

ECOSYSTEM-BASED MANAGEMENT: LAWS AND INSTITUTIONS

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ACRONYMS

CBP	Chesapeake Bay Program
CHPP	North Carolina Coastal Habitat Protection Plan
COPA	California Ocean Protection Act
COPC	California Ocean Protection Council
EBM	Ecosystem-Based Management
ELI	Environmental Law Institute
EPA	Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
GLC	Great Lakes Commission
GL Cities Initiative	Great Lakes and Saint Lawrence Cities Initiative
GL Governors Council	Great Lakes Governors Council
GLRC	Great Lakes Regional Collaboration
GOMA	Gulf of Mexico Alliance
GOMC	Gulf of Maine Council on the Marine Environment
IJC	International Joint Commission
MMS	Minerals Management Service
NOAA	National Oceanic and Atmospheric Administration
PSP	Puget Sound Partnership
SLOSEA	San Luis Obispo Science and Ecosystem Alliance

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I. EXECUTIVE SUMMARY

Ecosystem-based management (EBM) is an approach to achieving sustainability and ecosystem conservation using a cooperative, ecology-based management system. The goal of the Environmental Law Institute's (ELI's) EBM project is to identify the governance mechanisms capable of translating EBM concepts into concrete practices through the examination of seven case study regions. This Report is a first step in this process. The Report considers three main components of EBM governance: (1) the structure and function of regional organizations; (2) options for EBM implementation under existing federal environmental laws; and (3) sector-based implementation of EBM goals and objectives. It describes EBM components of the seven case study regions that relate to common EBM goals and actions. It identifies existing federal laws that may enable EBM implementation in some circumstances. And it describes sector-based laws and institutions that take an ecosystem approach to management.

DEFINING EBM

Based on existing EBM definitions, ELI applies the following EBM goals and actions in its initial assessment of regional programs:

- **GOALS**
 - Sustainability
 - Conservation and Protection to Ensure Ecological Health

- **ACTIONS TO ACHIEVE GOALS**
 - Achieve Balance among Human and Ecological Values
 - Coordinate and Cooperate
 - Understand the Science so as to Make Informed Decisions
 - Define Success and be Accountable
 - Be Adaptive

REGIONAL ORGANIZATION

CASE STUDY REGIONS

California Ocean Protection Council

Chesapeake Bay Program

Great Lakes (International Joint Commission, Great Lakes Commission, Great Lakes Regional Collaboration)

Gulf of Maine Council on the Marine Environment

Gulf of Mexico Alliance

Puget Sound Partnership

San Luis Obispo Science and Ecosystem Alliance

These case study regions have published plans with fundamental goals that relate to sustainability, conservation, and protection to ensure ecological health. The major focus of this project is to understand how the organizations' governance structures and functions achieve their fundamental goals of healthy and sustainable oceans.

Achieve Balance among Human and Ecological Values. The regional organizations' plans consider human uses and needs as well as the need for conservation and protection of ecosystems. One

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challenge that must be addressed in this balancing act is managing the designated ecosystem under the existing governance structure. There is an overarching need to reconcile ecosystem boundaries with jurisdictional boundaries and to enable institutions to respond to both rapid and slow ecosystem changes. Although this report does not assess how regional organizations set ecological boundaries, once set, their various approaches to *reconciling ecological issues with jurisdictional boundaries* include:

- Tailoring the ecological issues addressed to the program membership
- Creating multiple membership categories, each based on an institution's relationship to the issue or jurisdictional constraints

Examples of approaches to address *slow ecosystem - fast governance* include:

- Long-term monitoring programs to understand slow ecosystem changes over successive administrations
- Use of historical data sets for decision-making
- Maintaining institutional memory

Examples of approaches to address *fast ecosystem - slow governance* include:

- Contingency plans to respond to hazardous spills
- Rapid response programs to prevent introduction and spread of invasive species

Coordinate and Cooperate. A major function of regional programs is to enable coordinated and cooperative management of an ecosystem. ELI examined several components of coordination and cooperation, including founding mechanisms that outline an organization's authority to act, organization structure and membership, how regional programs address competing and conflicting uses and needs, how organizations may enable institutional harmonization, and the role of stakeholders in the management process.

Founding mechanisms include treaties, soft-law transboundary agreements, congressionally authorized state compacts, soft-law multi-state agreements, state law, state executive orders and appropriations, and non-governmental grassroots approaches. Founding documents often set up organizational structure and membership. Regional organizations range from bodies that are composed only of government officers and appointees to ones with broad membership that includes government officers, NGOs, industry, and other stakeholders.

A major focus for this project is to identify and understand how regional organizations address competing and potentially conflicting ocean and coastal uses and needs. Some ways that they are addressing or are seeking to address this challenge are:

- creating dispute resolution systems to solve conflicts
- establishing the authority to impose sanctions for non-compliance
- requiring a majority quorum for decision-making
- requiring consensus for decision-making
- creating a system of compromise during the strategic planning phase
- valuing competing uses relative to one another

Another component of regional organization is the ability to harmonize existing programs. This can occur in a variety of ways. It can include the harmonization of legislation, as is seen in the Chesapeake Bay region, as well as harmonization of information, including efforts to standardize data.

Finally, collaborative and cooperative approaches include public participation, ranging from education and outreach to a direct role for members of the public in decision-making.

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Understand the Science so as to Make Informed Decisions. Regional programs recognize the importance of science-based management that addresses the complexity, interconnectedness, and dynamic nature of ecosystems. Some approaches to enabling the use of science among institutions include:

- Coordinated monitoring programs, including contributing to or working with the Integrated Ocean Observing Systems
- Development of consistent standards and indicators of ecosystem health
- Increased funding for ecosystem-based research
- Mechanisms to deliver scientific information to managers and the public
- Mechanisms for information-sharing across scientific disciplines and institutions
- Development of new tools to enable EBM

Define Success and be Accountable. Regional organizations define their vision of EBM success through the development of management plans. ELI reviewed the management plans for the seven case-study regions and identified (1) types of information included in each plan and (2) specific ecosystem and governance goals that are the basis for regional action.

The plans include the following *types of information*:

- Description of the ecosystem impacts driving the need for action
- One or more overarching objectives for each major category of issue
- Specific action items that will be undertaken in a specified period of time for each overarching objective, including short-term goals and long-term actions
- Rationale for actions
- Cost estimate for actions
- List of lead and/or cooperating institutions to implement each action item
- List of laws, policies, and agency programs related to specific action items or objectives

Specific ecosystem and governance goals include:

- Restore, protect, and enhance fish/shellfish fisheries
- Preserve, protect, restore, and improve habitats and species
- Achieve, improve, and maintain water quality
- Enhance governance capacity and performance
- Improve understanding of ocean and coastal ecosystems, including research, mapping, and monitoring
- Improve public awareness and promote stewardship
- Prevent, eradicate, and control aquatic invasive species

Regional organizations use a variety of mechanisms to create *accountability* in order to achieve implementation. These include:

- providing dates to achieve defined goals as a way to gauge progress
- creating annual achievement reporting requirements

Be Adaptive. Several regional programs take steps toward adaptive management. These include developing plans with specific and measurable goals, updating regional plans on a regular schedule based on a review of previous achievements, continuous monitoring, and communicating results to the public.

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EBM OPPORTUNITIES UNDER EXISTING LAWS AND PROGRAMS

Existing environmental laws and programs may enable implementation of EBM concepts. This report examines key federal laws that offer opportunities for EBM implementation, including the Coastal Zone Management Act (CZMA), the essential fish habitat (EFH) provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and the total maximum daily load (TMDL) provisions of the Clean Water Act (CWA).

The **Coastal Zone Management Act (CZMA)** is a federal law that provides monetary incentives for states to set up coastal management programs that consider a multitude of ocean and coastal uses. The CZMA calls upon state and federal agencies to take actions to properly manage the coastal environment, many of which align with the actions to achieve ecosystem goals described in the previous section. States are able to define their coastal zone to include state marine waters and adjacent shoreline that strongly influences or is influenced by the marine environment. Under the CZMA states create regional plans that consider multiple ocean uses. The Act also enables coordination among neighboring states and between the coastal state and federal agencies when undertaking activities that may affect the coastal zone.

The National Oceanic and Atmospheric Administration (NOAA) manages federal fisheries pursuant to the **Magnuson-Stevens Fishery Conservation and Management Act (MSA)**. While limited in scope to fisheries, the Act's **essential fish habitat provisions** could provide some opportunity to conduct place-based EBM in critical fishery areas. One of the purposes of the MSA is "to promote the protection of essential fish habitat in the review of projects conducted under Federal permits, licenses, or other authorities that affect or have the potential to affect such habitat."¹ NOAA is to coordinate with other federal agencies regarding conservation and enhancement of essential fish habitat. Also, the MSA requires other federal agencies to consult with NOAA for actions that may adversely affect essential fish habitat. This enables fisheries managers to evaluate whether actions taken by other sectors will adversely impact critical fishery areas, and to potentially evaluate cumulative impacts based on multiple agency actions in essential fish habitat areas.

The goal of the **Clean Water Act (CWA)** is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."² Under the CWA, if water bodies or segments are impaired by pollutants, states must establish the **total maximum daily load (TMDL)** of pollutants necessary to achieve the applicable water quality standards.³ States implement this provision by creating TMDL reports that include a description of the geographic area, applicable water quality standards, an assessment of the problem, and the pollutant loading capacity for the water body. As a document that describes the geography, the health of the water body, and the source of the problems, these TMDL reports could be used as a basis for EBM planning. Traditionally, water bodies are divided into segments, and each segment is assessed individually. Newer approaches to water quality management include watershed management and the creation of watershed TMDLs. Also, some TMDLs have been developed for bays and estuaries, and the question remains as to whether TMDLs could be developed further into the marine environment.

The **National Estuary Program (NEP)** is created under Section 320 of the Clean Water Act. To date, 27 estuaries have been designated as being estuaries of national importance. While limited spatially to estuarine environments, NEPs have several EBM components including a coordination and planning mechanism that results in a comprehensive management plan, broad stakeholder participation, science-based management approach, and goals that consider biological integrity and human uses. NEPs are involved in two of the case study regions, Puget Sound and Morro Bay, and the Puget Sound NEP management plan is currently being used by the Puget Sound Partnership as the action agenda until a new plan is created.

¹ Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. § 1801(b)(7).

² Federal Water Pollution Control Act [hereinafter Clean Water Act or CWA], 33 U.S.C. §1251(a).

³ *Id.* § 1313(d).

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SECTORAL IMPLEMENTATION

To gain a better understanding of the sector-based laws and institutions necessary for EBM implementation, ELI defined six implementation categories based on the types of ecosystem issues typically addressed by regional organizations: (1) water quality and quantity; (2) habitat conservation, preservation, and restoration; (3) living resources; (4) land use; (5) maritime activities; and (6) human health and well-being. Within each of these categories, existing laws and institutions may stand out as examples that align with EBM principles and objectives.

Water quality and quantity. This category includes laws, programs, and institutions that focus on regulating or restricting activities that impact marine and freshwater quality and quantity. Specific examples highlighted and studied in this report include:

- Agricultural Nutrient Management Plans in the Chesapeake Bay Watershed
- Great Lakes Preservation Laws in Michigan

Habitat conservation, preservation and restoration. Several laws and institutions seek to conserve, preserve, and restore habitat for the purpose of protecting biodiversity and important places. Examples include:

- Agency Cooperation for Coastal Habitation Protection Plans in North Carolina
- Submerged Aquatic Vegetation Protective Zones in Maryland
- Marine Managed Areas Improvement Act in California

Aquatic living resources. The living resources category includes laws and institutions that regulate or manage individual species or groups of species, including management of target and non-target species. Examples include:

- North Carolina Coastal Habitat Protection Plan
- Governor's Salmon Recovery Office in Washington
- Ecosystem Approach to Fisheries Management in California

Land use. Laws and policies affect the uses of lands, development patterns, decisions to engage in activities, and the practices employed on the lands. Examples include:

- Critical Area Preservation Programs in the Chesapeake Bay Watershed
- Forestry Riparian Easements in Washington
- Permitting Restrictions near Aquatic Resources in Maine

Maritime activities. This section includes laws and institutions related to shipping and navigation and non-living resource use or extraction. Examples include:

- Ballast Water Release Permitting in Michigan
- Preservation Measures in Oil, Gas, and Mineral Leases in Mississippi
- Preventing Ecological Damage from Anchored Oil Vessels in Maine

Human health and well-being. This category focuses on laws and institutions that directly target human health and well-being, including recreational, cultural, economic, and human health issues. Examples include:

- Washington's Beach Environmental Assessment, Communication, and Health (BEACH) Program
- Prohibition on Importing Certain Marine Organisms in Maine
- Pollution Prevention through Restricted Drain Usage in Michigan

II. INTRODUCTION: ECOSYSTEM-BASED MANAGEMENT

A. Ecosystem-Based Management to Address Ocean Impacts

A wide variety of anthropogenic impacts to the ocean and coastal environment drive the need for development of better governance approaches to managing these environments. Anthropogenic impacts come from a variety of sources including, for example, coastal development; forestry; upstream and coastal agricultural activities; upstream and coastal industrial activities; diversion and retention of freshwater for industrial, agricultural, and domestic use; non-renewable resource extraction; commercial, subsistence, and recreational fishing; shipping; and coastal and oceanic tourism and recreation. These activities can lead to degradation of water quality, decreases in freshwater influx, degradation of habitat, loss of biomass and biodiversity, and depletion of non-renewable resources, among others.

Within the United States, human activities and their impacts on the ocean and coastal environments vary regionally. For example, agricultural impacts are a major challenge for the Chesapeake Bay and Gulf of Mexico.⁴ In the Gulf of Mexico, upstream nutrient loads from agricultural activities in the Midwest are the major contributing factor to an annual Gulf dead zone that can be as large as the state of Massachusetts.⁵ In port areas such as Long Beach, San Francisco, and New Orleans, shipping and the required infrastructure to transport goods across land cause degraded coastal air quality and the introduction of invasive species.⁶

In most instances, existing ocean and coastal governance does not adequately respond to ocean and coastal impacts. Governance challenges to effective management of marine and coastal environments (Box 1) include narrow sector-specific laws and institutions that do not allow for consideration of cumulative impacts.⁷ Overlapping mandates may lead to manager and/or user conflict or create redundant management systems.⁸ For example, both the Federal Energy Regulatory Commission under the Federal Power Act and Mineral Management Service of the Department of the Interior under the Energy Policy Act of 2005 claim some authority to license alternative energy development in the marine environment.⁹ The lack of a single management authority could prevent industry from developing alternative energy technologies because of management uncertainty, or could lead to over-development. It also might result in a redundant regulatory systems.¹⁰

⁴ Donald F. Boesch, *Scientific Requirements for Ecosystem-Based Management in the Restoration of Chesapeake Bay & Coastal Louisiana*, 26 *ECOLOGICAL ENGINEERING* 6 (2006).

⁵ *Id.* [4]

⁶ See, e.g., Port of Long Beach, *2006 San Pedro Bay Ports Clean Air Action Plan* (2006), available at http://www.polb.com/environment/air_quality/clean_air_action_plan.asp; see also, Andrew N. Cohen & James T. Carlton, *Accelerating Invasion Rate in a Highly Invaded Estuary*, 279 *SCIENCE* 555 (1998).

⁷ L. B. Crowder, G. Osherenko, O. R. Young, S. Aïramé, E. A. Norse, N. Baron, J. C. Day, F. Douvère, C. N. Ehler, B. S. Halpern, S. J. Langdon, K. L. McLeod, J. C. Ogden, R. E. Peach, A. A. Rosenberg, & J. A. Wilson, *Resolving Mismatches in U.S. Ocean Governance*, 313 *SCIENCE* 617 (2006); Lawrence Juda & Timothy Hennessey, *Governance Profiles and the Management of the Uses of Large Marine Ecosystems*, 32 *OCEAN DEVELOPMENT & INTERNATIONAL LAW* 43(2001).

⁸ Crowder et al., *supra* note 7.

⁹ Federal Power Act, 16 U.S.C. §§ 791 et seq.; Energy Policy Act of 2005 § 388 (2005). The Federal Energy Regulatory Commission [hereinafter FERC] is currently engaged in a licensing process that would allow tidal energy development. See FERC, *Hydropower – Industry Activities*, at <http://www.ferc.gov/industries/hydropower/indus-act/tidal-energy-permits/permits.asp>. Under Section 388 of the Energy Policy Act of 2005, the Minerals Management Service of the Department of the Interior is also authorized to grant leases for alternative energy development on the Outer Continental Shelf.

¹⁰ Despite the challenges faced by the existence of redundant management systems, redundancies may play an important role in creating governance systems that are resilient to changes and allow for distribution of risk. Carl Folke, Thomas Hahn, Per Olsson, & Jon Norberg, *Adaptive Governance of Social-Ecological Systems*, 30 *ANNUAL REVIEW OF ENVIRONMENTAL RESOURCES* 441 (2005) (stating that “diversity and redundancy of institutions and their overlapping functions across organizational levels may play a central role in absorbing disturbance and in spreading risks. Hence, it is an important challenge to overcome common perceptions of inefficiencies associated with redundancy, namely fragmentation and duplication of authority, policy inconsistencies, and high transaction costs.”)

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In addition to overlaps, fragmented governance leads to legal and regulatory gaps.¹¹ From an ecological perspective, management gaps can result in the unintended degradation of resources that do not fall within a particular management regime. From an industry perspective, a gap in management authority can lead to uncertainty and risk for business development and investment, which may prevent both environmentally positive and negative economic activities.

Mismatches of scale exist between governance structures and the ecosystems they govern.¹² Many marine policies may be national, regional, or global in scale and are broad enough to consider large-scale ecosystem impacts. However, implementation actions often happen at the small-scale local level, and local institutions may fail to consider impacts beyond local political boundaries.¹³ Similarly, temporal mismatches exist between institutional cycles and ecosystem impacts.¹⁴ Ecosystem response to actions may occur gradually over long periods of time such as decades or longer, whereas institutional cycles may follow political cycles of a few years. Conversely, resource management often considers the environment as static, or change to be gradual, and thus has difficulty responding to abrupt disturbances.¹⁵

BOX 1. GOVERNANCE CHALLENGES TO EFFECTIVE OCEAN AND COASTAL MANAGEMENT

- Sector-specific laws and institutions do not consider cumulative impacts.
- Overlapping mandates may lead to manager and/or user conflict or create redundant management systems.
- Fragmented governance leads to legal and regulatory gaps.
- Mismatches of geographic scale exist between governance and ecosystems.
- Temporal mismatches exist between institutional cycles and ecosystem impacts.

In order to address the myriad of impacts facing U.S. ocean and coastal environments and management shortcomings, many scientists, policy-makers, and environmental advocates call for ecosystem-based management (EBM).¹⁶ EBM is an approach to achieving sustainability and ecosystem conservation using a cooperative, ecology-based management system.¹⁷ It includes adoption of new ecosystem approaches within the ocean and coastal sectors, as well as cooperative and integrated management among sectors within a given region. Existing EBM definitions and criteria aid in conceptualizing EBM. However, they do not provide specific information about the laws, policies, and institutions necessary to implement EBM. The goal of this project is to elucidate the governance mechanisms required to translate these definitions and criteria into practice.

B. Project Goals and Objectives

This report is the first in a series of reports and guidance documents that ELI, in collaboration with science, law, and policy experts, is producing to develop practical governance approaches to EBM implementation. This report uses existing EBM projects as the starting point for information gathering and

¹¹ Crowder et al., *supra* note 7.

¹² Crowder et al., *supra* note 7; Juda & Hennessey, *supra* note 7; Tundi Agardy, *Global Marine Conservation Policy Versus Site-Level Implementation: The Mismatch of Scale and Its Implications*, 300 MARINE ECOLOGY PROGRESS SERIES 242 (2005); Terence P. Hughes, David R. Bellwood, Carl Folke, Robert S. Steneck & James Wilson, *New Paradigms for Supporting the Resilience of Marine Ecosystems*, TRENDS IN ECOLOGY & EVOLUTION (in press).

¹³ Agardy, *supra* note 12; Samuel D. Brody, *Implementing the Principles of Ecosystem Management Through Local Land Use Planning*, 24 POPULATION & ENVIRONMENT 511 (2003).

¹⁴ Crowder et al., *supra* note 7; Juda & Hennessey, *supra* note 7; Hughes et al., *supra* note 12.

¹⁵ Folke et al., *supra* note 10.

¹⁶ See, e.g., Howard I. Browman et al., *Theme Section: Politics & Socio-Economics of Ecosystem-Based Management of Marine Resources*, 300 MARINE ECOLOGY PROGRESS SERIES 241 (2005); Crowder et al., *supra* note 7; U.S. COMMISSION ON OCEAN POLICY, AN OCEAN BLUEPRINT FOR THE 21ST CENTURY (2004); Pew Oceans Commission, *America's Living Oceans: Charting a Course for Sea Change* (2003).

¹⁷ See Appendix B for a discussion of EBM definitions and components.

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assessment to identify: (a) the ecosystem issues and concerns driving EBM; (b) the scale of the ecosystem issues identified; and (c) the actions recommended, in progress, or already undertaken to address the ecosystem issues. Using this and supplementary information, the report seeks to address the following questions:

- What are the laws, policy decisions, or recommendations from the local, state, or federal programs that provide guidance to regions on coordination and cooperation?
- What institutions are charged with management decisions that may affect EBM?
- What laws and policies are used, required, and available for EBM implementation?
- What laws and policies mandate or allow for ecosystem management approaches?

BOX 2. TERMS

Governance: Governance includes formal and informal arrangements and institutions that work together to create rules, procedures, and customs that determine acceptable human behavior. As used here, it includes federal, state, and local government as well as non-governmental institutions such as academia, trade organizations, community organizations, and environmental groups.

Laws and Policies: Laws and policies are used here to describe a wide variety of format tools that include statutes, treaties, regulations, state compacts, and soft-law documents such as memorandums of understanding, management plans, and agreements.

Institutions: For purposes of this project, institutions include governmental and non-governmental institutions that act to implement EBM, such as federal and state agencies, regional bodies, academic institutions, industry groups, community organizations, and environmental organizations.

For further information on EBM governance, see Lawrence Juda & Timothy Hennessey, *Governance Profiles & the Management of the Uses of Large Marine Ecosystems*, 32 OCEAN DEVELOPMENT & INTERNATIONAL LAW 43 (2001).

C. Report Structure and Summary

Part III of this Report describes the seven regional programs examined as case studies for ELI's project. Part IV identifies EBM goals and actions to achieve these goals, based on definitions found in the existing literature. Using the goals and actions identified, Part V, Regional Organization, describes the regional programs and other approaches that address specific components of EBM success. Part VI, EBM Opportunities under Existing Laws and Programs, includes federal laws and institutions that have one or more of the components identified as important for EBM success. Part VII, Sectoral Implementation, categorizes key ocean and coastal ecosystem issues and describes ecosystem approaches to addressing these key categories based on the regional case studies and an examination of additional laws and institutions.

This Report is designed as to be a working document that will be revised as additional information is collected. It serves the purpose of identifying EBM laws and institutions and posing important questions regarding challenges and successes that will be addressed in the second phase of this study, EBM Implementation—Obstacles and Opportunities. The reader will find text boxes throughout the document that pose questions, some of which will be addressed in the next phase of this study (example below).

An Example—Obstacles and Opportunities Target Questions

1. *What are the key institutions needed for EBM implementation?*
2. *What prevents institutions from implementing EBM plans?*

III. OVERVIEW OF REGIONAL PROGRAMS

This Report examines U.S. regional management in six ocean and coastal regions—California, Chesapeake Bay, Gulf of Maine, Gulf of Mexico, Morro Bay, and Puget Sound—and one freshwater system, the Great Lakes. Each region has unique qualities and challenges. By examining these diverse regions, the authors hope to derive a set of common legal and institutional components used to achieve EBM implementation. The following section provides a brief overview of the selected regional programs.

California Ocean Protection Council: An Example of State Action

The California Ocean Protection Council (COPC) was chosen as an example of a new program created under state law. In selecting it, the authors hope to assess the role of state law in providing a mechanism to organize and integrate management and fund EBM activities.

The COPC was created in 2004 under the California Ocean Protection Act (COPA). It is a state government entity tasked with coordinating state agency ocean and coastal activities, establishing policies to coordinate and share scientific data among agencies, and recommending changes in law to the legislature to achieve its goals.¹⁸ The Council members include the Secretary for Resources, the State Lands Commission Chair, the Secretary for Environmental Protection, and two *ex officio* members. It is staffed by an executive policy officer and the California Coastal Conservancy staff. The COPC has developed a five-year strategic plan, *A Vision for Our Ocean and Coast*, for achieving its objectives. In addition to general goals that seek to achieve a healthy ocean, the strategic plan has the explicit goal to “[d]evelop practical approaches to implementing ecosystem-based management and encourage their implementation throughout the State.”¹⁹ Its implementation efforts include \$11.9 million in funding for improved coastal water quality, sea floor mapping, the San Luis Obispo Science and Ecosystem Alliance, long-term management of subtidal habitats and aquatic invasive species management.²⁰

Chesapeake Bay Program: A Multi-State Perspective

The authors chose the Chesapeake Bay Program (CBP) because it has operated for more than 20 years to coordinate state and federal agency actions in managing the resources of the Bay. The CBP is a well-developed program that faces a multitude of challenges, from a burgeoning coastal population to overfished fisheries. The legal and institutional achievements, along with the many obstacles the Bay still faces, make this an important case study.

The CBP was formed in response to historical decline of living resources, recognizing the shared responsibility among the federal agencies and Chesapeake Bay states for management decisions and resources. It was established by the 1983 Chesapeake Bay Agreement and updated by two subsequent agreements: the 1987 Chesapeake Bay Agreement and the Chesapeake 2000 Agreement. The Chesapeake 2000 Agreement identifies objectives and actions that were to be accomplished in the years 2000-2006, focusing on living resources, habitat, water quality, land use, and community. The CBP is led by an Executive Council whose members include the governors of Virginia, Maryland, and Pennsylvania, the Mayor of Washington, DC, the Chairman of the Chesapeake Bay Commission (a commission composed of Chesapeake Bay state legislators), and the Administrator of the federal EPA. The Executive Council was formed to “assess and oversee the implementation of coordinated plans to improve and

¹⁸ California Ocean Protection Act [hereinafter COPA], California Public Resources Code § 35615 (2004).

¹⁹ California Ocean Protection Council [hereinafter COPC], *A Vision for Our Ocean and Coast: Five Year Strategic Plan* [hereinafter *Five Year Strategic Plan*] 19 (2005).

²⁰ Mike Chrisman, Memorandum: Ocean Protection Council Initiatives on Ecosystem-Based Management (Jan. 27, 2006), available at http://resources.ca.gov/copc/docs/Sea_Grant_announcement_2006-01-27.pdf.

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protect the water quality and living resources of the Chesapeake Bay estuarine systems.” The Executive Council meets annually. Several committees and subcommittees work to implement the Chesapeake Bay Program. Committee membership varies in number, from 24 to 47, and composition, but often includes representatives from federal and state agencies, local government, academic institutions, industries, environmental organizations, and citizen groups.

Great Lakes: An Examination of Multiple Institutional Arrangements

The Great Lakes region, while not a marine environment, shares many common legal and institutional characteristics with marine regions, and is treated the same as marine regions under several federal laws and programs. The Great Lakes region was chosen to examine bilateral EBM efforts and to understand the advantages and disadvantages of multiple coordination and cooperation programs operating within a single region.

Several regional programs act and interact to coordinate management of the region’s ecosystems (Box 3). The multitude of regional Great Lakes programs have been established over the course of a century, from the establishment of the International Joint Commission in 1909 to the creation of the Great Lakes Regional Collaboration in 2004 -- all with different, but overlapping, objectives and goals that relate to healthy ecosystems and economies.

BOX 3. GREAT LAKES REGIONAL PROGRAMS.

International Joint Commission (IJC). Created by the 1909 Boundary Waters Treaty, the IJC addresses watershed and air pollution in boundary regions between the U.S. and Canada.

Great Lakes Fisheries Commission (GLFC). The GLFC was established by the 1955 bilateral Convention on Great Lakes Fisheries. It facilitates bi-national, coordinated management of fisheries.

Great Lakes Commission (GLC). The GLC was established by the 1955 Great Lakes Basin Compact (which was granted Congressional consent in 1968). Its members include the eight Great Lakes states. A Declaration of Partnership in 1999 established Quebec and Ontario as associate members. The GLC is “dedicated to the use, management and protection of the water, land and other natural resources of the Great Lakes-St. Lawrence system.” It addresses resource management, environmental protection, transportation, and sustainable development.

Council of Great Lakes Governors (GL Governors Council). The GL Governors Council was formed in 1983 among six Great Lakes governors (IL, IN, MI, MN, OH, WI). New York and Pennsylvania joined in 1989, and Quebec and Ontario now also participate. No specific agreement formed the council, which serves as a forum for development of regional agreements. The GL Governors Council’s mission is to “encourage and facilitate environmentally responsible economic growth.”

Great Lakes and St. Lawrence Cities Initiative (GL Cities Initiative). The GL Cities Initiative is a regional initiative, staffed by the Northeast-Midwest Institute, that brings together mayors and local officials from the U.S. and Canada to advance protection and restoration of the Great Lakes.

Great Lakes Regional Collaboration (GLRC). President George W. Bush signed Executive Order 13340 (May 18, 2004), which charged EPA with leading a regional collaboration. Together the Interagency Task Force, Council of Great Lakes Governors, Great Lakes Cities Initiative, Native American Tribes, and the Great Lakes Congressional Task Force signed the Great Lakes Declaration (December 3, 2004), forming the GLRC, and agreed to a framework document. The goal of the GLRC is to further protect and restore the Great Lakes ecosystem.

Gulf of Maine Council on the Marine Environment: A Bilateral and Multi-State Perspective

The Gulf of Maine Council on the Marine Environment (GOMC) is a regional program that includes the states of Maine, Massachusetts, and New Hampshire and the Canadian provinces of New Brunswick and Nova Scotia. It offers another opportunity to examine bilateral and multi-state arrangements within the context of multiple regional organizations. New England is home to a growing number of regional organizations—including the Oceans Working Committee, the Northeast Regional Ocean Council, and a Southern New England regional initiative—that are striving at the outset to coordinate regional actions. The Oceans Working Committee extends from Nova Scotia to New York. The Northeast Regional Council includes six New England states (Maine, New Hampshire, Massachusetts, Vermont, Rhode Island,

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Connecticut), and the southern regional initiative comprises Rhode Island, southern Massachusetts, and Connecticut, with New York having some representation.

Of the New England regional organizations, the GOMC is the oldest. It was created under the Governors' and Premiers' 1989 Agreement on Conservation of the Marine Environment of the Gulf of Maine between the Bordering States and Provinces. The mission of the GOMC "is to maintain and enhance environmental quality in the Gulf of Maine to allow for sustainable resource use by existing and future generations."²¹ It operates under four major guiding principles: ecologically sustainable development, ecosystem-based planning and management, environmental protection through precaution, and public information and participation-based planning and management.²² The GOMC is a non-profit organization that has no independent authority.²³ It is funded through participating state and federal contributions as well as from donations, grants, and contracts. It provides a regional forum for exchange of information and long-term planning. Membership on the GOMC includes two government representatives from each participating state and province federal agency representatives, and one NGO or industry representative from each state or provincial jurisdiction.

Gulf of Mexico Alliance: Multilateral and Multi-state Partnerships

The Gulf of Mexico faces large-scale challenges. For example, the Mississippi watershed, which drains into the Gulf of Mexico, includes all or part of 31 states and two Canadian provinces. It is a region that must contend with large-scale natural hazards, including hurricanes and tropical storms that may increase in the coming decades. From a governance perspective, the Gulf of Mexico Alliance provides an opportunity to examine a recently formed multi-state and federal partnership that is working to facilitate multilateral cooperation with the inclusion of the six Mexican states of the Gulf of Mexico.

The Gulf of Mexico Alliance (GOMA or Alliance) is a partnership that includes the Gulf of Mexico state governors and federal agencies. The state and federal partnership shares the vision of a healthy and resilient Gulf of Mexico coast.²⁴ The Alliance works together on targeted resource management issues to increase government effectiveness, prepare the coast for natural emergencies, and support an improved quality of life.²⁵ Interacting with the Alliance are the U.S. EPA's Gulf of Mexico Program, the 1995 Accord of the States of the Gulf of Mexico, and the NOAA- and EPA-led federal workgroup established in 2005. In 2006, the Alliance released the Governors' Action Plan for Healthy and Resilient Coasts, and it is now working to implement that plan.

Puget Sound Partnership: Public-Private Partnership

The Puget Sound Partnership provides the opportunity to examine a regional EBM program in an area of high population density with a diversity of users. It is a state-driven program rather than a grassroots approach (contrast the Morro Bay program described below).

In 2005, Governor Gregoire charged the Puget Sound Partnership (PSP or Partnership) with "develop[ing] recommendations for preserving the health and ecosystem of Puget Sound, and [helping] educate and enlist the public in achieving recovery of the Sound by 2020."²⁶ The first Partnership was composed of 22 members and led by three co-chairs: the Governor, the Chairman of the Northwest Indian Fisheries Commission, and the Chairman of the Salmon Recovery Funding Board. Other members represented the interests of agriculture, mariculture, forestry, development, state legislature, state agencies, cities, counties, EPA, academia, and environmental organizations. This initial Partnership developed recommendations and released its final report in December 2006.²⁷ In 2007, the Washington

²¹ Gulf of Maine Council on the Marine Environment [hereinafter GOMC], *About the Council*, at <http://www.gulfofmaine.org/council/mission.php>; see also GOMC, *Action Plan 2001 – 2006* (2002).

²² *Id.* [21]

²³ GOMC, *Action Plan 2001-2006*, *supra* note 21, at Appendix A.

²⁴ Letter by the Gulf State Governors (2006).

²⁵ *Id.*

²⁶ Jay Manning, Bill Ruckelshaus, and Billy Frank, Jr., Letter to Governor Gregoire (December 2006) (available in the Puget Sound Partnership Plan).

²⁷ Puget Sound Partnership [hereinafter PSP], *Sound Health, Sound Future: Protecting and Restoring Puget Sound* [hereinafter *PSP Recommendations*] (2006).

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Legislature passed, and Governor Gregoire signed, a bill (SB5372) that creates a permanent Partnership and charges it with continuing to coordinate region-wide Puget Sound recovery efforts.²⁸ Both the original PSP report and the new law are used in this study to evaluate EBM in Puget Sound. It should be noted, however, that the permanent Partnership will use the *2007-2009 Puget Sound Conservation and Recovery Plan* developed by the Puget Sound Action Team and the Puget Sound Council until a new science-based action agenda is developed.²⁹

Morro Bay: Grassroots Local Action

The San Luis Obispo Science and Ecosystem Alliance (SLOSEA) offers an opportunity to examine a newly-formed, grassroots, small-scale EBM program. Compared to other case study regions, Morro Bay is a small bay and watershed and has a relatively small population. This science-focused program provides the opportunity to examine issues of scale, institutional complexity, variability of human impact, and scientist-manager cooperation.

SLOSEA was launched in 2006 to create a “robust and integrated program of scientific, stakeholder, and management communities that are based on the natural boundaries of the ecosystem.”³⁰ SLOSEA is funded by private foundations and state funding mechanisms, including the David and Lucile Packard Foundation, the California and Coastal Marine Initiative of the Resources Legacy Fund Foundation, the California Ocean Protection Council, and the California Coastal Conservancy. SLOSEA has an advisory committee that includes representatives from the Morro Bay National Estuary Program, the Marine Interest Group of San Luis Obispo County, California Department of Fish and Game, Coastal San Luis Resource Conservation District, Coastal Conservancy, California State Parks, Los Osos Community Advisory Council, Bureau of Land Management, Cal Poly Center for Coastal Marine Studies, NOAA Fisheries, California Coastal Commission, the Monterey Bay National Marine Sanctuary, the Bay Foundation, local harbor districts, San Luis Obispo county government, the City of Morro Bay, recreational fishing, and the regional water quality board.

IV. DEFINING EBM

Scholars often cite to the EBM concept as it was described by Christensen et al. (1996),³¹ which identifies the following eight elements for ecosystem-based management:

- (1) long-term sustainability as fundamental value, (2) clear, operational goals, (3) sound ecological models and understanding, (4) understanding complexity and interconnectedness, (5) recognition of the dynamic character of ecosystems, (6) attention to context and scale, (7) acknowledgement of humans as ecosystem components, and (8) commitment to adaptability and accountability.³²

²⁸ Where appropriate, this report distinguishes the permanent Partnership from the original Partnership. The “original PSP” refers to the Partnership established by executive order, and “permanent Partnership” refers to the Partnership established by SB5372.

²⁹ SB5372, §13(3). ELI will use the *2007-2009 Puget Sound Conservation and Recovery Plan* in subsequent phases of this project.

³⁰ San Luis Obispo Science and Ecosystem Alliance [hereinafter SLOSEA], SLOSEA Flyer (2006), at <http://www.slosea.net/>.

³¹ 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).

³² *Id.*

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In moving from concept to practice, the authors state that the following steps and actions are required: (1) defining sustainable goals and objectives, (2) reconciling spatial scales, (3) reconciling temporal scales, and (4) making the system adaptable and accountable.³³

A review of recent literature provides additional EBM definitions and elements that relate to this definition. Based on a review of several commonly used definitions, ELI identified EBM goals and actions (Box 4).³⁴

BOX 4. ECOSYSTEM GOALS AND ACTIONS TO ACHIEVE GOALS

GOALS

*SUSTAINABILITY
CONSERVATION AND PROTECTION TO ENSURE ECOLOGICAL HEALTH*

ACTIONS TO ACHIEVE GOALS

INCLUDE HUMAN VALUES AND ACHIEVE BALANCE
Recognize humans as part of ecosystem
Integrate economic and ecological values
Achieve balance among human and ecological values
Reconcile spatial scales (temporal, geographic, political)

UNDERSTAND THE SCIENCE TO MAKE INFORMED DECISIONS
Understand complexity and interconnectedness
Recognize dynamic nature of ecosystems (including humans)
Science-based management
Take the precautionary approach

COORDINATE AND COOPERATE
Collaborative management
Participatory governance

*DEFINE SUCCESS AND BE ACCOUNTABLE
BE ADAPTIVE*

The ecosystem goals and actions provide ELI with a starting point for its assessment of ocean and coastal EBM implementation. However, successful implementation may require additional or different actions. Also, the practical mechanisms for achieving these goals and undertaking these actions, within the context of the existing U.S. legal and regulatory framework, is not fully understood.

The ultimate goal of ELI's project is to identify practical mechanisms to achieve successful EBM implementation. This Report takes the first step in achieving this goal in the following sections, which describe the case study regions' actions within the context of the ecosystem goals and actions, and identify laws and institutions that take an ecosystem approach to management.

EBM should facilitate connections among scientists (including social scientists), policy-makers, and resource managers within and among ocean and coastal institutions. EBM is often envisioned as occurring through the creation of umbrella regional organizations, wherein EBM constituents develop ecosystem-based plans that are implemented by individual institutions (e.g., federal and state agencies, NGOs, municipalities, academics, and industries). Under this model, successful EBM implementation will require effective regional organization and effective institutional implementation. But in addition to individual institutions implementing regional plans, institutions could pursue ecosystem approaches to management independently of an umbrella organization, and consistent with their existing mandates.

Accordingly, this report takes a dual approach to examining laws and institutions in the following sections: (V) Regional Organization and (VI) Sectoral Implementation. Part V, Regional Organization, identifies specific EBM goals and actions as a first step to identifying practical approaches to EBM implementation. Part VI, Sectoral Implementation, identifies ecosystem approaches to management that may occur within the context of a regional organization or independently of one.

³³ *Id.*

³⁴ For a detailed discussion of EBM definitions, see Appendix B.

V. REGIONAL ORGANIZATION

To achieve effective ocean governance, the Pew Oceans Commission recommended the creation of regional ocean governance councils that lead implementation of regional ecosystem plans.³⁵ According to the Pew Commission, the plans should have performance goals and indicators, meet developed federal standards, and be binding and enforceable.³⁶ The U.S. Commission on Ocean Policy also recognizes the importance of regional governance for implementing EBM approaches.³⁷ In its report, the U.S. Commission describes the need to work across jurisdictional boundaries to address whole ecosystems in order to coordinate activities, reduce duplicative efforts, minimize conflict, maximize limited resources, and foster a sense of stewardship among federal, state, and private institutions with a place-based focus.³⁸

Regional organizations are created to address a variety of regional challenges and needs, some of which relate to ecosystem health and function. ELI examined the case study regions to identify the key ecosystem goals and objectives of regional plans so as to reveal commonalities among them as well as the unique characteristics of specific regions.

The following section applies the (A) ecosystem goals and (B) actions designated to achieve these ecosystem goals to guide the examination of regional organizations via the seven case studies. This section also describes additional laws that mandate coordination and cooperation among federal and/or state agencies, as well as laws that require agencies to balance competing uses.

A. Ecosystem Goals

i. Sustainability

Like the definition of ecosystem-based management, “sustainability” can mean different things to different people. Christensen et al. (1996) viewed sustainability as applied to EBM as “[e]cosystem management [that] does not focus primarily on “deliverables” but rather regards intergenerational sustainability as a precondition.”³⁹ Achieving intergenerational sustainability requires the maintenance or enhancement of important ecosystem services, which typically require robust and healthy ecosystems.

To varying degrees, the regional programs under review in this report strive for sustainability. In some regions, programs were created before modern concepts of sustainability (e.g., the IJC). Also, the purpose of some regional programs may include EBM components that consider sustainability but also have other, potentially competing, objectives. Some of the programmatic objectives and action items that strive for sustainability include the following:

- According to its Mission Statement, the Great Lakes Commission “applies sustainable development principles in addressing issues of resource management, environmental protection, transportation and sustainable development.”⁴⁰

³⁵ Pew Oceans Commission, Report at 33.

³⁶ *Id.* at 33-34.

³⁷ U.S. Commission on Ocean Policy, Chapter 5: Advancing a Regional Approach at 86 (stating that “[i]n addition to improving coordination at the national level, as described in Chapter 4, an important component of the new National Ocean Policy Framework is the strengthening of regional approaches that allow decision makers to address pressing ocean and coastal issues on an ecosystem based scale.”).

³⁸ *Id.* at 87.

³⁹ Christensen et al., *supra* note 31.

⁴⁰ Great Lakes Commission [hereinafter GLC], Mission Statement, *available at* <http://www.glc.org/about/>.

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- The GLC Great Lakes Ecosystem Charter (see Appendix B), describing the GLC vision, includes an ecosystem “[t]hat embraces the concept of sustainable development by meeting the needs of this generation without compromising the ability of future generations to meet their needs.”
- Under Sound Land Use goals of the Chesapeake 2000 agreement, the CBP recognizes the importance of sustainable development in a region where the population is expected to expand by three million by 2020.⁴¹ It describes elements of sustainable development as including protecting natural and rural resource land, limiting impervious surfaces, concentrating growth in existing population centers, promoting more environmentally-sensitive development, and coordinating infrastructure development.⁴²
- The Gulf of Maine Council includes “ecologically sustainable development” as one of its guiding principles.
- The SLOSEA program includes “sustainable use” as one of its major goals.

ii. Conservation and Protection to Ensure Ecological Health

All regional programs strive for ecological health as a fundamental guiding principle. Examples include:

- COPC’s mandate to “[c]oordinate activities of state agencies, that are related to the protection and conservation of coastal waters and ocean ecosystems. . . .”⁴³
- GOMC’s long-range goals: “Coastal and marine habitats are in a healthy, productive, and resilient condition.”⁴⁴
- CBP purpose “to protect and restore the Chesapeake Bay’s ecosystem.”⁴⁵
- Permanent PSP’s charge to “coordinate and lead the effort to restore and protect Puget Sound.”⁴⁶
- SLOSEA’s goal “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.”⁴⁷
- The IJC’s Great Lakes Water Quality Agreement purpose of “restor[ing] and maintain[ing] the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem.”⁴⁸

Obstacles and Opportunities Target Questions:

1. *How do sustainability and conservation objectives affect decision-making processes?*
2. *Do regional organizations prioritize long-term intergenerational sustainability over short-term economic gains? If so, how?*

⁴¹ Chesapeake Bay Program [hereinafter CBP], *Chesapeake 2000 Agreement* at 8.

⁴² *Id.*

⁴³ COPA, California Public Resources Code § 35615 (a)(1).

⁴⁴ GOMC, *GOMC Action Plan 2007-2012*, *supra* note 21 at 1.

⁴⁵ CBP, *Chesapeake 2000* at Preamble.

⁴⁶ Puget Sound Partnership, Senate Bill 5372 § 1(2) (2007).

⁴⁷ SLOSEA Flyer, *supra* note 30.

⁴⁸ Great Lakes Water Quality Agreement, Article II.

B. Actions to Achieve Ecosystem Goals

i. Include Human Values and Achieve Balance

1. Recognize humans as part of ecosystem, integrating values and balancing needs

According to existing definitions, EBM should recognize that humans are part of the ecosystem; integrate economic and ecological values; and achieve balance among human and ecological values (Box 4). Regional plans and programs often implicitly, if not explicitly, recognize humans as part of the ecosystem, and all plans strive for both economic and ecological health. For example:

- COPA (under which COPC acts) includes the following guiding principle: “State decisions affecting coastal waters and the ocean environment should be designed and implemented to conserve the health and diversity of ocean life and ecosystems, allow and encourage those activities and uses that are sustainable, and recognize the importance of aesthetic, educational, and recreational uses.”⁴⁹
- GOMC’s long-range goal 2 links the environment and human health: “Environmental conditions . . . support ecosystem and human health.”⁵⁰
- The Gulf of Mexico Alliance was created to use regional cooperation to “enhance the ecological and economic health of the Gulf of Mexico.”⁵¹
- In establishing the permanent PSP, the Washington legislature found that Puget Sound restoration and protection is needed “to ensure a thriving natural system that exists in harmony with a vibrant economy.”⁵²

One mechanism for integrating economic and ecological values is to attach monetary values to ecosystem services or otherwise recognize the importance of ecosystem services to the economic success of the region. The GOMC Action Plan 2007-2012 provides data on the value of the marine economic sector for each state and province and also provides a list of ecosystem services that are not easily quantified, including nutrient cycling, carbon sequestration, recreation, and aesthetic experiences. The COPA and the COPC strategic plan recognize that California’s economy is tied to a healthy ocean.⁵³

In addition to recognizing the importance of humans as part of the ecosystem and the need to consider ecosystem values, EBM calls for decision-makers to balance these potentially competing needs. For a discussion of how regional programs balancing competing uses and needs, see this Part, Section B(ii)(3).

2. Reconcile spatial scales

Geographic Scale. The seven regional programs vary in geographic scale from the enormous Gulf of Mexico to the small watershed of Morro Bay, California. With the exception of the COPC, all case study regions have regional programs that address an enclosed or semi-enclosed water body (including Puget Sound, Gulf of Maine, Great Lakes, Gulf of Mexico, Morro Bay). While all regional programs are based on ecosystems, jurisdictional boundaries are also important considerations. This section highlights some of the variability in the regional programs that consider ecosystems, while recognizing jurisdictional constraints.

⁴⁹ COPA, California Public Resources Code § 35510(b)(1).

⁵⁰ GOMC, *GOMC Action Plan 2007-2012*, *supra* note 21 at 1.

⁵¹ Gulf of Mexico Alliance [hereinafter GOMA], *Governors’ Action Plan for Healthy and Resilient Coasts* [hereinafter *Governors’ Action Plan*] 6 (2006).

⁵² Senate Bill 5372 § 1(1)(c).

⁵³ COPA, Public Resources Code §35505(a); COPC, *supra* note 18 at 8.

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The Chesapeake Bay Program brings together institutions to manage the entire Chesapeake Bay and its watershed. The signatories to the Chesapeake Bay Agreement include the states surrounding the Chesapeake Bay (Maryland, District of Columbia, Pennsylvania, and Virginia). These states comprise a majority of the watershed. Additionally, the headwater states of New York, West Virginia, and Delaware participate in the Chesapeake Bay Program. The CBP seems to recognize the importance of including all states in the watershed in the Chesapeake 2000 agreement, wherein it states goals that include strengthening partnerships with headwater states “by promoting communication and by seeking agreements on issues of mutual concern” and working with non-signatory states through community-based organizations.⁵⁴ Similarly, the Great Lakes Commission has two types of members: Great Lakes states are the main members, and the Canadian provinces are associate members.

These types of arrangements seem to recognize the need for certain members to have strong ties, either for ecological reasons such as in the Chesapeake Bay or jurisdictional reasons such as with the Great Lakes Commission; while at the same time recognizing the need to include a broader set of constituents to manage the entire ecosystem.

The International Joint Commission’s geographic range includes all transboundary freshwater bodies at the border of the United States and Canada, including the Great Lakes. The IJC’s geographic range is designated by the Boundary Waters Treaty of 1909. According to the treaty,

boundary waters are defined as the waters from main shore to main shore of the lakes and rivers and connecting waterways, or the portions thereof, along which the international boundary between the United States and the Dominion of Canada passes, including all bays, arms, and inlets thereof, but not including tributary waters.

While the treaty limits regional cooperation to the main waterbodies and does not include the entire watershed in its management, the subsequent Great Lakes Water Quality Agreement includes the entire Great Lakes Basin watershed as part of the managed geographic range.⁵⁵ The Agreement covers a range of pollution sources, including industrial and municipal sources, agricultural and other land use sources, shipping, dredging, and on- and off-shore facilities.⁵⁶

Membership may be a factor in the range of issues that can be addressed by a regional program. For example, the Gulf of Mexico Alliance includes only the states that border the Gulf of Mexico. One of the main ecosystem components of the Gulf of Mexico is the Mississippi River and its watershed. While the Gulf of Mexico Alliance tackles some Mississippi River issues through its plans to create and restore wetlands and improve harmful algal bloom detection, it does not appear to have the appropriate membership to address the source of many Gulf of Mexico impacts – namely upstream nutrient input. This would require a coordinated approach with all 31 Mississippi River watershed states.

⁵⁴ CBP, *supra* note 41 at 12.

⁵⁵ For example, Article II of the Agreement states that “[t]he purpose of the Parties is to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem.” The Great Lakes Basin Ecosystem “means the interacting components of air, land, water and living organisms, including humans, within the drainage basin of the St. Lawrence River at or upstream from the point at which this river becomes the international boundary between Canada and the United States.” Article I.

⁵⁶ Article VI.

BOX 5. APPROACHES TO RECONCILING ECOLOGICAL ISSUES AND JURISDICTIONAL BOUNDARIES

The regional case study programs take different approaches to reconciling ecological needs with jurisdictional boundaries. These include:

- **Limiting the ecological issues** addressed based upon the program membership
 - GOMA does not address the Gulf of Mexico Dead Zone because the Alliance does not include the upstream states that are the main source of the nutrients causing the problem.
- **Creating more than one category of member** based on relationship to issue or jurisdictional constraints
 - CBP includes both member states and headwater states, the latter of which play a more limited role in the Program.
 - GLC includes both members (US Great Lakes States) and associate members (Canadian Great Lakes Provinces).

Temporal Scale. Temporal mismatch between ecosystems and governance is often cited as an EBM challenge. Temporal mismatch can occur with slow ecosystem processes and comparatively fast governance changes or when ecosystems change rapidly, requiring quick response from a comparatively slow governance system.

In the case of slow ecosystem processes and fast governance change, often at issue is the challenge of recognizing and responding to slow degradation over time that may be imperceptible in a governance system where institutional memory is short or where scientific assessments do not consider appropriate baselines. The term “shifting baselines” is often used to describe this phenomenon.⁵⁷ The Washington law SB 5372 creating the permanent Puget Sound Partnership addresses institutional memory by creating staggered appointments for council and board positions so that institutional knowledge is maintained over time. Another challenge with slow ecosystem processes is the possibility for slow ecosystem response to preservation and restoration efforts. This raises the issue of how to measure success of EBM governance programs.

Another type of temporal mismatch occurs when slow bureaucratic systems must respond to quick ecosystem changes. Ecosystems can change rapidly due to natural or human caused processes. Examples of rapidly changing natural processes can include natural disaster events as well as natural shifts such as changes in recruitment year classes in fish. In the first instance, rapid response may be necessary to mitigate damages to ecosystems and communities. In the second instance, managers may need to respond quickly by altering total allowable catch based on the shift in population size or structure. Human activities can also cause sudden ecosystem changes. For example, increased shipping traffic in the Great Lakes has led to the increased invasion rate of exotic species, some of which have rapid and devastating impacts on ecosystems and the services they provide. A review of the regional programs provides some examples of responses to these types of temporal mismatches.

Under the Great Lakes Water Quality Agreement, the parties are to maintain a joint contingency plan to allow for a coordinated and integrated response in the event or imminent threat of an oil or hazardous discharge.⁵⁸ Rapid response is also important to prevent establishment of invasive species. The GLRC Strategy recommends the establishment of a Great Lakes Aquatic Invasive Species Integrated

⁵⁷ Daniel Pauly, *Anecdotes and the Shifting Baseline Syndrome of Fisheries*, 10 TRENDS IN ECOLOGY AND EVOLUTION 430 (1995). Pauly describes shifting baselines in fisheries management as follows:

[E]ach generation of fisheries scientists accepts as a baseline the stock size and species composition that occurred at the beginning of their careers, and uses this to evaluate changes. When the next generation starts its career, the stocks have further declined, but it is the stocks at that time that serve as a new baseline. The result is a gradual shift of the baseline, a gradual accommodation of the creeping disappearance of resource species, and inappropriate reference points for evaluating economic losses resulting from overfishing, or for identifying targets for rehabilitation.

⁵⁸ Great Lakes Water Quality Agreement, Article VI(1)(i) & Annex 9.

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Management Program “to implement rapid response, control, and management programs.”⁵⁹ The recommendation includes increased funding for monitoring and surveys to detect invasive species, as well as the establishment of a coordinated data management system to allow for reporting and tracking of invasive species infestations.⁶⁰

BOX 6. APPROACHES TO RECONCILING ECOLOGICAL AND GOVERNANCE TIMING

Two issues arise:

- (1) slow ecosystem change and fast governance change; and
- (2) fast ecosystem change and slow governance response

Examples of approaches to address **slow ecosystem-fast governance** include:

- Long-term monitoring programs to understand slow changes over changing administrations
- Use of historical data sets for decision-making
 - GOMC Gulfwatch program (<http://gulfofmaine/gulfwatch>) monitors changes in toxic chemicals in the Gulf of Maine and uses information to establish baselines
 - COPC strategic plan monitoring objective “provide critical baselines . . . [and] metrics to assess future success or failure of management measures”
 - CBP plans to revise submerged aquatic vegetation restoration goals to reflect historic abundance based on information from the 1930s to the present
- Maintain institutional memory
 - The permanent PSP maintains institutional memory by having staggered appointments to the council and boards.

Examples of approaches to address **fast ecosystem-slow governance** include:

- Contingency plan to respond to a hazardous spill (Great Lakes Water Quality Agreement)
- Rapid response program to address invasive species (GLRC Strategy recommendation)

Obstacles and Opportunities Target Questions:

Geographic Scale

1. *How do the headwater states participate in the Chesapeake Bay Program? How do their roles vary in comparison to the signatory states? Do they have the same level of authority and/or commitment to the program?*
2. *How do local EBM programs connect to broader arrangements?*
3. *Is there a maximum and minimum size for effective EBM programs – e.g., watershed to LME?*
4. *Is there a need or use for an overarching EBM system that connects regional programs nationally? Internationally?*

Temporal Scale

1. *How do programs maintain institutional memory to address slow ecosystem changes?*
2. *What baselines are used to set goals and make management decisions?*
3. *The rapid response systems identified are sector- or issue-specific. Is there a need for a comprehensive rapid response system? If so, what does this look like?*

ii. Coordinate and Cooperate

Fundamental to the concept of ecosystem-based management is the need for coordination and cooperation among regional institutions as a way to:

- Integrate scientific fields and institutions to understand the ecosystem in a more holistic way;

⁵⁹ Great Lakes Regional Collaboration [hereinafter GLRC], *Great Lakes Regional Collaboration Strategy to Restore and Protect the Great Lakes* [hereinafter *GLRC Strategy*] 21 (2005).

⁶⁰ *Id.*

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- Link scientific information to management decisions; and
- Integrate decision-making across management sectors.

By creating a cooperative system, the hope is that decision-makers will have a better understanding of the environment and environmental impacts so as to make informed resource management decisions; that redundancies will be reduced, leading to a more efficient governance system; and that decision-makers will have a better understanding of the stakeholder demands on the system in order to balance competing objectives and make rational decisions.

Through examination of the seven regional case studies, ELI has identified several sub-components of collaboration and cooperation that may aid or impede regional organization and ultimately EBM implementation (Box 7). This section describes regional program similarities and differences as they relate to each of these subcomponents.

BOX 7. COMPONENTS OF COORDINATION AND COOPERATION

- **founding mechanisms**
- **program structure and membership**
- **addressing competing and conflicting uses and needs**
- **addressing cumulative impacts**
- **harmonization**
- **public participation**

1. Founding mechanisms

Founding mechanisms may determine how regional organizations can cooperate and coordinate—either enabling or inhibiting regional bodies from taking certain actions. For example, founding mechanisms may determine regional organizations' flexibility in decision-making, the breadth of the regional program, accountability mechanisms, financing, and authority to implement goals. The regional programs under review in this report have been initiated through a variety of mechanisms. These mechanisms include creation by:

- Treaty (IJC)
- Transboundary agreement (GOMC, Gulf of Mexico Accord, GLC)
- Congressionally authorized state compact (GLC)
- Soft law multi-state agreement (CBP)
- State law (COPC, permanent PSP)
- State executive order and appropriations (original PSP)
- Non-governmental grassroots approaches (SLOSEA)

Table 2A (Appendix) provides a brief description of the laws, agreements, and organizational documents that create the regional programs.

Obstacles and Opportunities Target Questions:

1. What are the advantages and disadvantages for EBM implementation when the regional program is created by each of the listed mechanisms? Consider flexibility, accountability, financing, authority to implement goals, among others.

2. Structure and membership

Regional programs establish permanent and temporary regional bodies, committees, and action teams. To varying degrees, regional programs include federal and state agencies, local government, tribes, the

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private sector, academia, environmental organizations, and citizen groups.⁶¹ In the regional programs reviewed, overseeing body (e.g., executive council or commission) membership includes:

- **Governmental officers and/or appointees only** (CBP, COPC, GLC, GLFC, GLRC⁶², GOMA, and IJC).
 - For example, the CBP Executive Council includes member-state representation and the EPA Administrator. The California Ocean Protection Council includes three state agencies and two non-voting *ex officio* members – one Member of the State Senate and one Member of the State Assembly.⁶³
 - In most of the large-scale programs, non-governmental interests are represented on committees and action teams.
- **Governmental officers and/or appointees and limited non-governmental participation** (GOMC).
 - The GOMC includes one non-governmental or industry representative from each state or provincial jurisdiction.
- **Broad membership** (original PSP, permanent PSP, SLOSEA).
 - Both the original PSP and SLOSEA have broad membership, including representation by state and federal government agencies, local government, academia, environmental organizations, citizens groups, the private sector, and tribes.
 - The leadership council of the permanent PSP is composed of seven members appointed by the governor “who are publicly respected and influential, are interested in the environmental and economic prosperity of Puget Sound, and have demonstrated leadership qualities.”⁶⁴ The permanent PSP also includes an ecosystem coordination board with members from general business interests, environmental interests, tribal governments, counties, cities, port districts, state agencies, and federal agencies.⁶⁵

Obstacles and Opportunities Target Questions:

1. *What are the advantages and disadvantages of the composition of regional programs (governmental officers and/or appointees versus broad membership)?*
2. *Are the appropriate actors involved in regional programs? Are the right institutions involved?*
3. *Is the right level of actor involved – e.g., do council members have decision-making authority within their respective institutions?*

3. Addressing competing or conflicting uses and needs

One of the major challenges for EBM approaches is to make management decisions when there are competing or conflicting ecosystem uses, especially when programs and regulations are sectoral rather than ecosystem-based. The reviewed regional programs take several approaches, including:

- **Dispute resolution** system to address conflicts
 - The International Joint Commission was designed to prevent and address disputes between the U.S. and Canada over the use of boundary waters. The Boundary Waters Treaty has extensive provisions regarding dispute settlement procedures. The IJC has the power to hear cases and render decisions.
 - The original PSP recommended the development of a system that will inspire collaboration and settle disputes in the absence of a collaborative solution.
 - The permanent PSP includes an ecosystem coordination board. One duty of the board is that “[w]hen the board identifies conflicts or disputes among ecosystem scale projects or programs, the board may convene the agency managers in an attempt to reconcile the conflicts with the objective of advancing the protection and recovery of Puget Sound.”⁶⁶

⁶¹ See Appendix for specific information on regional program membership and organization.

⁶² GLRC includes tribal representation.

⁶³ COPA, §§ 35600, 35605, 35610.

⁶⁴ PSP, SB 5372 § 4.

⁶⁵ PSP, SB 5372 § 7.

⁶⁶ PSP, SB 5372 § 8(6)(c).

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- The permanent PSP Council provides a forum for addressing and resolving conflicts.⁶⁷
- **Majority** required for decision-making
 - For boundary waters disputes, a majority of the IJC commissioners have the authority to render a decision. If the decision is evenly divided, the Commissioners make separate reports to their own Government, and the Parties shall seek to reach a decision.⁶⁸
- **Prioritizing** actions or uses
 - The Boundary Waters Treaty defines the relative importance of different uses, setting parameters for how the IJC may determine which use should trump another use should a conflict arise. While it does not include ecosystem health as a priority use, the Boundary Waters Treaty provides that the following water uses take priority (in order of preference) over all other uses: (1) uses for domestic and sanitary purposes; (2) uses for navigation, including the service of canals for the purposes of navigation; and (3) uses for power and for irrigation purposes.⁶⁹
 - The permanent PSP is to develop an action agenda that prioritizes actions.⁷⁰
- **Consensus** required for plan development
- **Collaborating without consensus**
 - The GLRC offers an example of a plan based on collaboration but not consensus. The GLRC Strategy makes clear that the document “should not be construed as an endorsement or approval by the GLRC members of each and every Strategy Team recommendation.”

Obstacles and Opportunities Target Questions:

1. *How are decisions made – by consensus? By majority? Is there a preferred method for decision-making?*
2. *If by consensus, how do you achieve it? Are there problems with playing to the least common denominator?*
3. *What other systems of conflict resolution are or should be applied in EBM programs?*

4. Harmonization

One of the perceived advantages of coordinated and cooperative management is that it leads to harmonized institutional activities that reduce redundant programs and create more efficient management systems. Regional organization can enable harmonization of laws and regulations to allow for consistent regulation across regions. Also, harmonization of standards and approaches to monitoring and data collection can facilitate regional approaches to ecosystem management.⁷¹

Case study regions harmonize management by:

- Harmonizing **agency activities** with regional organization (permanent PSP)
 - Washington law SB 5372 calls for the development of an action agenda that incorporates goals from other local, state and federal plans related to water quality and quantity, habitat restoration, recovery plans, and other relevant plans. The law also calls for the permanent PSP to build upon the existing watershed programs in the development of its action agenda.
- Taking measures to harmonize **laws and regulations** among governing bodies in the region (COPC, CBP, permanent PSP)
 - COPC is to identify and recommend to the state legislature changes needed in the law to conserve and protect the ocean ecosystem. It is also tasked with identifying changes needed in federal laws to protect and conserve ocean resources.⁷²
 - The Chesapeake Bay Commission is a partner of the CBP that coordinates regional policy and legislation. Its members include 15 state legislators and state cabinet members from the Chesapeake Bay states.

⁶⁷ PSP, SB 5372 § 17(4).

⁶⁸ Boundary Waters Treaty, Article VIII.

⁶⁹ Boundary Waters Treaty, Article VIII.

⁷⁰ PSP, SB 5372 § 13(1)(f).

⁷¹ See *infra* at Part V, Section B(iii) Understand the Science to Make Informed Decisions.

⁷² COPA, §§ 35615 (a)(3), (b)(1).

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- Harmonizing **scientific activities** (see Report Part V, Section B(iii))
- **Identifying lead agencies** to undertake plan implementation (COPC, GOMA, permanent PSP)

Obstacles and Opportunities Target Questions:

1. *Does strategic planning lead to harmonization of approaches in practice?*
2. *What are the disadvantages of programmatic redundancy?*
3. *Are there advantages? - e.g., resilience?*

5. Public participation

Public participation can include a range of activities, from dispersal of information to inclusion of members of the public in decision-making processes. This report categorizes these activities in the following manner:

- informing the public
- consulting the public
- actively engaging the public⁷³

The regional programs vary in the level of public participation. **Information sharing** occurs in all programs, and includes the following types of activities:

- publication of regional strategies (COPC, CBP, GLC, GOMA, GOMC, IJC, PSP)
- publication of implementation plans (COPC, GOMA)
- web pages describing regional program (all)
- databases containing regional information (CBP, GLC, GOMA, GOMC)
- plans or programs that include outreach activities such as education programs and information campaigns (COPC, CBP, GLRC, GLC, GOMA, PSP)

Several programs **consult** with the public when making some or all decisions. These activities include:

- notice-and-comment periods for program development or decision-making (COPC, IJC)
- public stakeholder meetings during the strategic planning phase or decision-making processes (COPC, GOMC, GOMA, IJC)
- web dialogue (IJC)

Several programs **actively engage** the public through direct participation in working groups, committees, and as members of the leading regional organizations' boards. These activities include:

- working group participation (CBP, GLC, IJC, GOMC)
- regional organization membership (PSP, SLOSEA, GOMC)

Obstacles and Opportunities Target Questions:

1. *What advantages are there for active participation versus less direct forms of participation?*
2. *What are the advantages and disadvantages of different participatory processes?*
3. *Does public participation lead to a healthier ecosystem? Greater support for conservation and sustainability programs?*

⁷³ See Jessica Troell et al, *Handbook on Public Participation in International Waters Management* (forthcoming).

6. Coordination and cooperation among regional organizations

In some regions (e.g., Great Lakes, New England, and Gulf of Mexico), multiple regional organizations exist or are being developed, all of which may strive to take an EBM approach to management. This raises the issue of how regional programs cooperate with other programs operating in the same region that may have an overlapping mandate. It also raises the potential for programmatic redundancy.

The Great Lakes region provides the best example of multiple regional programs acting with similar and potentially overlapping functions (Box 3). In the Great Lakes, programs such as the Great Lakes Commission (GLC) and the Great Lakes Regional Collaboration (GLRC) interact through direct participation in other programs. For example, the GL Governors Council is an observer of the GLC and a member of the GLRC Executive Committee. Also, many institutions participate in multiple regional programs. For example, the EPA participates on several IJC boards (e.g., the Great Lakes Science Advisory Board), is on the GLFC Board of Technical Experts and the Great Lakes Fish Habitat Conservation Committee, is a GLC observer, and is a member of the GLRC Interagency Task Force. In some instances the same individual participates in more than one regional program, providing a mechanism to link regional programs. For example, The Director of NOAA's Great Lakes Environmental Research Laboratory is an observer for the GLC and a member of the IJC Council of Great Lakes Research Managers.

Obstacles and Opportunities Target Questions:

- 1. What challenges exist when multiple regional bodies exist in the same region? Are there advantages to multiple regional bodies in a single region? If so, what are they?*
- 2. What additional mechanisms are used to coordinate and cooperate among institutions?*
- 3. Are there common components of coordination and cooperation laws that should be applied to EBM governance?*

iii. Understand the Science to Make Informed Decisions

1. Science-based

A fundamental principle of EBM is that resource management is based on a holistic understanding of the ecosystem. Several published EBM definitions have science-based management components, including:

- understanding ecosystem complexity and interconnectedness and recognizing the dynamic nature of ecosystems (including humans);
- developing sound ecological models and understanding and using science-based and technological tools;
- developing multiple indicators to measure the status of ecosystem function and measuring ecosystem integrity

The regional programs recognize the importance of science-based approaches and the challenges facing successful implementation. For example, in its Great Lakes strategy, the GLRC states:

Current challenges facing observing and monitoring include: incomplete inventories of federal, state/provincial and municipal observation and monitoring activities; insufficient spatial density of basic observations across the system; incomplete coverage over varying time scales (real-time to historic) and over space (site-specific, watershed, and region-wide); a reluctance to adopt uniform or fully compatible monitoring protocols; and

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an inability to establish long-term financial commitments, all resulting in poor availability of information on conditions and trends to managers and other stakeholders.⁷⁴

Science-based management is a core approach in many of the case study organizations. For example, COPA states that “[i]t is the state’s policy to incorporate ecosystem perspectives into the management of coastal and ocean resources, using sound science, with a priority of protecting, conserving, and restoring coastal and ocean ecosystems, rather than managing on a single species or single resource basis.” Several of the objectives in the GOMA Action Plan relate to advancing better understanding of the ecosystem through new research and better dissemination of existing information.

Examples of science-based principles and approaches in the case study regions include the following:

- **Complexity, interconnectedness and dynamic nature** of ecosystem:
 - COPC (COPA): “The ocean ecosystem is inextricably linked to activities on land”
 - CBP (Chesapeake 2000 at 2): “We recognize the interconnectedness of the Bay’s living resources and the importance of protecting the entire natural system. Therefore, we commit to identify the essential elements of habitat and environmental quality necessary to support the living resources of the Bay.”
- **Science-based tools** including sound models:
 - COPC (COPA): “A goal of all state actions shall be to improve monitoring and data gathering, and advance scientific understanding. . . .”
 - IJC (Great Lakes Water Quality Agreement at Article II. Purpose): “the Parties agree to make a maximum effort to develop programs, practices and technology necessary for a better understanding of the Great Lakes Basin Ecosystem.”
 - GOMA: “Improve the current HAB [harmful algal bloom] Forecasting System. . . .”
 - GOMA: “Produce a prototype Web portal to provide public access to and delivery of current and historic local, state and federal Gulf of Mexico habitat data. . . .”
- **Multiple indicators** to assess ecosystem function and integrity:
 - CBP (Chesapeake 2000 at 2): “We will also undertake efforts to determine how future conditions and changes in the chemical, physical and biological attributes of the Bay will affect living resources over time.”

In addition to scientific goals and objectives, several of the regional case study programs have scientific advisory boards and committees. Examples include:

- CBP created the Scientific and Technical Advisory Committee to provide guidance to the CBP on measures to restore and protect the Chesapeake Bay. The Committee has created a list of recommendations based on the Chesapeake 2000 Agreement. (*Scientific and Technical Needs for Fulfilling Chesapeake 2000 Goals*).
- Created by the Great Lakes Water Quality Agreement, the Great Lakes Science Advisory Board that is responsible for providing scientific advice to the IJC related to Great Lakes water quality. It includes advisors with natural, physical, and social science expertise.
- The Washington law SB5372, Sections 9-10, creates a nine-member Puget Sound science panel that prepares and updates action agendas, develops a strategic ecosystem science program, identifies gaps and research priorities, develops implementation strategies, and develops ecosystem health indicators as well as environmental benchmarks to achieve action agenda goals.

In addition to specific scientific data needs (e.g., fish population data, climate change predictions, habitat mapping), regional plans include the following types of actions and activities to achieve science-based management:

- Coordinated **monitoring programs** (including contributing to or working with the Integrated Ocean Observing Systems)
 - CBP plans to develop a GIS system to track preservation of resource lands.

⁷⁴ GLRC, *GLRC Strategy*, *supra* note 59 at 53.

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- GLRC Strategy calls for implementation of the Great Lakes Observing System.
- GOMC activities include contaminant and habitat monitoring (e.g., Gulfwatch).
- PSP plan recommends comprehensive monitoring linked to adaptive management.
- **Development of consistent standards and indicators of ecosystem health**
 - GLRC Strategy recommends development and implementation of science based indicators including State of the Lake Ecosystem Conference (SOLEC) indicators.
 - GLRC recommends standardizing data management protocols.
 - GOMC calls for lawmakers to enact consistent standards and guidelines related to contaminant releases.
 - GOMA plans include standardizing water quality data collection and analysis; standardizing and integrating habitat data; and increasing regional coordination in the development of nutrient criteria.
 - Washington law SB5372, Section 10, calls upon the Puget Sound science panel to identify ecosystem health indicators.
- **Increased funding for ecosystem-based research**
 - GOMC plans to increase funding for restoration by leveraging existing funds and encouraging support from local, NGO, and industry sources.
- **Mechanisms to deliver scientific information to managers and the public**
 - CBP has several goals that relate to providing information and assistance to local governments to enable implementation of plans
 - GLRC meshes information management infrastructure with existing infrastructure
 - PSP recommends coordinated scientific input into policy decisions and science-policy interactions
 - Washington law SB5372, Section 11(4), requires the executive director of the permanent PSP to provide a Puget Sound science update to the Washington academy of sciences, the governor, and the appropriate legislative committees.
- **Mechanisms for information-sharing across scientific disciplines and institutions**
 - GLRC recommends creating a communications working group
 - GOMA proposes making habitat data available through a single regional data management portal
 - Washington law SB5372, Section 11(1)(c), mandates the development of a science program that may include recommendations for data collection and management in such a way as to enable easy access and use by participating agencies and the public.
- **Development of new tools to enable EBM**
 - CBP plans to develop analytical tools to allow local government and communities to conduct watershed-based assessments
 - GOMC has the goal of developing ecosystem-based tools that managers need

2. Adopt the precautionary approach

The precautionary approach can be defined to mean that “[w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”⁷⁵ It can also shift the burden of proof from those seeking to protect the environment to show potential harm of an activity to those seeking to undertake potentially harmful activities to demonstrate that the activity is safe for the environment.

One of the Gulf of Maine Council’s Guiding Principles is “environmental protection through precaution.” The California Ocean Protection Council also includes the precautionary principle in its Guiding Principles stating that “where the possibility of serious harm exists, lack of scientific certainty should not preclude action to prevent the harm.”⁷⁶ Under its Living Resource Protection and Restoration goal, the CBP states that “[i]n protecting commercially valuable species, we will manage harvest levels with precaution to maintain their health and stability and protect the ecosystem as a whole.” Action items include development of new management plans based on ecosystem approaches.

Obstacles and Opportunities Target Questions:

1. *How do regional programs implement the precautionary approach?*
2. *For programs that do not adopt the precautionary approach, is there a reason why?*

⁷⁵ Rio Declaration, Principle 15.

⁷⁶ COPC, *supra* note 19.

iv. Define Success and Be Accountable

1. Sustainable and measurable goals and objectives

All case study programs create regional plans or strategic documents, often through multi-stakeholder processes, that identify key objectives and activities aimed at overcoming ecosystem challenges. Several regions have developed implementation plans either separately or as part of the regional plan. For each key issue category, the plans (and associated implementation plans) include some or all of the following components:

- Description of the **ecosystem impact** driving the need for action
- One to several **overarching objectives** for each major category of issue
- **Specific action items** that will be undertaken in a specified period of time for each overarching objective, including short-term goals and long-term actions
- **Rationale** for actions
- **Cost** estimate for actions
- List of lead and/or cooperating **institutions** to implement each action item
- List of **laws, policies, and agency programs** related to specific action items or objectives

Regional programs categorize goals, objectives and activities by target issues (Table 1). Within each target issue, regional program plans identify key drivers, list program objectives, and describe specific actions or sub-objectives. A review of the regional program plans demonstrates that by and large, human-caused impacts or threats drive regional program objectives and actions (Table 1A, Appendix). For example, human-induced habitat degradation and loss of biodiversity is a common driver (COPC, GLRC, GOMC, and GOMA). Pollution from human activities leading to degradation of water quality also is described as a driver for action in most regional plans (COPC, GLRC, GOMC, GOMA, and PSP⁷⁷). While target issues vary among regions, and some issues are location-specific, such as enabling human access in Morro Bay, and increasing community resilience to natural hazards in the Gulf of Mexico, many overarching objectives are common to all or most regional programs. These include the following:

- Restore, protect, and enhance fish/shellfish important to commercial and/or recreational fishing (COPA, CBP, PSP)
- Preserve, protect, restore, and improve habitats and species (COPA, CBP, GLRC, GOMC, GOMA, PSP)
- Achieve, improve and maintain water quality including addressing issues related to toxic pollutants, sewerage, and nutrients (COPA, CBP, GLRC, GOMC, GOMA, PSP)
- Enhance governance capacity and performance (COPA, SLOSEA)
- Improve understanding of ocean and coastal ecosystems including research, mapping, and monitoring (COPA, GLRC, GOMC, GOMA, SLOSEA)
- Improve public awareness and promote stewardship (COPA, CBP, GOMC, GOMA, SLOSEA, PSP)
- Prevent, eradicate, and control aquatic invasive species (GLRC, GOMC, CBP)

Additional objectives include:

- Achieve sound land use practices and sustainable development (CBP, GLRC)
- Balance economic, social, cultural, and ecosystem needs (GLRC, SLOSEA)

⁷⁷ The original PSP report, *Sound Health, Sound Future: Protecting and Restoring Puget Sound*, is used in this section. However, under Washington law SB 5372, §13(3), the permanent PSP is using the *2007-2009 Puget Sound Conservation and Recovery Plan* to guide their management until a new action agenda is created.

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California Ocean Protection Council	Governance; Research and Monitoring; Ocean and Coastal Water Quality; Physical Processes and Habitat; Ocean and Coastal Ecosystems; Education and Outreach
Chesapeake Bay Program	Living Resources; Habitat; Water Quality; Land Use; Community
Great Lakes Regional Collaboration	Aquatic Invasive Species; Habitat/Species; Coastal Health; Areas of Concern/Sediment; Nonpoint Source; Toxic Pollutants; Indicators and Information; Sustainable Development
Gulf of Maine Council	Habitat; Human Health and Ecosystem; Maritime Activities
Gulf of Mexico Alliance	Water Quality; Wetland Restoration; Environmental Education; Characterization of Gulf Habitats; Reduction of Nutrient Inputs
Puget Sound Partnership	Protect Puget Sound Habitat; Restore Damaged Forests, Rivers, Shorelines, and Marine Waters; Accelerate Control and Cleanup of Toxic Pollution; Significantly Reduce Pollution from Human and Animal Wastes and Other Sources; Significantly Reduce Polluted Stormwater Runoff; Ensure Adequate Water for People, Fish and Wildlife, and the Environment; Protect Ecosystem Biodiversity and Recover Imperiled Species; Build and Support our Human Capacity to Protect and Sustain the Environment
San Luis Obispo Science and Ecosystem Alliance	Water Quality; Habitat; Bioindicators; Human Access; Economic Indicators; Science and Management Linkages

2. Accountability

One of the greatest challenges for EBM is getting from planning to implementation. Creating a system that ensures accountability is one mechanism for achieving implementation. Through examination of the seven case-study regions, ELI identified mechanisms that create accountability. These include:

- **Performance measures and benchmarks** as a way to gauge progress (CBP, GOMC, permanent PSP)
- **Reporting achievements** (CBP, permanent PSP)
 - Those receiving PSP funds must report biennially to the council on progress.
 - The CBP is creating annual reports of yearly goals and progress made.
- **Reporting non-compliance** (permanent PSP)
 - Under the Washington law SB5372, Section 17, the PSP is to notify an agency if it is in substantial non-compliance with an action agenda and, if no agreement is reached on corrective action, hold a public meeting to present its findings.
- **Financial incentives and disincentives** (permanent PSP)
 - Washington law SB 5372, Section 16, states that “[t]he legislature intends that fiscal incentives and disincentives be used as accountability measures designed to achieve consistency with the action agenda.”
 - Under Washington law SB 5372, Section 15, if entities that have received PSP funding do not use the funds in a manner consistent with the action plan, the PSP may suspend funds or put conditions on future funding.
 - Under Washington law SB 5372, Section 17, if substantial non-compliance continues after the public meeting, the PSP can recommend to the governor that the entity be ineligible for state financial assistance until the entity comes into compliance.
- **Assistance to remedy inconsistencies** and non-compliance (permanent PSP)

The ultimate goal of ecosystem-based management is to have a healthy ecosystem. However, it is no small task to determine if EBM approaches are successful in achieving a healthy ecosystem, because society and ecosystems are not static. As time moves forward, ecosystems change naturally and human populations and activities may expand, contract, or change in ways that impact ecosystems. The Chesapeake Bay Program is an example of this. It has received considerable criticism for failing to achieve several of the measures put in place to restore the ecosystem, begging the question of whether

the CBP is capable of being an effective governance system.⁷⁸ However, the Chesapeake Bay population has grown by 28 percent from 1970 to 1997⁷⁹ (800,000 new residents were added from 2000 – 2005),⁸⁰ which could equally mean that the Program has done well just to keep up with the growth. In other instances, the issue of temporal mismatch may make it difficult to assess success. Governance changes today may take years or decades before seeing positive ecological impacts.

v. *Be Adaptive*

Adaptive management is an iterative system of management that includes testing assumptions, monitoring and learning from the results, and adapting management responses based on what has been learned.⁸¹ Salafsky et al. (2002) list the following steps in this process: (A) design an explicit system model, (B) develop a management plan, (C) develop a monitoring plan to test assumptions, (D) implement plans, (E) analyze data and communicate results, and (F) use results to adapt and learn.

Examination of the seven case-study regions indicates that several programs are explicitly striving for adaptive management. For example, the Chesapeake Bay Program's Strategic Implementation Plan is an iterative three-step management framework. The areas of focus for implementation derive from the Chesapeake 2000 Agreement (Step A). The steps are as follows:

- (1) annual target strategy (including a strategic approach, actions, schedule, responsibility, funding resources, and measurement) (Step B);
- (2) implementation (Step D); and
- (3) annual monitoring (including health and restoration reports) (Steps C, E).

Annual monitoring and assessment is used to determine program effectiveness and help the CBP revise priorities and activities as needed (Step F).⁸²

The Gulf of Maine Council includes some of these components in its program. It states its clear and common purpose in its four Guiding Principles (see Appendix B). Based on those principles, it has developed action plans (Step B), which list goals, outcomes, and activities. The recently released Action Plan 2007 – 2012 communicates the results of the previous plan goals in its section, Accomplishments from 2001 – 2006 (Step E). The Gulf of Maine Council is working to develop performance measures and assessment procedures to measure progress towards the action items in its Action Plan 2007 – 2012 (Step C).

VI. EBM OPPORTUNITIES UNDER EXISTING LAWS AND PROGRAMS

Those seeking to implement EBM often envision the need for new laws and regulations to provide existing institutions with the mandates necessary to implement EBM. Even in the absence of new EBM

⁷⁸ See, e.g., David A. Fahrenthold, *A Revitalized Chesapeake May Be Decades Away: EPA Official Warns of Slow Progress Toward 2010 Goals*, Washington Post A01 (Jan. 5, 2007).

⁷⁹ Population Trends, at <http://www.chesapeakebay.net/info/pop.cfm>.

⁸⁰ Fahrenthold, *supra* note 78.

⁸¹ Nick Salafsky, Richard Margoluis, & Kent Redford, *Adaptive Management: A Tool for Conservation Practitioners* (2002), available at http://fosonline.org/resources/Publications/AdapManHTML/Adman_1.html.

⁸² CBP, *Chesapeake Bay Program Strategic Implementation Plan*, at <http://www.chesapeakebay.net/strategicimplementation.htm>.

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laws, however, existing environmental laws and programs may enable the implementation of EBM concepts. This section examines selected federal laws that offer opportunities for EBM implementation, including the Coastal Zone Management Act (CZMA), the essential fish habitat (EFH) provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the total maximum daily load (TMDL) provisions of the Clean Water Act (CWA), and the National Estuary Program.⁸³ Appendix C includes additional environmental laws and programs that may provide lessons for regional organization. Subsequent phases of this project will examine implementation of the CZMA, MSA, CWA, and the National Estuary Program established under the CWA in order to understand existing obstacles to and potential opportunities to using these laws to achieve EBM objectives.

ELI recognizes that the programs created under these federal laws, as currently written and implemented, fall short of the EBM vision, and cannot achieve all aspects of EBM as the laws are currently written. Despite that, this exercise serves two purposes. First, even in the absence of a regional EBM program or a new overarching EBM mandate, existing institutions may be able to take steps towards EBM. The goal of this assessment is to help such institutions achieve as many of the EBM goals as possible to reach a healthy, sustainable ocean and coastal environment. Second, for those institutions that are already part of a regional organization seeking to achieve EBM, institutional actions must be taken within the context of existing legal obligations. This assessment is geared to help institutions identify existing authority to achieve EBM goals to enable EBM implementation.

A. Coastal Zone Management Act (CZMA)

The Coastal Zone Management Act (CZMA) is a federal law that provides monetary incentives for states to set up coastal management programs that consider a multitude of uses. The CZMA calls upon state and federal agencies to take actions to properly manage the coastal environment, many of which align with the actions to achieve ecosystem goals described in the previous section. The following section matches EBM components to provisions of the CZMA as a first step in identifying how this law could be used to achieve EBM. A critical consideration not addressed in this report (but that will be addressed in subsequent phases of the project) is how best to implement the provisions of the CZMA in order to achieve EBM.

The goals of the CZMA align with the EBM goals of sustainability and conservation. CZMA Section 302(b) findings include that “[t]he coastal zone is . . . of immediate and potential value to the present and *future* well-being of the Nation” (emphasis added). Section 303 declares the national policy to be “to preserve, protect, develop, and where possible, to restore or enhance” coastal resources, and includes “protection of natural resources.”

Recognize humans as part of ecosystem, integrate values, and balance needs. The CZMA describes the value of the coastal zone as it relates to the natural, commercial, and recreational resources in its findings and in its purpose (§§ 302, 303). The CZMA calls for both “protection of natural resources” and “management of coastal development” (§303).

Reconcile spatial scales. The CZMA provides some opportunity to reconcile spatial scales. The coastal zone is defined to include coastal waters and the adjacent shorelands that are “strongly influenced by each other and in proximity to the shore” (§304). In developing plans, states have the opportunity to more explicitly define their coastal zones. The CZMA allows specific areas to be designated for preservation or restoration (§306). As the CZMA is currently used and envisioned, it is a state program, begging the question of how to reconcile this geographic restriction when ecosystems extend beyond state boundaries. However, the CZMA accounts for interstate management under §306(d)(3)(A), which requires states to develop management programs that are coordinated with relevant local, area-wide, and interstate plans. With the exception of Texas and Florida, whose waters extend to nine miles, state waters extend to three miles from the shoreline, limiting the seaward range of CZM programs. However, federal

⁸³ See Appendix C for a list of additional federal laws that have EBM components.

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activities that affect the coastal zone must be carried out in a manner consistent with the state CZM program (§307), which has limited federal activities in the waters beyond state waters in the past.⁸⁴

Cooperative management. Cooperative management is a fundamental component of the CZMA. As described above, states are to coordinate their programs with applicable local, area-wide, and interstate plans (§306(d)(3)). The CZMA calls upon state CZM programs to develop a Coastal Nonpoint Pollution Control Program, which should include “mechanisms to improve coordination among State agencies and between State and local officials responsible for land use programs and permitting, water quality permitting and enforcement, habitat protection, and public health and safety, through the use of joint project review, memoranda of agreement, or other mechanisms.”

Not only must the state take a cooperative approach, the CZMA requires federal agencies to cooperate with states regarding coastal zone management. It calls for federal agencies to consult, cooperate, and coordinate activities as they relate to the federal agencies’ duties under the CZMA (§307). The CZMA requires federal activities that affect the coastal zone to be carried out in a manner consistent with the state CZM program (§307).

The CZMA recognizes competing ocean needs in its findings: “In light of competing demands and the urgent need to protect and to give high priority to natural systems in the coastal zone, present state and local institutional arrangements for planning and regulating land and water uses in such areas are inadequate” (§302(h)). The CZMA calls for coastal zone management to include mechanisms for resolving conflicts among competing users (§306(d)(10)), and for mediation of disputes arising between a federal agency and a coastal state, which are to include public hearings in the area of concern (§307(h)).

Participatory governance. The CZMA provides several avenues of public participation, including public hearings during the development of the management program (§306(d)(4)), continued public participation in the management program for permitting processes, consistency determinations, and similar processes (§306(d)(9)).

Standards and accountability. The CZMA requires standards and accountability in some circumstances. Under §306(d)(13), the management program must designate coastal resources of national significance and provide for “specific and enforceable standards to protect such resources.” Under §306(d)(11), the management program can manage land uses and water uses through the “establishment of criteria and standards for local implementation, subject to administrative review and enforcement.”

Obstacles and Opportunities Target Questions:

1. *Are there CZMA programs that are particularly effective at achieving EBM objectives? If so, what elements do they use to achieve success?*
2. *What existing authority could be used to implement EBM that is not currently being used?*
3. *If the CZMA were to become an EBM framework law, what legal and institutional changes are needed?*

B. Magnuson-Stevens Fishery Conservation and Management Act (MSA) Essential Fish Habitat Provisions

In some instances, a central issue or species may drive regional cooperative efforts.⁸⁵ For example, the need to effectively conserve salmon and orcas was a driver for the PSP. In the Gulf of Mexico, regional

⁸⁴ See *California v. Norton*, 311 F.3d 1162, 1165 (9th Cir. 2002).

⁸⁵ EBM Working Group Meeting Summary (2007).

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issues such as harmful algal blooms and the annual dead zone drive regional collaborations that could later be broadened to address additional regional challenges. While management under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) is necessarily fisheries-based, it could be used in some situations to achieve place-based ecosystem management. It should be noted, however, that the current fisheries management system is often criticized for its single-species focus and for its failure to achieve sustainable populations for many fisheries.

The National Oceanic and Atmospheric Administration (NOAA) manages federal fisheries pursuant to the MSA. Under the MSA, federal fisheries management is divided among eight regions. Regional Fishery Management Councils (Councils) develop fishery management plans (FMPs) for the federal fisheries in their management areas. FMPs are developed pursuant to ten National Standards that include conservation measures (e.g., prevent overfishing, minimize bycatch) and human use goals (e.g., consideration of communities and efficiency in use of fishery resources).⁸⁶ According to the National Standards, FMPs are to achieve optimum yield—an amount equivalent to the maximum sustainable yield reduced according to relevant economic, social or ecological factors.⁸⁷ In the recent reauthorization of the MSA, language was added enabling FMPs to “include management measures in the plan to conserve target and non-target species and habitats, considering the variety of ecological factors affecting fishery populations.”⁸⁸

One of the requirements of the FMPs is to “describe and identify *essential fish habitat* for the fishery . . . , minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat” (emphasis added).⁸⁹ Essential fish habitat is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.”⁹⁰ While limited in scope to fisheries, the essential fish habitat provisions could provide some opportunity to conduct place-based EBM in critical fishery areas.

Recognize humans as part of ecosystem, integrate values and balance needs. At its core the MSA is a law to manage human use of the marine environment. The ten National Standards include values that relate both to human uses and conservation needs.

Reconcile spatial scales (temporal, geographic, political). The MSA creates a regional management system through the creation of eight regional councils that are tasked with managing fisheries in their regions.⁹¹ Regional Councils could take advantage of the essential fish habitat provisions, designate essential fish habitat, and create the possibility of place-based management in critical areas.

Science-based management. National Standard 2 calls for use of “best science available” in managing federal fisheries. Each Council creates a scientific and statistical committee to assess statistical, biological, economic, and social information.⁹² The MSA requires the development of a strategic plan for research that includes “biological research concerning the abundance and life history parameters of stocks of fish, the interdependence of fisheries or stocks of fish, the identification of essential fish habitat, the impact of pollution on fish populations, the impact of wetland and estuarine degradation, and other factors affecting the abundance and availability of fish.” The strategic plan for research, therefore, has the capacity to take a holistic approach to examining the environment in which federally-managed fisheries are managed.

Cooperative management. The essential fish habitat provisions may enable NOAA-led cooperative management of marine habitats essential for the spawning, breeding, feeding, and growth of managed species. While these areas are designated based on the management of one or more commercially

⁸⁶ MSA, § 301(a); 16 U.S.C. § 1851(a).

⁸⁷ MSA, §§ 301(a); 3(33); 16 U.S.C. §§ 1851(a); 1802(33).

⁸⁸ MSA, § 303(b)(12); 16 U.S.C. § 1853(b)(12).

⁸⁹ MSA, § 303(a)(7); 16 U.S.C. § 1853(a)(7).

⁹⁰ MSA § 3(10); 16 U.S.C. § 1802(10).

⁹¹ MSA, § 302(a); 16 U.S.C. § 1852(a).

⁹² MSA, § 302(g); 16 U.S.C. § 1852(g).

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important federal fish stocks, the management of the habitats could also be ecosystem-based in approach.

One of the purposes of the MSA is “to promote the protection of essential fish habitat in the review of projects conducted under Federal permits, licenses, or other authorities that affect or have the potential to affect such habitat.”⁹³ NOAA is to coordinate with other federal agencies regarding conservation and enhancement of essential fish habitat.⁹⁴ Also, the MSA sets up a consulting requirement—federal agencies must “consult with the Secretary with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat identified under this Act.”⁹⁵ Regional councils are to comment on and make recommendations regarding the proposed federal action, and if the proposed action will adversely affect essential fish habitat the Secretary is to recommend measures that the consulting agency can take to conserve the habitat.

Participatory governance. Council membership includes fishery stakeholders. Regional Councils are comprised of voting and nonvoting members. Voting members include state officials, regional NMFS directors, representatives from commercial and recreational fisheries, and in some cases tribal and environmental representatives.⁹⁶ Nonvoting members include regional directors of the U.S. Fish and Wildlife Service, regional Coast Guard commanders, the Executive Director of the Marine Fisheries Commission, and a Department of State representative.⁹⁷ The scientific and statistical committees may include members that are federal or state employees, academics or independent experts.⁹⁸ Regional Councils must create fishing industry advisory committees.⁹⁹ Regional Councils also have the authority to establish other advisory panels are necessary to carry out the purpose of the MSA.¹⁰⁰

The MSA provides opportunities for public input in developing FMPs and research plans. Councils are to conduct public hearings when developing and amending plans.¹⁰¹ Draft research plans are to be published in the Federal Register to allow public review and comment.¹⁰²

Standards and accountability. The Secretary is tasked with establishing guidelines for the identification and establishment of essential fish habitat.¹⁰³ FMPs are to minimize adverse effects caused by fishing and are to identify other actions to encourage conservation and enhancement of such habitat. One of the major challenges for NOAA has been to establish essential fish habitat that does not include the entire range of a species, so as to make the designation meaningless.

Adaptive management. Councils are to respond to changing information and conditions based on the health of the fishery. If evidence demonstrates that fisheries are overfished, the Councils must respond by amending the FMPs to stop overfishing and rebuild the stocks.¹⁰⁴ The Secretary is required to set a schedule for FMP amendments that identify essential fish habitat and update the identification based on new information.¹⁰⁵

⁹³ MSA, § 2(b)(7); 16 U.S.C. § 1801(b)(7).

⁹⁴ MSA, § 305(b)(1); § 16 U.S.C. 1855(b)(1).

⁹⁵ MSA, § 305(b)(2); § 16 U.S.C. 1855(b)(2).

⁹⁶ MSA, § 302(b); 16 U.S.C. § 1852(b).

⁹⁷ MSA, § 302(c); 16 U.S.C. § 1852(c).

⁹⁸ MSA, § 302(g); 16 U.S.C. § 1852(g).

⁹⁹ *Id.*

¹⁰⁰ *Id.*

¹⁰¹ MSA, § 302(h); 16 U.S.C. § 1852(h).

¹⁰² MSA, § 404(d); 16 U.S.C. § 1881c(d).

¹⁰³ MSA, § 305(b); 16 U.S.C. § 1855(b).

¹⁰⁴ [cite]

¹⁰⁵ MSA, § 305(b); 16 U.S.C. § 1855(b).

Obstacles and Opportunities Target Questions:

1. *Is essential fish habitat designated in any of the existing EBM program regions? If so, how does the designation and management relate to the regional organizations?*
2. *How do NOAA-Fisheries and the Regional Councils implement essential fish habitat provisions?*
3. *In practice, does the federal consulting requirement lead to alternative actions that better protect the resource?*

C. Clean Water Act TMDL Program

The goal of the Clean Water Act (CWA) is “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.”¹⁰⁶ Under the CWA, states create water quality standards for all state waters and assess on a recurring basis whether or not the designated water quality is attained.¹⁰⁷ If water bodies or segments are impaired by pollutants, states must establish the total maximum daily load (TMDL) of pollutants necessary to achieve the applicable water quality standards.¹⁰⁸ States implement this provision by creating TMDL reports that include the following components:

- Description of the geographic area
- Applicable water quality standards
- Assessment of the problem
- Consideration of seasonal variations
- Point sources and non-point sources
- Pollutant loading capacity and allocations with a margin of safety

TMDL programs may provide an opportunity achieve EBM objectives through an existing management system. Granted, state TMDL programs focus on impairments based on pollutants and not other sources of environmental degradation, such as habitat damage from physical activities and overfishing; however, the TMDL process should recognize these problems as states are required to assess the biological, physical, and chemical integrity of the water bodies.

Science-based management. The CWA creates a science-based assessment and planning process, aligning with the science-based management components of EBM.

Recognize humans as part of ecosystem, integrate values and balance needs. States designate water quality standards based on human uses including fisheries, recreation, and industry. Some states are developing water quality standards—known as total aquatic life uses—based on the health of biological assemblages.¹⁰⁹

Reconcile spatial scales. Traditionally, water bodies are divided into segments, and each segment is assessed individually. Newer approaches to water quality management include watershed management and the creation of watershed TMDLs. TMDLs are created for bays and estuaries.

Cooperative management. The CWA does not explicitly require inter-agency cooperation in implementing the TMDL program. However, states can avoid TMDL development when other programs effectively address the pollutant. This could provide a mechanism to drive inter-agency coordination. Oregon’s watershed management program could be a model to explore. See, for example, the Nestucca Bay TMDL and Water Quality Management Plan (WQMP).¹¹⁰ It includes a WQMP that:

¹⁰⁶ Clean Water Act [hereinafter CWA], 33 U.S.C. §1251(a).

¹⁰⁷ CWA, § 305; 33 U.S.C. § 1315.

¹⁰⁸ CWA, § 303(d); 33 U.S.C. § 1313.

¹⁰⁹ For example, Ohio and Maine.

¹¹⁰ Oregon Department of Environmental Quality, Nestucca Bay Total Maximum Daily Load (TMDL) (2002), available at <http://www.epa.gov/waters/tmdl/docs/NestuccaBayTMDL-WQMP.pdf>.

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explains the roles of various land management agencies, federal, state, and local governments, as well as private landowners in implementing the actions necessary to meet the allocations in the TMDLs. It also includes directly or by reference the statutes, rules, ordinances, local plans, and all other known mechanisms for implementation. The WQMP for the Nestucca Bay Watershed focuses specifically on:

- State Forest Lands (Forest Practices Act);
- Federal Forest Lands (Northwest Forest Plan);
- Private Agricultural Lands (North Coast Basin Agricultural Water Quality Management Area Plan – SB1010);
- County Ordinances;
- The Nestucca/Neskowin Watershed Council Action Plan
- Regional stormwater controls, including the option of a storm water permit for Small Cities.
- Tillamook National Estuary Program – Portions that apply to Tillamook County.¹¹¹

Obstacles and Opportunities Target Questions:

1. *Could the TMDL program be linked to federal waters?*
2. *Does the CWA provide the authority to create TMDLs for the ocean?*
3. *How do TMDL programs link to existing EBM programs?*

D. National Estuary Program

The National Estuary Program (NEP) was created in 1987 with the addition of Section 320 to the Clean Water Act. It allows the Governor of any state to nominate to the EPA Administrator an estuary as one of national significance to the EPA Administrator.¹¹² To date, 28 estuaries have been designated. As part of the Program, NEPs develop comprehensive conservation and management plans to restore and maintain the chemical, physical, and biological integrity of the estuary.¹¹³ The plan is implemented through grant-making to state and regional agencies and public or non-profit institutions or individuals.¹¹⁴ NEPs are funded by annual appropriations from Congress as well as additional funding. While limited spatially to estuarine environments, NEPs have many EBM components and, in fact, are substantial components of two of the case study regions: Puget Sound, Washington, and Morro Bay, California.

Reconcile spatial scales. NEPs are limited to estuarine environments. However, the law does allow for NEPs to consider “associated aquatic ecosystems and those portions of tributaries draining into the estuary up to the historic height of migration of anadromous fish or the historic head of tidal influence, whichever is higher.”¹¹⁵

Science-based management. In developing the management plan, managers assess water quality, natural resources and estuary use as well as collect and characterize data on toxics, nutrients and natural resources.¹¹⁶

Collaborative management and participatory governance. The NEP management plans are developed collaboratively including representatives from the state, regional entities having jurisdiction over a significant part of the estuary, interested federal agencies, local governments having jurisdiction in

¹¹¹ *Id.* at 3-4.

¹¹² CWA § 320(a)(1); 33 U.S.C. § 1330(a)(1).

¹¹³ CWA § 320(b); 33 U.S.C. § 1330(b).

¹¹⁴ CWA § 320(g); 33 U.S.C. § 1330(g).

¹¹⁵ CWA § 320(k); 33 U.S.C. § 1330(k).

¹¹⁶ CWA § 320(b); 33 U.S.C. § 1330(b).

the estuarine zone, and “affected industries, public and private educational institutions, and the general public.”¹¹⁷

Be accountable. NEPs must report to Congress biennially on priority monitoring and research needs, state and health of the estuarine zones, pollution problems and trends, and the management measures implemented.¹¹⁸

VII. SECTORAL IMPLEMENTATION

One of the goals of this project is to provide practical information to those tasked with implementing EBM, which usually occurs at the sectoral level. To gain a better understanding of the sector-based laws and institutions necessary for EBM implementation, this report uses the following implementation categories: (1) water quality and quantity; (2) habitat conservation, preservation, and restoration; (3) living resources; (4) land use; (5) maritime activities; and (6) human health and well-being. These categories were identified through examination of the common target issues among the seven case study regions.¹¹⁹

Within each of these categories, laws and institutions may address regulation, research, education and outreach, financing, and other governance measures. The following section provides examples of the types of laws and institutions that may be included within each category. For each category, it describes a few state laws that have EBM components. There is substantial overlap among the categories, which is briefly described under each section.

A. Water Quality and Quantity

Description. Water quality and quantity include laws and institutions that focus on regulating or restricting activities that impact marine and freshwater quality (including biological, physical, and chemical integrity) and freshwater quantity.

Ecological Scope. The ecological scope of this category extends from headwaters to the pelagic marine environment.

Relationship to Other Categories. Water quality and quantity are closely linked with all of the categories described. Water quality and quantity affect habitats, living resources, and human health and well-being. Water quantity can also affect land use and maritime activities. All categories described below can cause impacts to water quality.

Example Institutions

Environmental Protection Agency, Federal Energy Regulatory Commission, U.S. Army Corps of Engineers, Coastal Zone Management Program, Bureau of Reclamation, state water quality departments, state water resources agencies, interstate basin compacts, municipal

Example Laws

Clean Water Act (NPDES, TMDL, and wetlands programs), Federal Power Act, Northwest Power Act, Oil Pollution Act, CERCLA, Coastal Zone Management Act, state water quantity laws, Colorado (or Delaware) River Basin Compact

¹¹⁷ CWA, § 320(c); 33 U.S.C. § 1330(c).

¹¹⁸ CWA, § 320(j)(2); 33 U.S.C. § 1330(j)(2).

¹¹⁹ See *infra* at Part V, Section B(iv)(1).

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water supply and wastewater treatment entities

Detailed Examples:

Agricultural Nutrient Management Plans in the Chesapeake Bay Watershed

Virginia, Maryland, and Pennsylvania each have statutes regarding nutrient management on agricultural operations that generate or utilize animal manure. The most recent of these programs, enacted by Virginia in 2005, mandates that state lands where nitrogen or phosphorus compounds are applied must have nutrient management plans.¹²⁰ All other landowners are not required to have such plans, but Virginia has established tax credit incentives for corporations and individuals involved in agricultural production that implement a plan approved by the local Soil and Water Conservation District.¹²¹

In 1998, Maryland enacted a law requiring that all farms with at least \$2,500 in gross annual income and at least eight animal units and that use artificial fertilizer, sludge, or animal manure have a nutrient management plan for nitrogen and phosphorus. The statute also requires that the governor supply sufficient funds to assist in the development of these plans.¹²²

Pennsylvania requires the development of a nutrient management plan for any concentrated animal operation.¹²³ Unlike both Maryland and Virginia, Pennsylvania does not have a tax incentive for implementing a nutrient management plan.

Great Lakes Preservation Laws in Michigan

Michigan's legislature has declared that "[a] diversion of water out of the basin of the Great Lakes may impair or destroy the Great Lakes" and "[a]ny new diversion ... will have significant economic and environmental impact adversely affecting the use of this resource by the Great Lakes states and Canadian provinces."¹²⁴ As a consequence of these findings, Michigan has imposed a prohibition against diverting Great Lakes basin waters that are within the state out of the basin.¹²⁵

The legislature also held that "Water use registration and reporting are essential to implementing the principles of the Great Lakes charter and necessary to support the state's opposition to diversion of waters of the Great Lakes basin."¹²⁶ This finding has resulted in many rules regarding water withdrawals, including the registration of real property owners with the capacity to make large withdrawals, mandatory submission of water use conservation plans by farm owners who use water for agricultural purposes, and requirements of the Department of Environmental Quality to collect, maintain, and exchange information on present uses and potential needs of other states and provinces in the Great Lakes region.¹²⁷

B. Habitat Conservation, Preservation, and Restoration

Description. Several laws and institutions seek to conserve, preserve, and restore habitat for the purpose of protecting biodiversity and important places.

¹²⁰ VA. CODE ANN. § 10.1-104.4 (2006).

¹²¹ *Id.* § 58.1-337, -436.

¹²² MD. CODE ANN., Agriculture § 8-803.1 (2006).

¹²³ 3 PA. CONS. STAT. ANN. § 502 (2006).

¹²⁴ MICH. COMP. LAWS ANN. § 324.32702 (2007).

¹²⁵ *Id.* § 324.32703.

¹²⁶ *Id.* § 324.32702.

¹²⁷ *Id.* §§ 324.32705 - 324.32710.

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Ecological Scope. The ecological scope of this category includes the entire watershed (both terrestrial and freshwater environments) and the marine environment.

Relationship to Other Categories. Habitat conservation and preservation is directed at protecting specific biomes or places for their ecological function and intrinsic value, including biodiversity. This category is closely linked to the living resources category, especially as it relates to non-target species. It also may be closely linked to human health and well-being objectives, especially the sub-categories relating to culture and recreation. In addition to offering protection within the habitat boundaries, habitat conservation often has the added effect of protecting environments beyond the particular habitat conserved. For example, marine protected areas protect species within the area boundary, and may also provide a mechanism to achieve living resources objectives. Also, conflict may arise with other maritime and living resource objectives. Protection of terrestrial habitats may positively affect water quality and negatively interact with land use objectives.

Sub-Categories	Example Institutions	Example Laws
Aquatic	National Estuarine Research Reserve, National Marine Sanctuaries Program, Department of Interior (National Monuments), National Park Service, National Estuary Programs, State Parks, State Sanctuaries	National Marine Sanctuaries Act, Antiquities Act, Clean Water Act, state laws, Endangered Species Act (critical habitat designations), Coastal Zone Management Act (§ 315 – NERR system), international treaties (e.g., RAMSAR)
Terrestrial	Forest Service, Bureau of Land Management, National Park Service, State Parks	U.S. Forest Service and Park Service Organic Acts, Wilderness Act, Federal Land Policy and Management Act, Endangered Species Act (critical habitat designations), state laws

Detailed Examples:

Agency Cooperation for Coastal Habitation Protection Plans in North Carolina

The North Carolina Coastal Habitat Protection Plan (CHPP) is a state-mandated plan that requires coordination among the state agencies responsible for fisheries management, coastal zone management, and water-quality management to address impairment of coastal fisheries habitats.¹²⁸ The CHPP is developed by three state commissions: the Marine Fisheries Commission (which leads the planning process), the Coastal Resources Commission, and the Environmental Management Commission. Conflict resolution is addressed during the planning phase. The Marine Fisheries Commission is responsible for creating an initial draft of the CHPP, including other state agencies and requesting federal agency assistance. The law requires that the chairs of the Coastal Resources Commission, the Environmental Management Commission, and the Marine Fisheries Commission each appoint two commission members to a review committee.¹²⁹ The six-member review committee reviews and revises the CHPP based on consensus.¹³⁰ Each Commission then examines the draft, and if there are disagreements as to any part of the draft, a six-member conference committee is created to facilitate resolution of any differences.¹³¹ The CHPP is reviewed and revised every five years.¹³²

In carrying out their powers and duties, the three Commissions are required to ensure, to the maximum extent practicable, that their actions are consistent with the Coastal Habitat Protection Plans as they adopted them. If any of the three Commissions concludes that another Commission has taken an action that is inconsistent with a Plan, that Commission may request a written explanation of the action from the other. The three Commissions also must annually report to the

¹²⁸ Fisheries Reform Act, § 143B-279.8(a).

¹²⁹ § 143B-279.8(b).

¹³⁰ *Id.*

¹³¹ *Id.*

¹³² *Id.*

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Joint Legislative Commission on Seafood and Aquaculture and the Environmental Review Commission on progress in developing and implementing the Coastal Habitat Protection Plans.¹³³

The Commissions released the first CHPP in 2005, which characterizes and provides management recommendations for six habitat types: water column, shell bottom, submerged aquatic vegetation, wetlands, soft bottom, and hard bottom.¹³⁴ It includes an evaluation of habitat function and fisheries values, existing and potential threats to habitats and fisheries, and recommendations for actions to protect and restore habitats.¹³⁵ The Commissions also released a joint implementation plan for 2005-2007 that describes concrete actions to implement the CHPP. The implementing agencies correspond to the Commissions, and include the Division of Marine Fisheries, the Division of Coastal Management, and the Division of Water Quality.¹³⁶

Submerged Aquatic Vegetation Protective Zones in Maryland

Maryland has established SAV protection zones for “the protection from uprooting and the restoration of submerged aquatic vegetation.” In these zones, the use of a hydraulic clam dredge, a traditional bottom dredge, or a shinnecock rake is prohibited. The SAV protective zones cover areas where submerged aquatic vegetation was mapped at least one of the prior three years. The zones are marked by buoys. Every three years the zone delineations are revised, but revisions may occur at any time if deemed necessary.¹³⁷

Marine Managed Areas Improvement Act in California

With the goal of ensuring long-term ecological viability and biological productivity of marine and estuarine ecosystems, California has restructured the way in which it sites, classifies, and implements marine managed areas.¹³⁸ The California legislature recognizes marine managed areas as offering “many benefits, including protecting habitats, species, cultural resources, and water quality; enhancing recreational opportunities; and contributing to the economy through such things as increased tourism and property values.”¹³⁹ Prior to the Marine Managed Areas Improvement Act, designation of these protected sites and the adoption of regulations often occurred with inadequate consideration of broader policy objectives, resulting in fragmented management, poor compliance, and ineffective enforcement.¹⁴⁰

Under this act, marine managed areas are to be created and regulated with a cohesive mission, specific classification goals, clearly defined designation guidelines, and a more scientific process for designating sites and determining their effectiveness.¹⁴¹ The specific management objectives of several of these streamlined marine managed area classifications include: “[p]rotect or restore rare, threatened, or endangered native plants, animals, or habitats in marine areas;” “[p]rotect or restore outstanding, representative, or imperiled marine species, communities, habitats, and ecosystems;” and “[p]rotect or restore diverse marine gene pools.”¹⁴² The California legislature also emphasized the importance of siting marine managed areas close to terrestrial protected areas so as to benefit from the interrelationship between land and sea, and it mandated coordination between the managing agencies of both protected areas when they are adjoining.¹⁴³

¹³³ *Id.*

¹³⁴ Michael W Street, Anne S. Deaton, William S. Chappell, & Peter D. Mooreside, *North Carolina Coastal Habitat Protection Plan* (February 2005).

¹³⁵

¹³⁶ Division of Marine Fisheries, CHPP Authorities and Relationships, at <http://www.ncfisheries.net/habitat/chpp5.html>.

¹³⁷ MD. CODE ANN., Natural Resources § 4-1006.1 (2006).

¹³⁸ CAL. PUBLIC RESOURCES CODE § 36620 (2006).

¹³⁹ *Id.* § 36601(3).

¹⁴⁰ *Id.* § 36601(9).

¹⁴¹ *Id.* § 36601(13)(b).

¹⁴² *See id.* § 36700.

¹⁴³ *Id.* § 36601(13)(c).

C. Aquatic Living Resources

Description. The living resources category includes laws and institutions that regulate or manage individual species or groups of species. These include laws and institutions regulating extraction of target species or species harvested for commercial value. It also includes laws and institutions that manage non-target species, such as marine mammals or endangered and threatened species, either in the course of targeted catch or separately. This category does not include, however, regulation of aquaculture or livestock, which are included under maritime activities and land use.

Ecological Scope. The ecological scope of this category includes all land and water within the ecosystem boundaries.

Relationship to Other Categories. Regulation of living resources has important links to habitat conservation. Also, regulation of living resources can affect water quality. For example, healthy oyster beds provide a mechanism to maintain water quality. Water quality and quantity can impact the abundance and survival of living resources. Land use and maritime activities may interfere with living resources. Also, extraction of living resources has human health and well-being components, including offering recreational and cultural opportunities as well as serving as an important economic resource.

Sub-Categories	Example Institutions	Example Laws
Target Species	NOAA Fisheries, State Fish and Game Agencies, U.S. Fish and Wildlife Service, regional fisheries management organizations	Magnuson-Stevens Marine Fisheries Management and Conservation Act, state fish and game laws, United Nations Convention on the Law of the Sea, Straddling Stocks Agreement, High Seas Compliance Agreement, RFMO resolutions, non-binding agreements
Non-target Species	NOAA Fisheries, National Ocean Service, State Fish and Game Agencies, U.S. Fish and Wildlife Service, U.S. Customs	Endangered Species Act, Migratory Bird Treaty, Marine Mammal Protection Act, state endangered species laws, CITES

Detailed Examples:

Fisheries Reform in North Carolina

In an effort “to ensure the long-term viability of the State's commercially and recreationally significant species or fisheries,” the North Carolina legislature entrusted the Department of Environment and Natural Resources with preparing fishery management plans for the commercially and recreationally significant species or fisheries comprising the State’s marine or estuarine resources. These plans include management goals, data on the status of fish stocks and habitat, and recommended conservation measures with a focus on protection of marine ecosystems and sustainable harvests. The Marine Fisheries Commission has the authority to adopt these plans.¹⁴⁴ The fisheries reform also extended to licensing, including the fees and transferability of commercial fishing and fishing gear licenses, shellfish licenses, dealer licenses, and vessel endorsements.¹⁴⁵ The legislation also strengthened civil and criminal penalties for violating fisheries laws.¹⁴⁶ North Carolina also links fisheries management with habitat protection through the development of the CHPP (see above).

¹⁴⁴ N.C. GEN. STAT. § 113-182.1 (2006).

¹⁴⁵ *Id.* § 113-168.1.

¹⁴⁶ *Id.* § 113-191.

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Governor's Salmon Recovery Office in Washington

Having failed at improving salmonid fish runs from repeated efforts throughout the state, and concerned about the impact of listing salmon and steelhead runs as threatened or endangered under the federal Endangered Species Act, the Washington legislature established the Governor's salmon recovery office.¹⁴⁷ This office is intended to coordinate state strategy for returning salmon populations to healthy levels, specifically assisting with the development of regional salmon recovery plans. The office also gathers these regional plans and submits them to federal agencies for adoption as federal recovery plans. Additionally, it helps state agencies, local governments, landowners, and others obtain assurance from the federal government that plans, programs, or activities are consistent with recovery objectives of the federal Endangered Species Act. The office serves the role of liaison to the U.S. Congress, federal agencies, federally recognized tribes, the state congressional delegation, and local governments for issues related to the state's salmon recovery plans.¹⁴⁸ The new Washington law establishing the permanent PSP links the permanent PSP to the salmon recovery office.¹⁴⁹

Ecosystem Management of Fisheries in California

Attempting to preserve the "rich marine living resources" of the Pacific Ocean, the California legislature enacted the Marine Life Management Act.¹⁵⁰ The Act is designed to "ensure the conservation, sustainable use, and, where feasible, restoration of California's marine living resources."¹⁵¹ Goals of the act include: conserving entire systems, valuing non-consumptive species and habitats, sustainability, habitat conservation, restoration of depressed fisheries, limiting bycatch and recognizing long-term interests of fishing communities.¹⁵² The Act calls for best available science but also recognizes the limits of scientific information¹⁵³—it takes the precautionary approach, shifting the burden of proof to demonstrating that fishing activities are sustainable rather than waiting until evidence demonstrates that fishing activities are not sustainable.¹⁵⁴

D. Land Use

Description. Land uses are wide and varied, ranging from rural practices such as silviculture and agriculture, to residential and industrial development, to urban infrastructure. Laws and policies affect the uses of lands, development patterns, decisions to engage in activities, and the practices employed on the lands.

Ecological Scope. The ecological scope of land use includes the entire terrestrial environment as well as wetlands.

Relationship to Other Categories. Many land-use regulations target protection of water quality, closely linking these two categories. Land-use decisions may affect habitat conservation and living resources regulation. Also, land-use decisions are tightly linked to human health and well-being.

Sub-Categories	Example Institutions	Example Laws
Rural	USDA, Forest Service, state forestry and agriculture agencies	Forest Service Organic Act, state forestry and agriculture laws

¹⁴⁷ WASH. ADMIN. CODE § 78.85.005 (2007).

¹⁴⁸ *Id.* § 77.85.030.

¹⁴⁹ PSP, SB 5372 § 49, amending Wash. Admin Code § 77.85.090

¹⁵⁰ CAL. FISH AND GAME CODE §§ 7050 et seq. (2006). For additional information, see Michael Weber and Burt Heneman, *Guide to California's Marine Life Management Act*, at <http://www.fgc.ca.gov/mlma/home.html>.

¹⁵¹ *Id.* § 7050(b).

¹⁵² *Id.* §§ 7050, 7055, 7056; Weber and Heneman, *supra* note 150 at Overview.

¹⁵³ *Id.* § 7050(b)(6).

¹⁵⁴ Weber and Heneman, *supra* note 150 at Overview.

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Urban	Urban planning and development agencies	Local zoning laws
Cross cutting	Federal and State Coastal Zone Management Programs, U.S. Corps of Engineers and state wetlands agencies, state and local land-use boards	CZMA, state takings laws, public nuisance laws, Clean Water Act Section 404 and state wetlands laws, state and local land-use laws and ordinances

Detailed Examples:

Critical Area Preservation Programs in the Chesapeake Bay Watershed

Maryland's Chesapeake and Atlantic Coastal Bays Critical Area Protection Program fosters more sensitive development activity for certain shoreline areas so as to minimize damage to water quality and natural habitats. It is also meant to implement the Resource Protection Program on a cooperative basis between the state and affected local governments, with local governments establishing and implementing their programs in a consistent and uniform manner subject to state criteria and oversight.¹⁵⁵ With a few exceptions, critical areas under this program include all waters of the Chesapeake Bay and its tributaries, all land within 1,000 feet of those waters, and additional areas proposed for inclusion by local jurisdictions and approved by the Commission.¹⁵⁶ The statute includes many specific guidelines for the local governments in their land-use planning.

Virginia's Chesapeake Bay Preservation Act requires that the counties, cities, and towns of Tidewater Virginia incorporate general water-quality protection measures into their comprehensive plans, zoning ordinances, and subdivision ordinances and establish programs that define and protect preservation areas. The state will provide oversight and funding for carrying out and enforcing this Act.¹⁵⁷ The Act establishes a Local Assistance Board that provides land-use and development and water-quality protection information and assistance to the various levels of local, regional and state government within the state.¹⁵⁸ Adopting these policies is voluntary for local governments outside of Tidewater Virginia.¹⁵⁹

Forestry Riparian Easements in Washington

Washington's Small Forest Landowner Forestry Riparian Easement Program is a practical step toward implementing the objectives of the Salmon Recovery Act. This program is designed to acquire easements from small forest landowners along riparian lands and other areas of value to the state for protection of aquatic resources. Small forest landowners are targeted because it is less economically viable to keep their lands in forestry use, thus putting the amount of habitat available for salmon recovery and conservation of other aquatic resources at greater risk. Provisions of the Washington Code outline the requirements necessary for the easements, and even draft a model document.¹⁶⁰

Permitting Restrictions near Aquatic Resources in Maine

Maine requires special permitting for draining, filling, dredging, displacing soil or vegetation, or any construction, repair, or alteration of any permanent structure located in, on, or over any protected natural resource or adjacent to a coastal wetland, great pond, river, stream, or significant wildlife habitat contained within a freshwater wetland.¹⁶¹ In order to receive a permit, the applicant must demonstrate that the proposed activity meets certain standards. Among these

¹⁵⁵ MD. CODE ANN., Agriculture § 8-1801 (2006).

¹⁵⁶ *Id.* § 8-1807.

¹⁵⁷ VA. CODE ANN. § 10.1-2100 (2006).

¹⁵⁸ *Id.* § 10.1-2102.

¹⁵⁹ *Id.* § 10.1-2110.

¹⁶⁰ WASH. ADMIN. CODE § 222-21-030 (2007).

¹⁶¹ ME. REV. STAT. ANN. tit. 38, § 480-C (2006).

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standards, the activity must not “unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life.” Other standards include requiring that there be no unreasonable interference with the natural flow of surface or subsurface waters, no violations of state water quality laws, and no unreasonable erosion of soil or sediment nor unreasonable restraint of natural soil transfer from the terrestrial to the marine or freshwater environment.¹⁶²

E. Ocean Industrial Activities

Description. Ocean industrial activities include laws and institutions related to shipping and navigation, including activities that maintain shipping channels. It also includes non-living resource use or extraction, including laws and institutions that regulate extractive industries such as oil and gas extraction or sand mining, as well as non-living resource uses such as wind farm developments.

Ecological Scope. The ecological scope of ocean industrial activities includes the marine environment from internal waters to offshore activities.

Relationship to Other Categories. Ocean industrial activities may impact water quality and living resources. Such activities are important for human health and well-being because they provide important economic opportunities, goods, and services. They may also adversely affect recreational and cultural activities as well as human health in some instances. While not directly impacting land use, the presence of ocean industrial activities can affect the nature of surrounding land use because ocean industrial activities are linked to the land. For example, shipping and oil and gas production may require large land-based transportation infrastructures. Pipelines and cables may run from the terrestrial environment and into the marine environment.

Sub-Categories

Shipping and Navigation

Resource Use or Extraction

Example Institutions

NOAA, U.S. Coast Guard, State Coastal Zone Programs, U.S. Army Corps of Engineers Minerals Management Service, Federal Energy Regulatory Commission, NOAA, State Coastal Zone Programs, state agencies

Example Laws

Deep Water Ports Act, Outer Continental Shelf Act
Outer Continental Shelf Act, Energy Policy Act of 2005, state oil and gas laws

Detailed Examples:

Ballast Water Release Permitting in Michigan

In an effort to more aggressively combat the introduction of aquatic invasive species into the Great Lakes, Michigan enacted a new statute that requires all ocean-going vessels engaging in port operations in the state to obtain a permit from the Michigan Department of Environmental Quality. The Department will issue a permit “only if the applicant can demonstrate that the oceangoing vessel will not discharge aquatic nuisance species or if the oceangoing vessel discharges ballast water or other waste or waste effluent, that the operator of the vessel will utilize environmentally sound technology and methods, as determined by the department, that can be used to prevent the discharge of aquatic nuisance species.”¹⁶³

¹⁶² *Id.* § 480-D.

¹⁶³ MICH. COMP. LAWS ANN. § 324.3112(6) (2007).

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While this legislation goes beyond prior agreements with other states and Canada, the statute requires the Michigan Department of Environmental Quality to cooperate as much as practicable with the Great Lakes Commission, the International Joint Commission, the Great Lakes panel on aquatic nuisance species, the Great Lakes Fishery Commission, the Canadian Great Lakes provinces, and other Great Lakes basin states to create standards for the control of aquatic nuisance species that protect Michigan's waters and other natural resources.¹⁶⁴

Preservation Measures in Oil, Gas, and Mineral Leases in Mississippi

For any private party development or extraction of oil, gas, or other minerals from state-owned lands, the State of Mississippi requires the party to obtain a mineral lease from the Mississippi Major Economic Impact Authority. Such leases for offshore sites are prohibited for areas leased by the Department on Marine Resources for any public or private oyster reef and areas within one mile thereof. Also, leases north of the coastal barrier islands are restricted to specific Mississippi Department of Environmental Quality Bureau of Geology Plat of Lease Blocks. Furthermore, the Mississippi Commission on Marine Resources must review each permit within the Mississippi Sound or tidelands, and may attach special conditions to the permit.¹⁶⁵

When one of these leases is approved, the state will receive at least three-sixteenths of the value of the extracted resources. Of that money, two percent is paid into the "Gulf and Wildlife Protection Fund." The money from the fund is apportioned for the Mississippi Department of Wildlife, Fisheries, and Parks and the Mississippi Department on Marine Resources, half exclusively for cleanup, remedial, or abatement actions for pollution resulting from the exploration or production of oil or gas, and half for the prudent management, preservation, protection and conservation of existing waters, lands, and wildlife of the state and, if such purposes are accomplished, for the acquisition of additional waters and lands.¹⁶⁶

Preventing Ecological Damage from Anchored Oil Vessels in Maine

Invoking the state's police power, a Maine statute grants the Department of Environmental Protection the authority to address the hazards and threats of damage posed by the anchoring of vessels designed to carry oil as cargo and that are not waiting for a scheduled loading or unloading.¹⁶⁷ The department may limit or even prohibit the anchoring of these vessels in Maine coastal waters, estuaries, or rivers.¹⁶⁸ Actions taken under this authority are meant to "protect the coastal waters, tidal flats, beaches and lands adjoining the waters of the State from damage by the intentional or accidental discharge of oil, other pollutants ... or air contaminants ... or explosion from the accumulation of gases aboard vessels and to prohibit interference with the harvesting of marine resources and aesthetic and recreational uses of coastal waters."¹⁶⁹ In adopting rules under this provision, the department must consider, among other things, "The protection of the natural environment, aesthetic and recreational uses of State waters" and "protection of the fisheries or fishing industry of the State."¹⁷⁰

F. Human Health and Well-Being

Description. This category focuses on laws and institutions that directly target human health and well-being.

Ecological Scope. The ecological scope of human health and well-being covers the entire EBM region.

¹⁶⁴ *Id.*

¹⁶⁵ MISS. CODE ANN. § 29-7-3 (2006).

¹⁶⁶ *Id.*

¹⁶⁷ ME. REV. STAT. ANN. tit. 38, § 560(1) (2006).

¹⁶⁸ *Id.* § 560(3).

¹⁶⁹ *Id.* § 560(1).

¹⁷⁰ *Id.* § 560(4)(f)-(g).

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Relationship to Other Categories. Human health and well-being is a category in and of itself as well as being a universal driver for activities that fall under the previous categories. Legal, regulatory, and policy decisions regarding the above categories are often considered within the context of human health and well-being. Conflict may arise both within this category and among other categories. For example, activities that support recreation may conflict with those supporting cultural well-being or human health.

Sub-Categories	Example Institutions	Example Laws
Recreational	Municipalities, state boating agencies, state fish and game agencies	Ordinances, state recreational fishing laws, state boating laws
Cultural	State preservation agencies	State preservation laws
Health	Environmental Protection Agency and state DEQs, tort system	Clean Water Act and state laws, nuisance law

Detailed Examples:

Washington's Beach Environmental Assessment, Communication, and Health (BEACH) Program

The Washington BEACH Program is jointly led by the Washington State Departments of Ecology and Health. They work together with county environmental health and surface water departments, tribal nations, non-profit organizations, and volunteers to help protect beachgoers by monitoring the beaches for fecal bacteria, notifying the public when the levels are high, and educating people about what they can do to avoid getting sick from altwater.¹⁷¹ Funding for the program is provided by a grant from the U.S. Environmental Protection Agency in accordance with the BEACH Act of 2000, which, through 2006, has made available \$62 million in grants for the 35 coastal and Great Lakes states and territories who currently maintain similar BEACH programs.¹⁷²

Prohibition on Importing Certain Marine Organisms in Maine

The Maine legislature has enacted a statute designed to prohibit the introductions of certain marine organisms, specifically sickly or non-indigenous ones, to the state's waters.¹⁷³ The statute assigns authority over matters in importation, aquaculture, and research, and establishes requirements for licensing and leasing.¹⁷⁴ All of these efforts forward the state's objective in preserving the health of Maine's aquatic resources and, more broadly, its ecosystems, as well as protecting the health and well-being of its citizens, both through the food they eat and through minimizing the pathogens and poisons in the state's waters.

Among its many other provisions, the statute creates a comprehensive Marine Shellfish Toxins Monitoring Program, which identifies contaminated marine regions, making possible the harvest of susceptible marine mollusks in areas not affected by the contamination.¹⁷⁵ This program is administered by the Public Health Division of the Maine Department of Natural Resources.

Pollution Prevention through Restricted Drain Usage in Michigan

In Michigan, a person may not discharge into any county or inter-county drain any sewage or waste matter capable of, among other things, "producing such pollution of the waters of the state receiving the flow from the drains as to injure livestock, destroy fish life, or be injurious to public

¹⁷¹ *About Us*, Washington State Dept. of Ecology, at http://www.ecy.wa.gov/programs/eap/beach/who_we_are.html.

¹⁷² Dale Kemery, *EPA Commits \$10 Million to Protect the Nation's Beaches*, at <http://yosemite.epa.gov/opa/admpress.nsf/27166bca9a9490ee852570180055e350/bcff12ffca5148b88525725e00681e1f!OpenDocument>.

¹⁷³ See ME. REV. STAT. ANN. tit. 12, § 6071(2) (2006).

¹⁷⁴ See *Id.* §§ 6071 - 6072.

¹⁷⁵ *Id.* § 6076.

health.”¹⁷⁶ To help prevent further detrimental discharges from causing damage to the environment and public health, violation of this statute can result in a fine up to \$25,000 or imprisonment up to 90 days. Furthermore, the Department of Environmental Quality is authorized to construct disposal plants, filtration beds, and other mechanical devices to purify the flow of any drain and then will pass the cost of construction on to those benefited by it.¹⁷⁷ Also, the statute authorizes the drain commissioner or drainage board, subject to the review and approval of the department of environmental quality, to study the requirements of persons for flood control or drainage projects, with the objective of protecting public health by making drainage facilities available to people in any drainage district.¹⁷⁸

VIII. CONCLUSIONS AND NEXT STEPS

ELI developed this Report as a working document that will help us develop practical governance options for EBM implementation. It examines seven case study regions in an effort to understand how regional organizations and sector-based actors implement EBM goals and actions. ELI focused on three major topics in this Report:

- (1) mechanisms of regional organization based on the seven case study regions;
- (2) other federal laws and programs that have promising EBM attributes; and
- (3) examples of sectoral laws and institutions that take an ecosystem-approach to managing specific resources.

The next phase of this project will build upon several issues raised in this Report with the goal of identifying obstacles to and opportunities for EBM implementation. Based on the results of this report, the next phase of the project will target the legal and institutional obstacles to and opportunities for addressing conflicting uses, resolving disputes, diminishing cumulative impacts, and achieving accountability. ELI will expand upon the sectoral implementation section to find additional valuable legal and institutional examples so that we may better understand existing linkages among programs, identify effective ecosystem-approaches to management, and make note of key challenges for integrating sector-based management into an EBM framework.

¹⁷⁶ MICH. COMP. LAWS ANN. § 280.423(1) (2007).

¹⁷⁷ *Id.* § 280.423(2).

¹⁷⁸ *Id.* § 280.423(8).