

# State of the Science

*A common concern about Ecosystem-based Management (EBM) is that we do not have enough scientific knowledge to move forward with implementation. A new scientific assessment argues that it is possible and practical to begin applying EBM along the West Coast right now.*



Ecosystem-based management (EBM) is an integrated approach to managing ecosystems for the sustainable delivery of important services like food, coastal protection, and recreation. Unlike conventional management, EBM considers the cumulative impacts of human activities on entire ecosystems and the services they produce. While gaps remain, particularly in the understanding of human systems, many in the scientific community believe we already have the necessary knowledge to apply EBM now and improve our management practices.

## Critical Research

This review—authored by the Science Advisory Committee to the California Current EBM Initiative—focuses on the availability of scientific information and understanding needed to move forward with EBM. While many other scientific topics are relevant, the following research areas are central to an EBM approach:

### ECOSYSTEM SERVICES

Core to EBM is maintaining healthy ecosystems that provide the range of benefits humans want and need. Decision making which accounts for how services are produced, valued and connected is key to maintaining the flow of a suite of services.

#### What do we know now?

We can identify many key services for the region (fisheries, coastal protection, tourism) and have begun mapping their location, assessing their economic value, and determining what affects their production and delivery.

#### What still needs more study?

We have better data for fisheries-associated services than others, and thus need to broaden our scope. We also need to improve our understanding of social drivers of and values and responses to changes in services.

### CUMULATIVE IMPACTS

Multiple human activities affect the environment, yet management tends to assess impacts individually rather than collectively. Understanding interactions among impacts – on ecological and human systems - will strengthen management over the long term.

#### What do we know now?

We know that overfishing, climate change, and invasive species are some of the key impacts to California Current ecosystems, and we are beginning to understand the ultimate drivers of these impacts. The greatest cumulative impact occurs near urban centers in southern California, San Francisco Bay, southern Oregon, and Puget Sound.

#### What still needs more study?

Now that we know what and where the impacts are, we need to better understand how they interact to more accurately predict their effects on the delivery of ecosystem services.

### VARIABILITY AND CHANGE

Comprehending how human and ecological systems vary over time and space allows scientists to better predict how to sustain the flow of ecosystem services over the long term.

#### What do we know now?

We understand and in some instances can predict short term fluctuations, like upwelling events and the El Nino cycle, as well as longer-term trends, like the Pacific Decadal Oscillation. Climate effects, such as decreasing pH and increasing temperature, and their synergies are being increasingly studied throughout the region.

#### What still needs more study?

Variability in human systems and large-scale climate change are still poorly understood, and it is unclear how various aspects of these may interact and ultimately affect marine ecosystem health.