

# **APPENDIX B: DEFINING EBM GOVERNANCE SUCCESS**

## **TABLE OF CONTENTS**

<b>I. ECOSYSTEM-BASED MANAGEMENT DEFINITIONS .....</b>	<b>2</b>
<b>II. ECOSYSTEM APPROACHES FROM REGIONAL PROGRAMS .....</b>	<b>9</b>

## **I. ECOSYSTEM-BASED MANAGEMENT DEFINITIONS**

### **Christiansen et al. (1996)<sup>1</sup>**

Christensen et al. (1996) finds that "[e]cosystem management includes the following elements:

- 1) Sustainability. Ecosystem management does not focus primarily on "deliverables" but rather regards intergenerational sustainability as a precondition.
- 2) Goals. Ecosystem management establishes measurable goals that specify future processes and outcomes necessary for sustainability.
- 3) Sound ecological models and understanding. Ecosystem management relies on research performed at all levels of ecological organization.
- 4) Complexity and connectedness. Ecosystem management recognizes that biological diversity and structural complexity strengthen ecosystems against disturbance and supply the genetic resources necessary to adapt to long-term change.
- 5) The dynamic character of ecosystems. Recognizing that change and evolution are inherent in ecosystem sustainability, ecosystem management avoids attempts to "freeze" ecosystems in a particular state or configuration.
- 6) Context and scale. Ecosystem processes operate over a wide range of spatial and temporal scales, and their behavior at any given location is greatly affected by surrounding systems. Thus, there is no single appropriate scale or time frame for management.
- 7) Humans as ecosystem components. Ecosystem management values the active role of humans in achieving sustainable management goals.
- 8) Adaptability and accountability. Ecosystem management acknowledges that current knowledge and paradigms of ecosystem function are provisional, incomplete, and subject to change. Management approaches must be viewed as hypotheses to be tested by research and monitoring programs."

To move from concept to practice, Christensen et al. (1996) state the need to: (1) define sustainable goals and objectives; (2) reconcile spatial scales; (3) reconcile temporal scales; and (4) make the system adaptable and accountable.

### **MacKenzie (1997)<sup>2</sup>**

MacKenzie (1997) analyzes the ecosystem approach to management of the Great Lakes system and identifies several components of the ecosystem approach:

- Process including agency participation, disciplinary representation, and decision making
- Cultivating legitimacy through political support and public support

MacKenzie (1997) identifies several challenges for the ecosystem approach including:

- Funding
- Demonstrating tangible results
- Tracking restoration projects
- Training participants on the ecosystem-approach

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<sup>1</sup> Norman L. Christensen, Ann M. Bartuska, James H. Brown, Stephen Carpenter, Carla D'Antonio, Rober Francis, Jerry F. Franklin, James A. MacMahon, Reed F. Noss, David J. Parsons, Charles H. Peterson, Monica G. Turner, & Robert G. Woodmansee, *The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management*, 6 *ECOLOGICAL APPLICATIONS* 665 (1996).

<sup>2</sup> Susan H. MacKenzie, *Toward Integrated Resource Management: Lessons about the Ecosystem Approach from the Laurentian Great Lakes*, 21 *ENVIRONMENTAL MANAGEMENT* 173 (1997).

## *Ecosystem-Based Management: Laws and Institutions*

MacKenzie (1997) identifies additional emerging issues including:

- Determining appropriate geographic scale
- Measuring ecosystem integrity
- Modifying institutional structures and mandates to enable an ecosystem approach

### **Pew Oceans Commission (2003)<sup>3</sup>**

In its ocean report, the Pew Commission described ecosystem-based management as follows:

- “Ecosystem-based management requires defining standards of ecosystem health. Maintaining, protecting, and, where appropriate, restoring ecosystem health should be the goal of our new ocean governance.
- “The goal of ecosystem-based management is to maintain the health of the whole as well as the parts. It acknowledges the connections among things.”

The report lists elements of ecosystem-based fisheries management:

“Ecosystem-based management entails developing a new perspective that acknowledges and understands that

- there are limits to our knowledge;
- marine ecosystems are inherently unpredictable;
- ecosystems have functional, historical, and evolutionary limits that constrain human exploitation;
- there is a fundamental trade-off in fishing that must be balanced between fish for human consumption and fish for the rest of the ecosystem;
- ecosystems are complex, adaptive systems.”

### **U.S. Commission on Ocean Policy (2004)<sup>4</sup>**

The U.S. Commission on Ocean Policy stated that “The nation’s ocean and coastal resources offer many opportunities for beneficial uses but are also affected by the cumulative impacts of human activities that span cities, counties, states, and sometimes nations. To move toward an ecosystem-based management approach, government should have the institutional capacity to respond to ocean and coastal issues in a coordinated fashion across jurisdictional boundaries.”

**Recommendation 4–3.** The National Ocean Council (NOC) should adopt the principle of ecosystem-based management and assist federal agencies in moving toward an ecosystem-based management approach. As part of this effort, the NOC should:

- coordinate the development of procedures for the practical application of the precautionary approach and adaptive management.
- encourage agencies to incorporate preservation of marine biodiversity in their management programs and support further study of biodiversity.

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<sup>3</sup> Pew Oceans Commission, *America’s Living Oceans: Charting a Course for Sea Change* (2003).

<sup>4</sup> U.S. COMMISSION ON OCEAN POLICY, *AN OCEAN BLUEPRINT FOR THE 21<sup>ST</sup> CENTURY* (2004).

## *Ecosystem-Based Management: Laws and Institutions*

### **McLeod et al. (2005)<sup>5</sup>**

In 2005, leading marine scientists and policy experts published a Scientific Consensus Statement on Marine Ecosystem-Based Management. They identified nine key elements of marine ecosystem-based management (Box 1).

#### **BOX 1. KEY ELEMENTS OF ECOSYSTEM-BASED MANAGEMENT\***

1. Make protecting and restoring marine ecosystems and all their services the primary focus, even above short-term economic or social goals for single services. Only intact, healthy ecosystems can provide the complete range of benefits that humans want and need over long periods of time.
2. Consider cumulative effects of different activities on the diversity and interactions of species.
3. Facilitate connectivity among and within marine ecosystems by accounting for the import and export of larvae, nutrients, and food.
4. Incorporate measures that acknowledge the inherent uncertainties in ecosystem-based management and account for dynamic changes in ecosystems, for example as a result of natural oscillations in ocean state or shifts in the frequency or intensity of storms. In general, levels of precaution should be proportional to the amount of information available such that the less that is known about a system, the more precautionary management decisions should be.
5. Create complementary and coordinated policies at global, international, national, regional, and local scales, including between coasts and watersheds. Ecosystem processes operate over a range of spatial scales, and thus appropriate scales for management will be goal-specific.
6. Maintain historical levels of native biodiversity in ecosystems to provide resilience to both natural and human-induced changes.
7. Require evidence that an action will not cause undue harm to ecosystem functioning before allowing that action to proceed.
8. Develop multiple indicators to measure the status of ecosystem functioning, service provision and effectiveness of management efforts.
9. Involve all stakeholders through participatory governance that accounts for both local interests and those of the wider public.

\* From the *Scientific Consensus Statement on Marine Ecosystem-Based Management (2005)*.

### **Arkema et al. (2006)<sup>6</sup>**

A recent report by Arkema et al. (2006) develops a common set of EBM criteria based upon review of several scientific EBM definitions. The criteria include the following:

- **General Criteria**
  - Sustainability
  - Ecological health
  - Inclusion of humans in the ecosystem
- **Specific Ecological Criteria**
  - Considers complexity
  - Incorporates temporal scales
  - Recognizes spatial scales
- **Specific Human Dimension Criteria**
  - Recognizes ecosystem goods and services
  - Integrates economic factors
  - Engages stakeholders
- **Specific Management Criteria**
  - Science-based
  - Recognizes spatial boundaries
  - Uses technological tools

<sup>5</sup> Karen L. McLeod et al., Scientific Consensus Statement on Marine Ecosystem-Based Management (March 21, 2005), available at <http://www.compassonline.org>.

<sup>6</sup> Katie K. Arkema, Sarah C. Abramson, & Bryan M. Dewsbury, *Marine Ecosystem-Based Management: From Characterization to Implementation*, 4 FRONTIERS IN ECOLOGY & THE ENVIRONMENT 525 (2006).

## *Ecosystem-Based Management: Laws and Institutions*

- Adaptive
- Promotes co-management
- Adopts the precautionary approach
- Interdisciplinary
- Monitors change<sup>7</sup>

### **Boesch (2006)<sup>8</sup>**

Boesch (2006) identifies four key management principles for EBM:

- integration
- sustainability
- precaution
- adaptation

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<sup>7</sup> *Id.*

<sup>8</sup> Donald F. Boesch, *Scientific requirements for ecosystem-based management in the restoration of Chesapeake Bay and Coastal Louisiana*, 26 *ECOLOGICAL ENGINEERING* 6 (2006).

*Ecosystem-Based Management: Laws and Institutions*

<b>Table B-1. EBM Components Identified from Literature</b>							
	<b>Christensen et al</b>	<b>Arkema et al</b>	<b>Consensus Statement</b>	<b>MacKenzie</b>	<b>Boesch</b>	<b>Pew Oceans Commission</b>	<b>USCOP</b>
<b>GOALS</b>							
<b>Sustainability</b>	long-term sustainability	sustainability			sustainability		
<b>Conservation and protection to ensure ecological health</b>		ecological health	Protect and restore ecosystems and services as primary focus / Maintain historical levels of native biodiversity			functional, historical and evolutionary limits constrain exploitation (EBFM)	encourage agencies to incorporate preservation of marine biodiversity in management programs
<b>ACTIONS TO ACHIEVE GOALS</b>							
<b>INCLUDE HUMAN VALUES AND ACHIEVE BALANCE</b>							
<b>Recognize humans as part of ecosystem</b>	humans as ecosystem components	humans as part of ecosystem					
<b>Integrate economic and ecological values</b>		integrate economic factors / ecosystem goods and services					
<b>Achieve balance among human and ecological needs</b>						balance trade-offs for humans and the rest of ecosystem (EBFM)	
<b>Reconcile spatial scales (temporal, geographic, political)</b>	reconcile spatial scales / reconcile temporal scales / attention to context and scale	spatial boundaries / temporal scale / spatial scale	create complementary and coordinated policies at various spatial and management scales	geographic scale			
<b>UNDERSTAND THE SCIENCE TO MAKE INFORMED DECISIONS</b>							

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<b>Understand complexity and interconnectedness</b>	understanding complexity and interconnectedness	consider complexity	facilitate connectivity among and within ecosystems; consider cumulative effects			acknowledge connections among things (maintain health of the whole as well as the parts)	
<b>Recognize dynamic nature of ecosystems (including humans)</b>	recognition of dynamic character of ecosystems					ecosystems are complex and adaptive (EBFM)	
<b>Science-based management</b>	sound ecological models and understanding	science-based / technological tools used	develop multiple indicators to measure the status of ecosystem function	measuring ecosystem integrity			
<b>Take the precautionary approach</b>		precautionary approach	incorporate measures that acknowledge uncertainties / require evidence that actions will not cause undue harm to ecosystem functioning before allowing action to proceed		precaution	acknowledge knowledge limits and unpredictability of system (EBFM)	precautionary approach
<b>COLLABORATE AND COOPERATE</b>							
<b>Participatory governance</b>		engage stakeholders / promotes co-management	involve all stakeholders through participatory governance	cultivate legitimacy: political support, public support			
<b>Collaborative management</b>		interdisciplinary		process: agency participation, disciplinary representation, decision-making	integration		need institutional capacity to respond in a coordinated fashion across jurisdictional

*Ecosystem-Based Management: Laws and Institutions*

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							boundaries
<b>DEFINE SUCCESS AND BE ACCOUNTABLE</b>							
<b>Define goals and objectives</b>	define sustainable goals and objectives / clear operational goals					define standards of ecosystem health (maintaining, protecting, restoring ecosystem health)	
<b>Be accountable</b>	make the system accountable / commit to accountability						
<b>BE ADAPTIVE</b>	make the system adaptable / commitment to adaptability	adaptive			adaptation		adaptive management
<b>Other</b>				modify institutional structures and mandates			

## **II. ECOSYSTEM APPROACHES FROM REGIONAL PROGRAMS**

The following section provides a brief description of the mission and principles of the case study programs.

### **California Ocean Protection Council**

Based on the California Ocean Protection Act, the California Ocean Protection Council is guided by the following principles (as listed in the Strategic Plan):

- “Recognizing the interconnectedness of the land and the sea, supporting sustainable uses of the coast, and ensuring the health of ecosystems
- Improving the protection, conservation, restoration, and management of coastal and ocean ecosystems through enhanced scientific understanding, including monitoring and data gathering
- Recognizing the “precautionary principle”: where the possibility of serious harm exists, lack of scientific certainty should not preclude action to prevent the harm
- Identifying the most effective and efficient use of public funds by identifying funding gaps and creating new and innovative processes for achieving success
- Making aesthetic, educational, and recreational uses of the coast and ocean a priority
- Involving the public in all aspects of OPC process through public meetings, workshops, public conferences, and other symposia”

### **Chesapeake Bay Program**

The Chesapeake Bay Program was established to “protect and restore the Chesapeake Bay’s ecosystem.” Under the original agreement, the parties agreed to the following goals:

- Provide for the restoration and protection of the living resources, their habitats and ecological relationships.
- Reduce and control point and non-point sources of pollution to attain the water quality condition necessary to support the living resources of the Bay.
- Plan for and manage the adverse environmental effects of human population growth and land development in the Chesapeake Bay watershed.
- Promote greater understanding among citizens about the Chesapeake Bay system, the problems facing it and policies and programs designed to help it, and to foster individual responsibility and stewardship of the Bay’s resources.
- Provide increased opportunities for citizens to participate in decisions and programs affecting the Bay.
- Promote increased opportunities for public appreciation and enjoyment of the bay and its tributaries.
- Support and enhance the present comprehensive, cooperative and coordinated approach toward management of the Chesapeake Bay system.
- Provide for continuity of management efforts and perpetuation of commitments necessary to ensure long-term results.

### **Ecosystem Charter for the Great Lakes-St. Lawrence Basin, Shared Vision (1994)**

“Our Vision is a Great Lakes-St. Lawrence Basin Ecosystem...

- Where all people consider and conduct themselves as part of their Ecosystem;
- Where all people recognize the fundamental and inextricable link between economic well-being and the health of the Ecosystem;

## *Ecosystem-Based Management: Laws and Institutions*

- In which all beneficial organisms can thrive free from preventable ecological threats to their well-being;
- Where environmental degradation is a legacy of the past and a basis for remedial action;
- That exists as an evolving natural and cultural system that can successfully adapt to change;
- In which use of natural resources is compatible with conservation of such resources;
- That maintains the integrity of the Ecosystem and accommodates appropriate development;
- That is a rich mosaic of waters and lands, of natural areas and places of human activity, and of different peoples who govern themselves in various ways;
- That nurtures an abundance and diversity of plant and animal species in their natural communities and habitats as well as in specially protected and rehabilitated sites;
- That embraces the concept of sustainable development by meeting the needs of this generation without compromising the ability of future generations to meet their needs;
- Where all people and their governments act as stewards and are committed to informed action and supportive policy decisions;
- In which a shared governance process, among diverse and respected traditions, provides an accessible and equitable basis for responsible action and accountability among all people and their institutions.”

### **Gulf of Maine Council on the Marine Environment, Action Plan 2001-2006**

**Mission:** “To maintain and enhance environmental quality in the Gulf of Maine and to allow for sustainable resource use by existing and future generations.”

**Guiding Principles:** “These principles help guide the Council and participating agencies in their decisions involving the Gulf of Maine ecosystem. Each principle is congruent with other international protocols, as well as state, provincial and national legislation in Canada and the United States.

1. Ecologically Sustainable Development
  - The Council seeks to meet the region’s current social, cultural and environmental needs without compromising the needs of future generations. Working in partnership with others, it strives to sustain ecological processes and enhance the region’s quality of life.
2. Ecosystem-based Planning and Management
  - The Council supports collaborative management that integrates economic and ecological values and objectives, emphasizing natural rather than political boundaries.
3. Environmental Protection through Precaution
  - The Council supports conservation of the coastal and marine environment, and urges its members to proceed with caution when scientific information is incomplete to avoid environmental degradation.
4. Public Information and Participation
  - The Council is committed to a participatory process that informs and engages the public in setting priorities, forming policies and pursuing efforts to conserve the Gulf’s environment.”

## *Ecosystem-Based Management: Laws and Institutions*

### **North Carolina Coastal Habitat Protection Plan**

In adopting the plan the Chairmen of the Environmental Management Commission, Coastal Resources Commission and the Marine Fisheries Commission stated the following:

“We recognize the importance of North Carolina’s coastal fisheries resources and the commercial and recreational fisheries they support. The continued existence and enhancement of these resources depend on the health of the aquatic habitats they occupy. We pledge to cooperatively manage these aquatic habitats to ensure the long-term viability of the coastal fisheries resources. We agree that these Commissions will work to accomplish the following goals:

GOAL 1 – Improve effectiveness of existing rules and programs protecting coastal fish habitats

GOAL 2 – Identify, designate, and protect strategic habitat areas

GOAL 3 – Enhance habitat and protect it from physical impacts

GOAL 4 – Enhance and protect water quality”

### **Gulf of Mexico Alliance**

In a joint letter, the five Gulf of Mexico governors state the purpose of the Action Plan:

The Governors’ Action Plan is intended to be a dynamic starting point for effective regional collaboration. As we move forward, we encourage and expect additional collaboration and contributions from other interested partners or organizations. Through our initial teamwork, the Governors’ Action Plan will begin to set the stage for a long-term regional partnership that can address an expanded suite of issues, culminating in an improved Gulf of Mexico ecosystem and sustained economy. In addition, the Plan proposes several actions to be implemented in conjunction with the six Mexican Gulf States allowing for the Alliance to serve as a forum for effective bi-national partnership.

By working together on targeted resource management issues, we can increase governmental effectiveness, better prepare for future natural emergencies and support an improved quality of life. Together, our accomplishments as an Alliance will serve as a lasting legacy for all Gulf State coastal residents and visitors alike.

### **Puget Sound Partnership**

The newly established Puget Sound Partnership was established to “coordinate and lead the effort to restore and protect Puget Sound.”

### **San Luis Obispo Science and Ecosystem Alliance**

According to the San Luis Obispo Science and Ecosystem Alliance flyer, it is:

“building a robust and integrated program of scientific, stakeholder, and management communities that are based on the natural boundaries of the ecosystem. Our major goal in establishing the program is to develop high-quality, broadly-shared knowledge of the ecosystem to facilitate conservation, restoration, and sustainable use of the services provided by the Morro Bay ecosystem.”