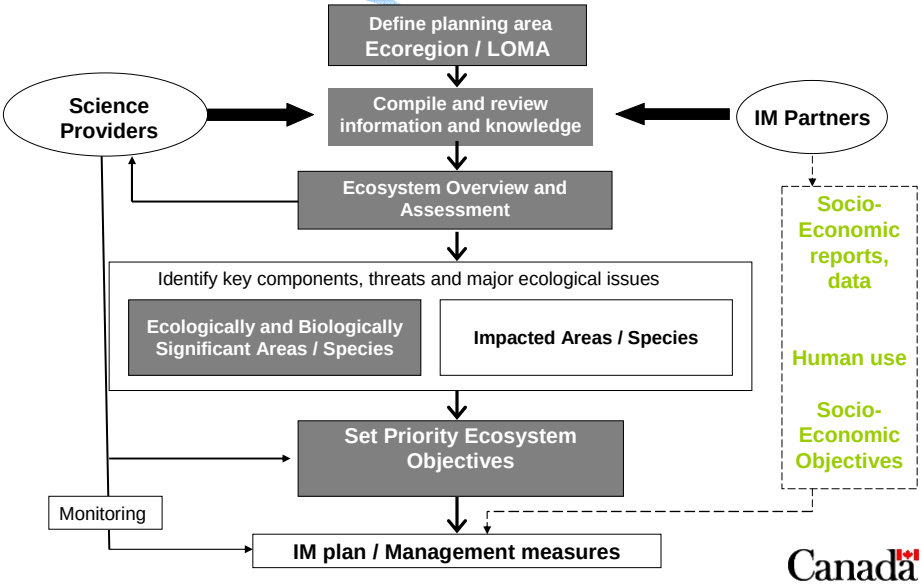
Making the approach operational



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Ecological Framework:

- Ecosystem structure / Biodiversity issues:
  - *"Conserve enough components so as to maintain the emerging biodiversity and resilience of the marine ecosystem"*
    - Indicators: Biodiversity; Species distribution; Abundance
    - Measures: genetic diversity; species/pops and habitat diversity
- Ecosystem function / Productivity issues:
  - *"Conserve the function of each component of the ecosystem so that it can play its natural role in the food web"*
    - Indicators: Production / Reproduction; Trophic interactions; Mortality
    - Measures: Primary/Second prod.; fecundity; sex-ratio; mean generation time
- Ecosystem properties / Environmental Quality issues:
  - *"Conserve the physical and chemical properties of the ecosystem so as to maintain the overall marine environmental quality"*
    - Indicators: seafood quality; Water quality, Habitat quality
    - Measures: bioaccumulation; diseases

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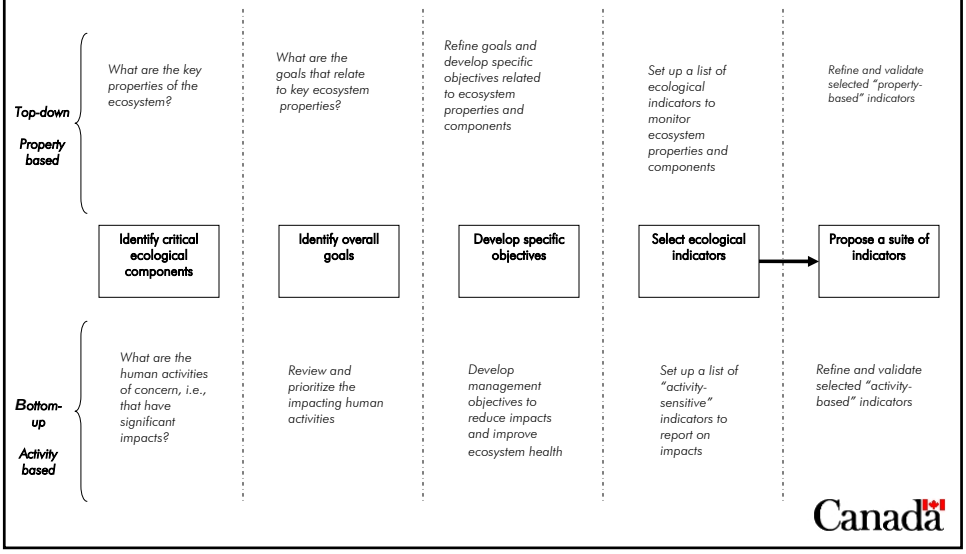
Management Approaches



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Lessons learned

To be effective, application of the ecosystem approach needs:

- A simple and gradual approach
- Good, but not perfect scientific knowledge
- Scientific advice that is cross-disciplinary, risk-based and relevant to decision-making
- A commitment to fill critical knowledge gaps and to revisit advice, decisions when new and relevant information becomes available
- To be built around an integrated management process that brings stakeholder together and provides for the incorporation of socio and economic consideration

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Incorporating the ecosystem approach

- In Legislation and regulations
  - Species at Risk legislation provides for Multi-Species / Ecosystem-Based Recovery Strategies
  - Revised Canadian Environmental Assessment Act
  - Alternative ballast water exchange zones
- In sector-specific Policies
  - Policy Framework for the Conservation of Pacific Salmon
  - Objective-based Fisheries Management
  - Forage Species and Emerging Fisheries Policies
  - Sensitive Areas policy (under development)
- In provision of General Advice
  - Mitigation of seismic noise (Statement of Practice; MEQ regulations)
  - Evaluation of impact of fishing practices on habitat types
- In the planning of an ecological network of marine protected areas

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Towards an International Work Plan

- Sharing and interpretation of area-specific knowledge
- Use of existing governance bodies and guidance documents to facilitate process
- Development of common scientific advice to guide decision-making

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Panel 3: Lessons learned from implementation of ecosystem approaches at the national level in developed States

A Practical Approach to Ecosystem-Based Management

Camille Mageau, Dept of Fisheries and Oceans, Canada

Application of ecosystem approaches to the management of ocean activities does not need to be inordinately complex. In its simplest form, ecosystem-based management involves consideration of the impacts of a single activity on the biological, chemical and physical components of the ecosystem. In its more complex and challenging application it focuses on the dynamic interactions between the species within an ecosystem, between the biological components of an ecosystem and environmental processes influencing them, between inter-connected land, air and marine systems and finally between and among the core components of the marine ecosystem subjected to the stresses of multiple human activities.

In Canada ecosystem approaches to management are being applied in two distinct but complementary ways. In a more holistic fashion through an integrated approach to oceans management and at the same time through the modification of existing and generation of new sector specific policies, regulations and management approaches. This presentation will provide a brief outline of the two approaches currently being applied and will highlight a few pre-requisites for successful implementation of an ecosystem approach. Suggested elements of an international work-plan to advance ecosystem-based management will be outlined for consideration.

Canada is a federation with legislative responsibility for the regulation and management of ocean related activities distributed among several federal agencies. Generally speaking, the national government has overall responsibility for the management of oceans; provincial and territorial authorities are primarily responsible for land based activities. To provide a legislative base for a unified and modern management regime for all oceans activities, Canada adopted national umbrella oceans legislation and an overarching Oceans Policy Framework.

Of particular relevance to this discussion is the fact that the *Oceans Act*, the Oceans Strategy and most recently Canada's Oceans Action Plan are all based on an ecosystem approach to management, and, more specifically commit Canada to managing activities in and affecting oceans in a way that does not compromise ecosystem health while encouraging multiple uses of ocean spaces. Canada has adopted a combination of objective-based measures and area-based approaches to the planning and management of activities and has made ecosystem-based considerations central to its approach to integrated management.

In terms of the objective-based approach, we have developed a national conceptual framework to guide the application of the ecosystem approach. The frameworks, as well as companion implementation tools are focused on three key elements which contribute to ecosystem health: the structure, or biological organization of the ecosystem, the

vigour or productivity of the ecosystem and water and habitat quality properties of the ecosystem.

In terms of the area based approach, our national policy framework sets out two complementary approaches to guide the application of the ecosystem approach: management of Large Oceans Management Areas (LOMAs), and management of Coastal Management Areas. In terms of Large Ocean Management Areas, all marine waters within Canadian jurisdiction have been delineated into 17 ecoregions, the boundaries of which have been set to capture large-scale ecosystem features and patterns including geomorphologic, oceanographic and ecological characteristics. The LOMAs extend from the coast out to the outer boundary of the Exclusive Economic Zone. Within these large regions, are the smaller, nested coastal management areas. These areas deal primarily with issues related to the land-water interface and land-based activities that have an impact on the marine environment.

Via our Oceans Action Plan, we have advanced our ecosystem-based management approach in five priority Large Ocean Management Areas -three in the Atlantic Ocean, one in the Pacific Ocean, and one in the Arctic Ocean. For each of these areas, existing baseline information on the status and trends of physical habitats (soil and subsoil), the water column, oceanographic processes and biological components including their trophic relationship is being assembled. An inventory of human activities is also being compiled and an assessment of the individual and cumulative impacts of these activities on significant components of the ecosystem is being conducted. As well, purely practical considerations such as administrative, historical, cultural uses as well as other management approach and zoning schemes are being considered.

To facilitate application of the area-based approach, guidance tools have been developed to assist with the identification of significant components of the ecosystem which may require special management attention. Science based criteria are used to identify areas which are ecologically and biologically significant with respect to surrounding areas, based on their uniqueness, degree of aggregation, fitness consequence, resilience and naturalness.

A similar diagnostic tool is now being developed to support the identification of ecologically and biologically significant species and community properties (above the species level) within the planning areas. These species are considered significant because they play a pivotal role in the food web or serve another key role in the ecosystem. The ecosystem-based assessments conducted also provide for the identification of impacted species. Impacted species can include Species at Risk, over-fished species or weak links in the food chain. Impacted areas or habitats which are threatened, degraded are also identified during the assessment phase.

Identification of these areas, species and relationship of particular ecological interest serve to identify where Ecosystem Objectives need to be set on a priority basis. The identification of ecologically and biologically significant species and areas, as well as

impacted areas and species also supports the ecological basis for the design of Canada's ecosystem-based network of Marine Protected Areas.

It is at this point, that the area-based and objective-based approaches are combined and that the process to define specific priority ecosystem objectives is initiated. The concept of ecosystem-based management has been simplified for application to ocean management by the development of an Ecological Framework which focuses on the three key elements which contribute to ecosystem health. These elements include the biological organization or structure of the ecosystem, the vigour or productivity of the ecosystem and finally the physical and chemical properties of the ecosystem. The Canadian framework for an ecosystem-based approach initially focuses on the articulation of "goal statements" for each of these elements.

The biological organization or structure of the ecosystem considers the biological diversity (at three levels of organization, genetic diversity, species diversity and habitat diversity) as well as the ecological role and interactions of the various biological components. Organization of the ecosystem is also defined by the trophic structures, the complexity of the food webs, the age structure and relationships, as well as the spatial distribution of the biological components. Ecosystem objectives focused on organisation are therefore set to "conserve enough components so as to maintain the biodiversity and natural resilience of the system".

The vigour of the ecosystem addresses the productivity of the ecosystem with particular attention to interactions affecting energy flows and reproductive capacity. The overall goal to maintain productivity is therefore expressed as "conserving the function of each component of the ecosystem so that it can play its natural role in the food web and contribute to the overall productivity of the ecosystem.

The abiotic properties of the ecosystem that is the nature of the oceanographic processes as well as the physical and chemical quality of its components influence both ecosystem structure and function. As such, the goal is to "conserve the geological, physical and chemical properties of the ecosystem so as to maintain the overall marine environmental quality".

These overarching goal statements (or what may be referred to as "conceptual objectives") serve as the equivalent of "policy statements". If however, they are to provide planners and regulators with the guidance needed to manage human activities; they need to be much more specific, measurable and operational.

Two different but complementary approaches to the identification of operational objectives are currently being tested in the five large oceans management areas situated in waters of the Beaufort Sea, off the north central coast of British Columbia, in the Gulf of St. Lawrence, on the Eastern Scotian Shelf and in Placentia Bay and the Grand Banks of Newfoundland and Labrador. The bottom-up or activity based approach involves establishing ecosystem-based objectives based on a review of the activities which may have a significant impact of specific ecosystem properties or components. This approach

is particularly useful in incorporating local and traditional knowledge and in data poor areas.

The top-down or ecosystem property-based approach is based on the identification of key ecosystem properties and components without prior consideration of human activities which may be impacting the system. Combining the two approaches blends the rigour of the scientific process associated with the ecosystem driven analysis with the more management oriented impact driven approach. Identifying ecosystem objectives is made even more practical and efficient with the if ecologically and biologically significant species and areas and the rare and depleted species and habitats needing rehabilitation are identified early in the process.

The identification of Ecosystem Objectives and selection of the indicators most suited to track the ecosystem property are at various stages in the five large ocean integrated management areas in Canada. Nevertheless, key lessons have already been learned. Above all, there is a need for a high degree of patience. The process to develop an objective-based integrated oceans management plan for one of the large, data rich ocean management area has taken almost eight years.

To be effective, application of an ecosystem-based approach to management requires good but not perfect science, but most importantly requires scientific assessments and advice which integrate data collected for very different purposes, over different spatial and temporal scales.

Another challenge facing the scientific community has been the requirement to provide "un-ambiguous" and risk-based scientific advice in support of decision-making. While the starting point must be the use of existing scientific and anecdotal data, critical data gaps will emerge, and must be taken into account in managing the risk. Ecosystem-based scientific advice and selection of management measures cannot wait for critical data gaps to be filled. There needs to be a willingness to work with some uncertainty. We do not have, nor will we ever know all of the answers; but we do need to embrace adaptive management in order to regularly re evaluate advice and adjust management decisions as information becomes available to fill the critical data gaps.

Application of an ecosystem approach does not have to be complex or frightening; it can be progressive and evolutionary. Canada has incorporated key elements of the ecosystem approach into a variety of legislative, regulatory, policy and management instruments. Recent Canadian legislation, such as the Species at Risk Legislation provides for the development of ecosystem-based and multi-species recovery strategies. Amendments to older statutes such as the Canadian Environmental Assessment Act have also incorporated the concept.

A number of fishery related policies in Canada address the concept of an ecosystem approach to management. For example, the Policy Framework for the Conservation of Pacific Salmon targets the restoration and management of genetically diverse wild salmon populations and their supporting habitat including management of watershed

areas of critical importance to the different life stages of salmon. Traditional single species assessment and management has evolved towards an Objective-Based Fisheries Management approach in which conservation objectives including trophodynamic linkages are identified and respected.

Application of an ecosystem approach is also being included in policies and regulatory instruments affecting other marine sector-specific activities. One such example is the identification of alternative ballast water exchanges zones, selected because of their ecological conditions non-conducive to the survival of invasive species thereby reducing risk to structural and functional damages to the ecosystem. A policy is also being developed to address impacts on benthic habitats and sensitive areas with particular attention on sensitive and ecologically significant habitat areas. Similarly the development of an ecosystem-based assessment of the impact of seismic sound on critical biological functions of key ecosystem components contributed to improved policy and regulatory instruments which guide oil and gas development in Canada.

It is my view that a collaborative international work-plan to advance ecosystem-based management should be developed. Such a work-plan should include the collation and interpretation of the international body of social and ecologic science related to a specific planning area combined with a review of human activities which may be impacting that ecosystem. International collaboration need not be limited to the sharing of information and the spatial application of the ecosystem approach. There is a large body of science advice that can be assembled, peer reviewed and made available as a common basis for decision- making. Existing international scientific advisory bodies and existing inter-governmental and governance mechanisms offer a very good starting point for implementation of ecosystem-based management in international waters.

Elements of the work-plan are already under development. For instance, a detailed guidance document for the identification and application of objective-based and area-based indicators has been developed and is being pilot-tested globally. This work, sponsored by UNESCO's Intergovernmental Oceanographic Commission and others provides methodologies and tools to facilitate integration of social, economic, ecosystem and governance consideration the management of activities occurring in coastal and ocean areas.

In conclusion, demystification, simplification and a progressive application of the ecosystem approach by existing governance bodies, using the wide variety of policy, legislative and capacity building tools available to the international community is achievable. It's a question of will.