Development of Guidelines for NOAA's Integrated Ecosystem Assessment Program: <u>An Update</u>

A Presentation to the
NOAA Science Advisory Board

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Outline

- Purpose & Desired Outcome
- Issue
- Briefing
- NOAA Coordination and Views









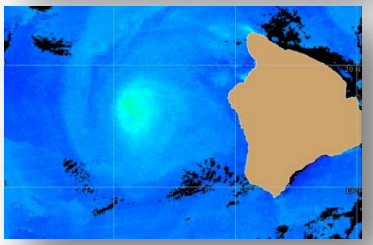


Purpose & Desired Outcome

Informational: This briefing is provided to:

- Update the NOAA SAB on the development of guidance on NOAA's IEA approach as a result of their recommendation.

- Provide the SAB with the final element of that response – a document that clearly lays out and describes the general methodology for IEAs, based on our experience to date.



Issue

- As reported to the SAB in March 2011, NOAA's IEA program would develop a "guidance" document to be shared with the SAB in the following year.

- The information in the document would be based on experience and progress developing and implementing IEAs to date and provide enhanced clarity on the implementation of NOAA's IEA framework and approach (National program with regional flexibility).

- The provided document, the subject of this brief, is the result of that effort as well as responds to the original SAB recommendation.

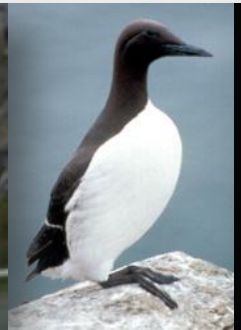


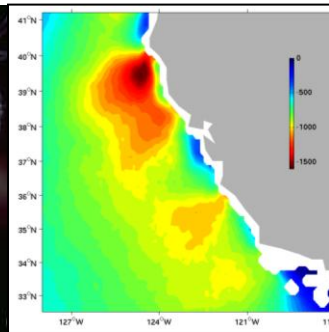



Development of IEA “Guidance” Document

- The IEA Guidance document was written collaboratively by a diverse team of IEA partners: a sub-group of the larger NOAA IEA team that includes representation from each of the 5 IEA regions, including multiple NOAA Line Offices, and one of our academic partners (USF).

- Comments were received and incorporated into the document which was then submitted to the SAB from:
  - Larger NOAA IEA team which includes 50+ individuals from multiple programs and offices in NMFS, NOS, OAR, NESDIS (NCDDC)
  - The SAB ESMWG for independent review by individual members

Development of IEA "Guidance" Document

- Key document sections include:
  - Concepts and Terminology for Integrated Ecosystem Assessments
    - What is Ecosystem-based Management?
    - What is an IEA?
    - Why IEAs?
  - A Step-wise process for developing an IEA
    - Step 1: Scoping the IEA
    - Step 2: Defining Ecosystem Indicators and Reference Levels
    - Step 3: Risk Analysis - Impacts of Natural Perturbations and Human Activities on Ecosystem Status
    - Step 4: Evaluation of Management Strategies for Protection or Restoration of Ecosystem Status
    - Step 5: Monitoring and Evaluation
  - Completing an IEA
    - IEA Products
    - Peer Review
  - Progress towards implementing IEAs in the United States

Concepts and Terminology

What is Ecosystem-Based Management?

- Ecosystem-based Management (EBM) is an integrated approach to management that considers the entire ecosystem, including humans.
- It requires managing human activities as a whole instead of separately managing individual ecosystem components or uses;
- It considers all elements that are integral to ecosystem functions; and
- It accounts for economic, social, and environmental costs and benefits

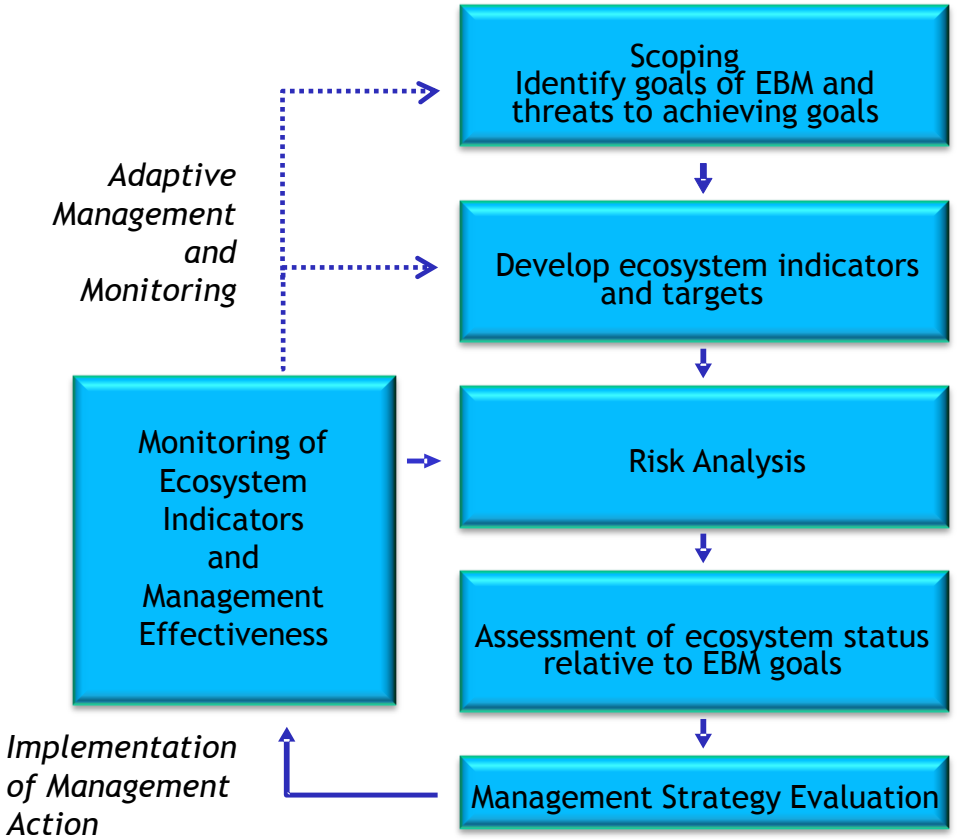
(McLeod et al. 2005)

Concepts and Terminology

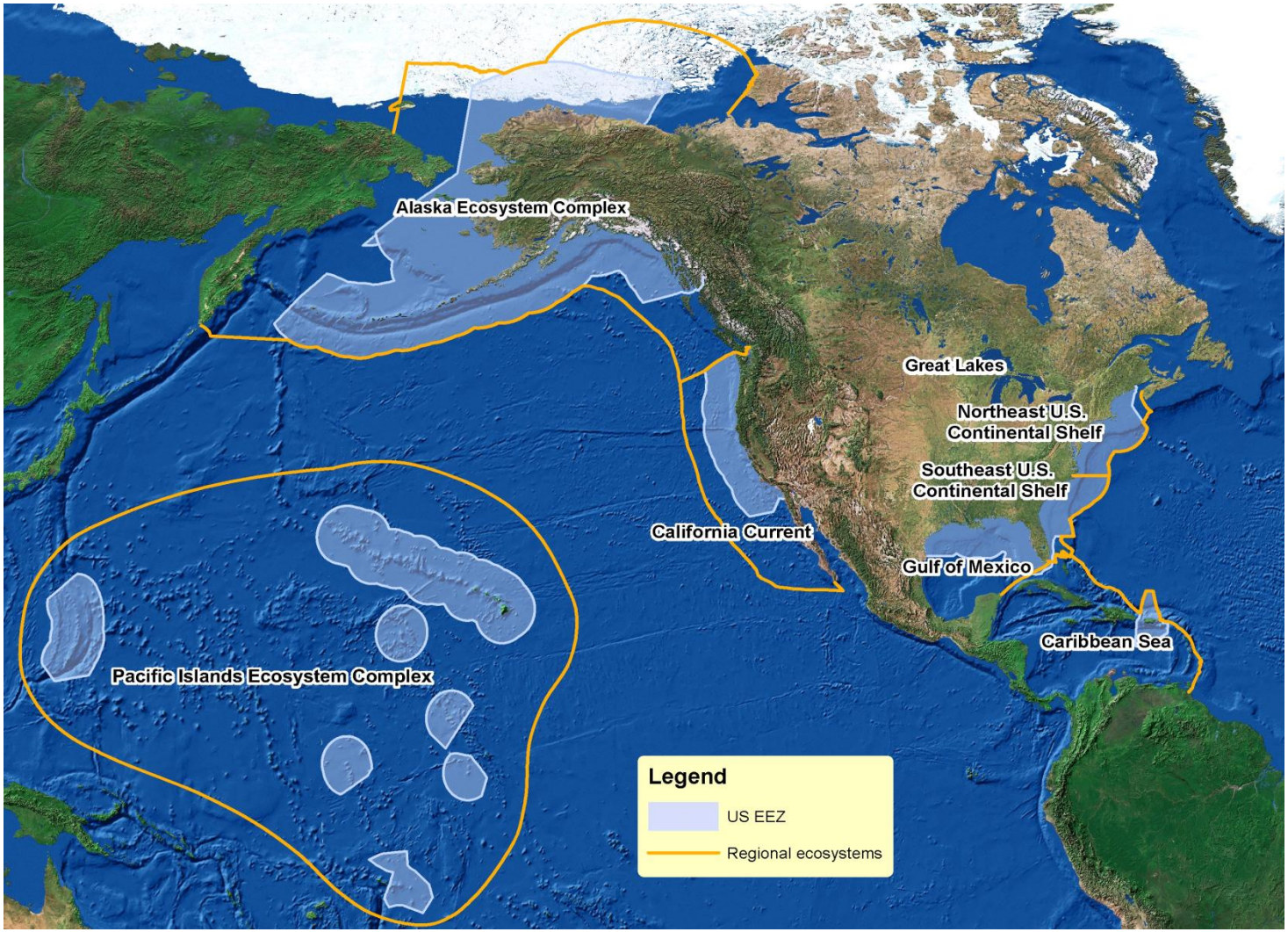
What is an IEA? and Why IEAs?

> "A synthesis and quantitative analysis of information on relevant physical, chemical, ecological and human processes *in relation to specified ecosystem management objectives*".

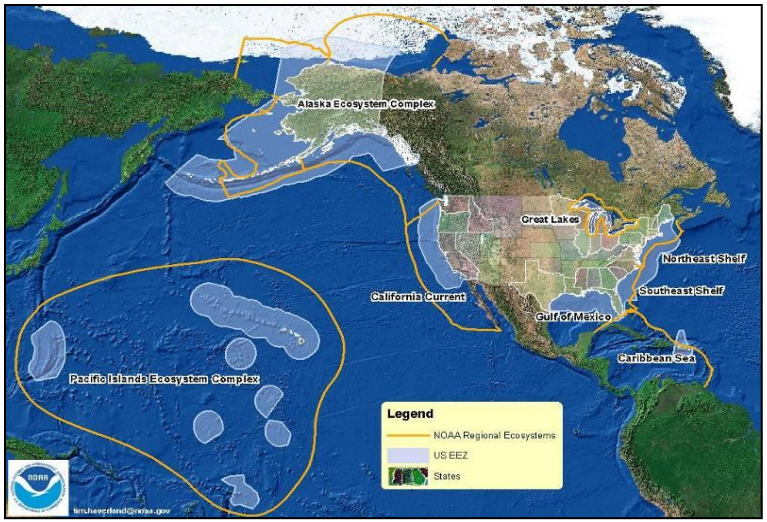
- NOAA's IEA program has a defined, discrete, systematic, and iterative multi-step **process** and approach (framework).
- The framework is to be adopted by all eight regions as the program expands.
- It is flexible to be adaptable to specific regional needs, though all steps should be included.
- The "guidance" document takes you through this step-wise process.



NOAA's Regional Ecosystems – US LMEs = NOAA's IEA regions



IEAs – Defining the Scale is Driven by the IEA Process



National Overview

Extra-basin assessments

Hierarchical Structure

Basin-Wide

- Regional Ecosystem (LME)

Regional

-Sub-Regional Ecosystems

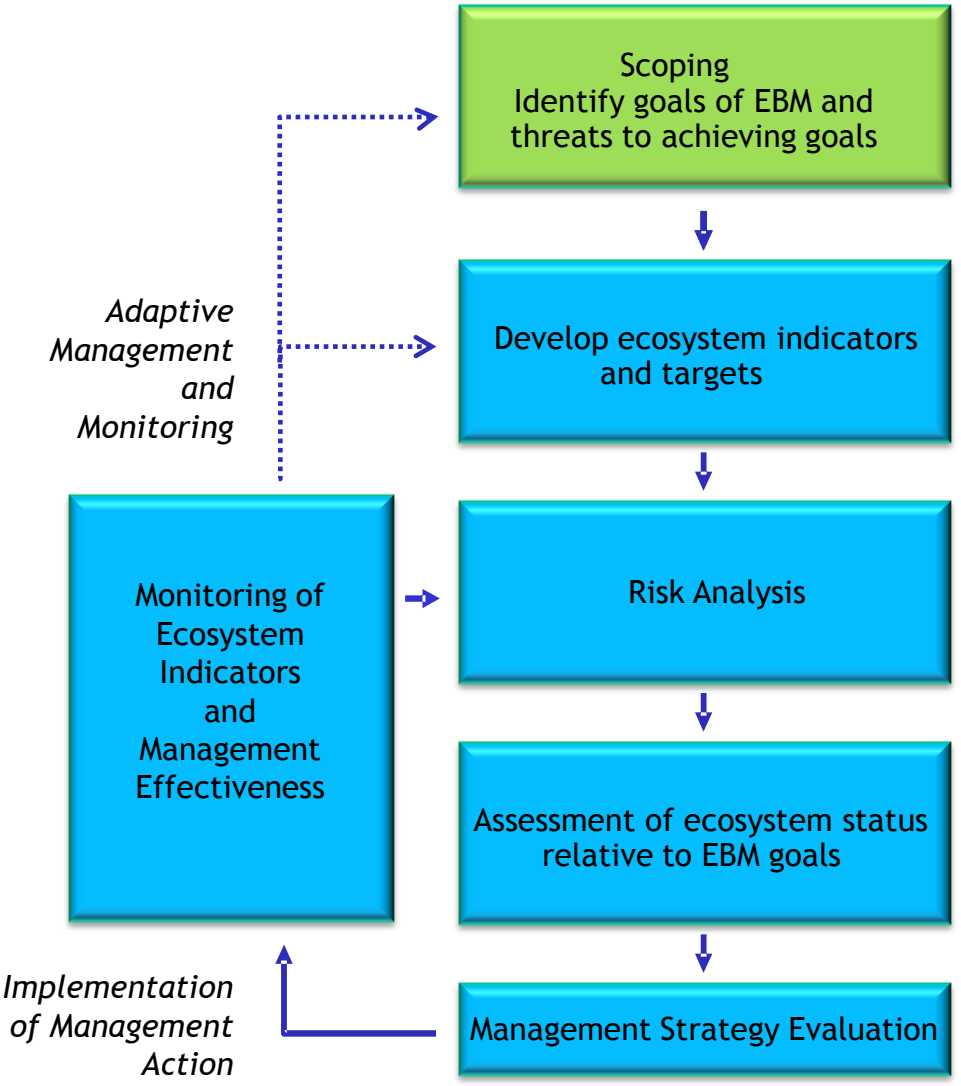
Local

-Place based
(e.g., sanctuaries, NERRs)
-Bays, Harbors, Estuaries

A Step-Wise Process

Step 1: Scoping

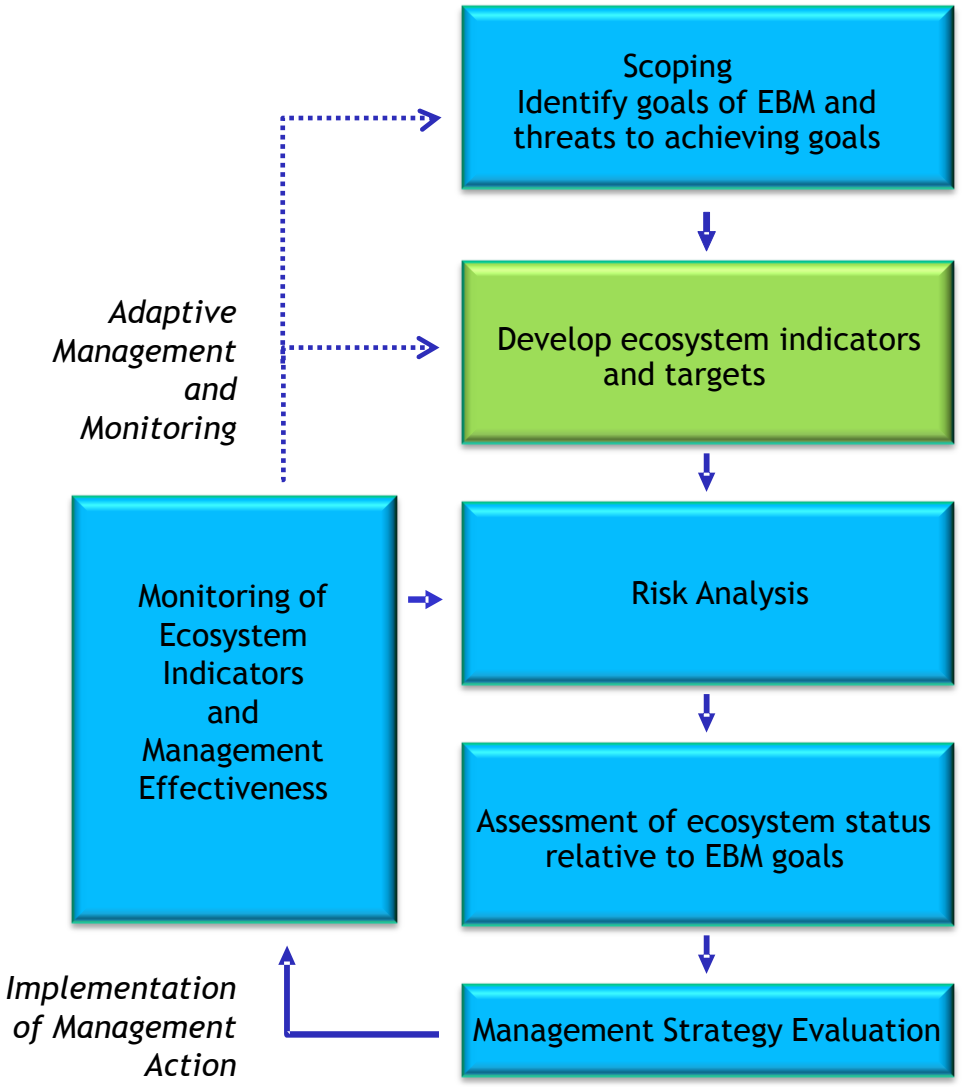
- IEAs are driven by clearly defined management objectives.
- Thus, the IEA approach begins with scoping to define priority objectives to be addressed and frames the execution of the process to be responsive to the objective(s).
- This step requires that scientists, managers, and stakeholders work together to define:
  - The broad vision and objectives;
  - The spatial scale relative to the objectives; and
  - The ecosystem components and threats to be considered
- This Scientist-Manager-Stakeholder interaction is ongoing throughout the process.



A Step-Wise Process

Step 2: Indicators and Reference Levels

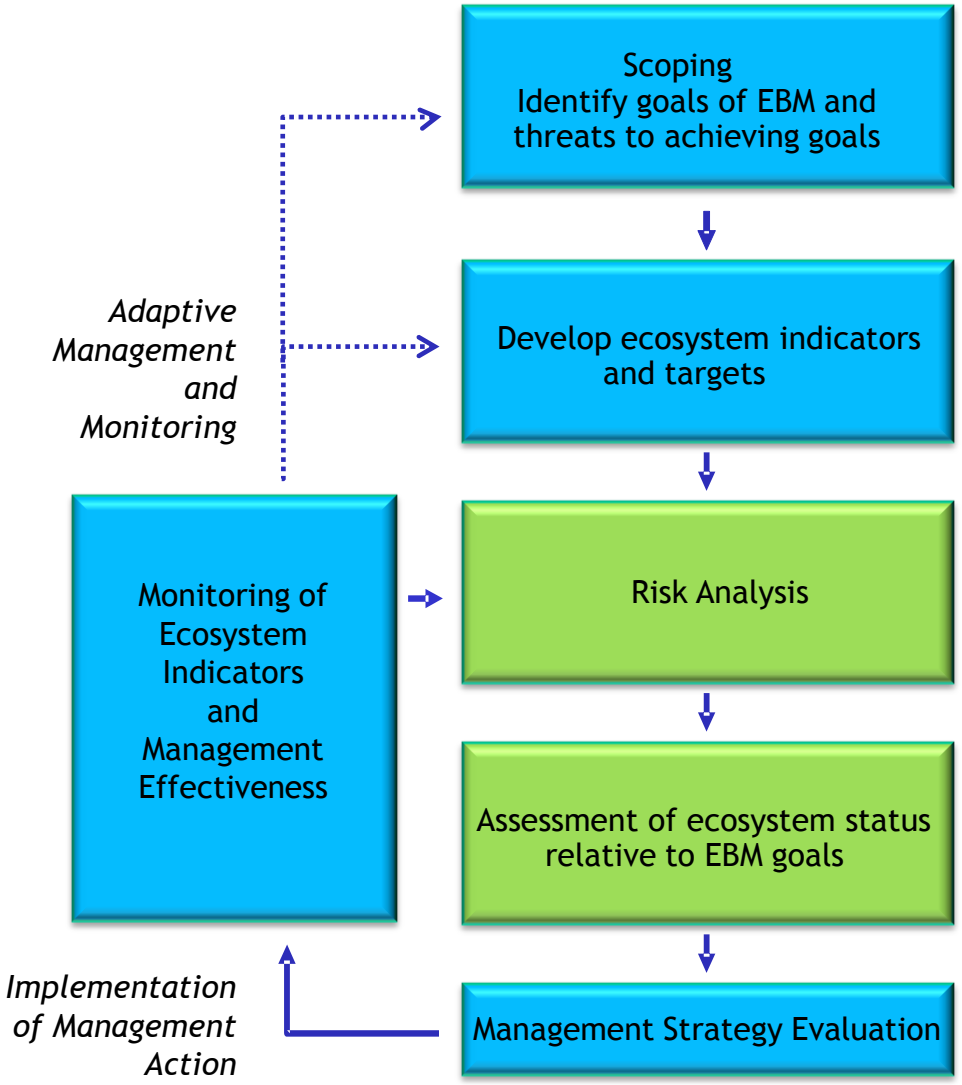
- A critical step in the process is to select indicators that capture key ecosystem states and are tied to the identified objectives.
- They are quantitative measures that serve as proxies for characterizing key biogeochemical and human system attributes.
- Effective indicators serve as measures of the many ecosystem services that concern policy-makers and stakeholders.
- Hundreds of indicators exist for EBM; the key is to select a set that will reflect progress towards specific objectives.
- Reference levels provide the context for evaluating progress; can include ecosystem state variables as well as metrics of ecosystem pressures.



A Step-Wise Process

Step 3: Risk Analysis and Ecosystem Status

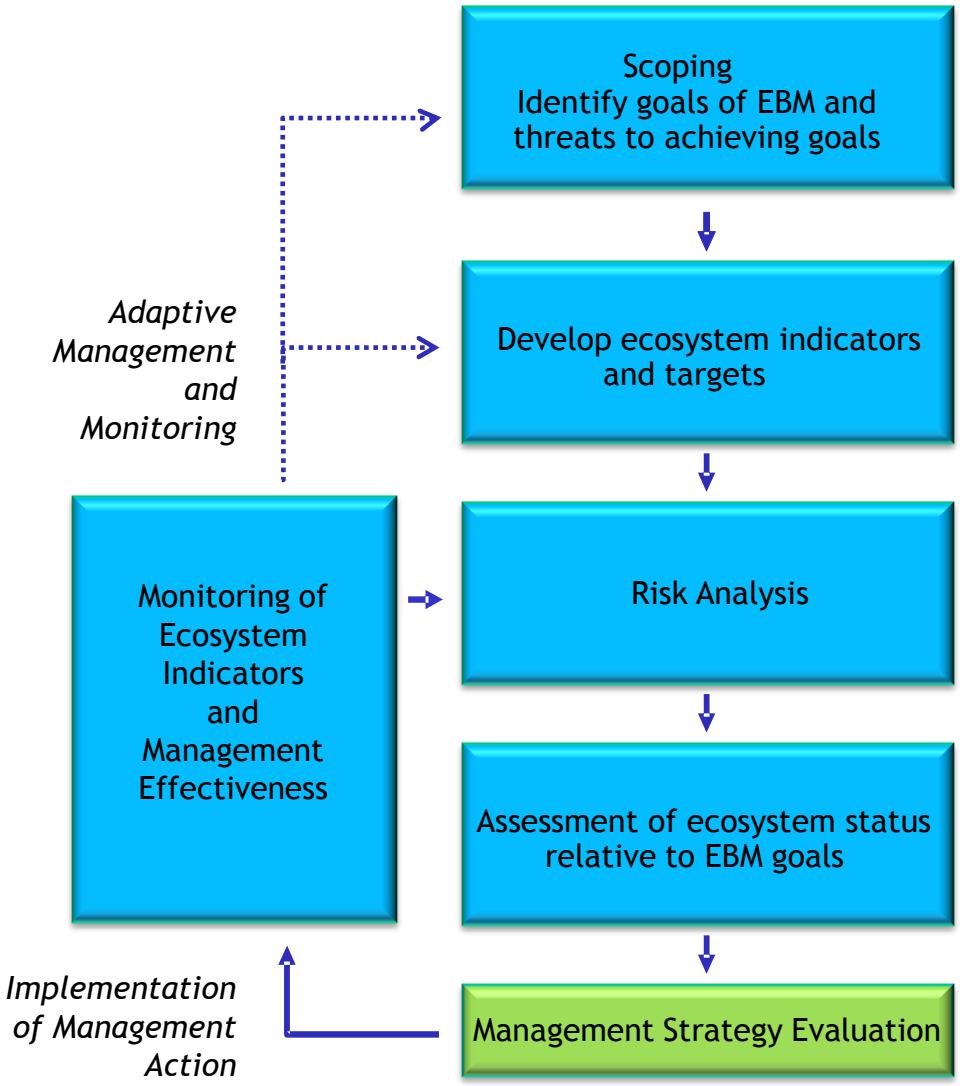
- Once indicators and reference levels are selected, this step evaluates the risk to the indicators posed by human activities and natural processes.
- The goal is to quantitatively or qualitatively determine the probability that an indicator will reach or remain in an undesirable state (i.e. surpass a reference limit).
- Results from the risk analysis for each indicator are considered together to inform the assessment of ecosystem status.



A Step-Wise Process

Step 4: Evaluation of Management Strategies

- The next step uses simulation, analytical, or conceptual modeling to evaluate the potential of different management strategies to influence the status of natural and human system indicators, and to achieve defined objectives.
- Management Strategy Evaluation (MSE) is a modeling approach to analyze proposed scenarios and is a key feature of the IEA approach.
- MSE incorporates a number of features that make it ideal for supporting IEAs:
  - Simulations are performed on the system as a whole;
  - Performance metrics are evaluated quantitatively in a simulation framework using indicators developed earlier in the process;
  - A variety of models and submodels may be used in the evaluation;
  - The whole management decision system is evaluated;
  - Allows opportunity for stakeholder involvement and is strengthened by this engagement;
  - Identifies data and knowledge gaps which informs future research.

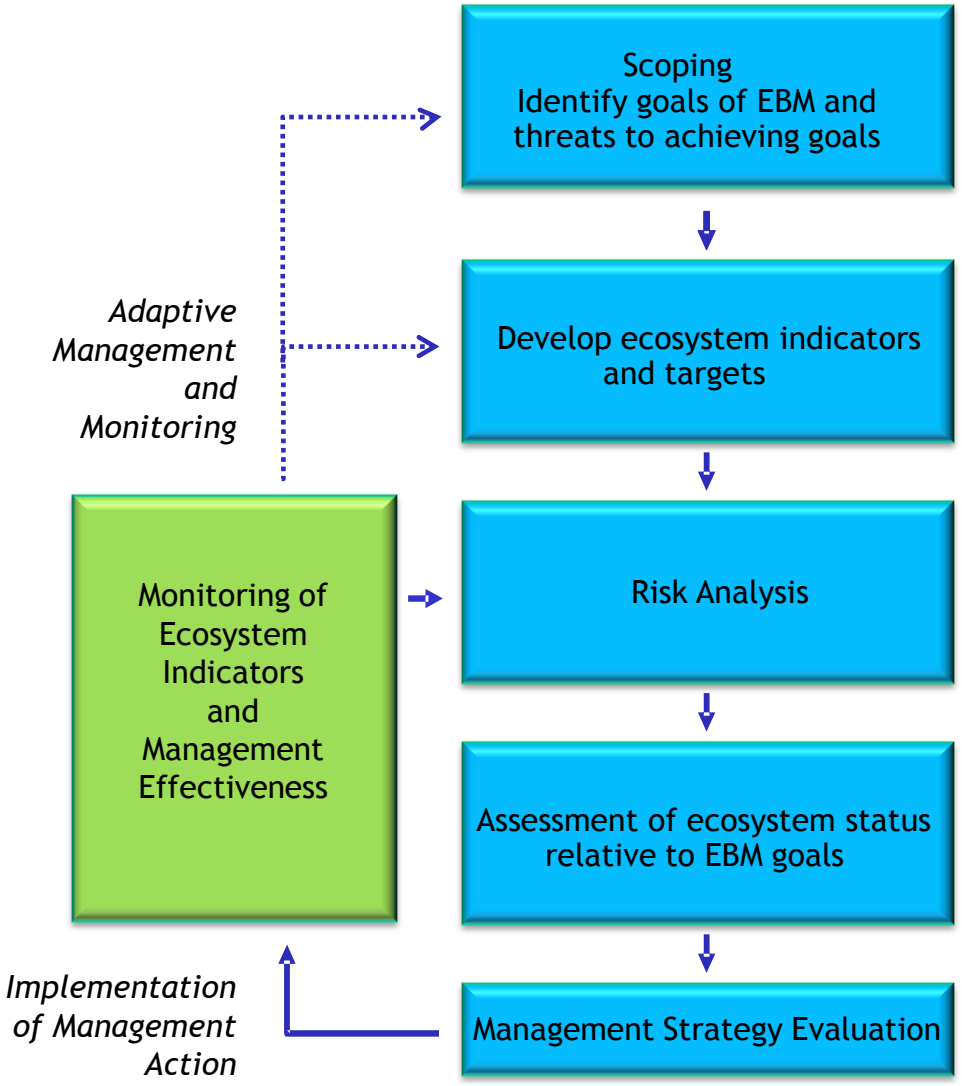


A Step-Wise Process

Step 5: Monitoring and Evaluation

- Monitoring and evaluation is necessary to determine if the implemented management strategy has been effective and quantifies the trade-offs that have occurred since implementation.

- Adaptive management relies on this step; it is based on implementing management in steps or stages while monitoring and evaluating the system to determine the effect the change in management has had on the system.



Completing an IEA
Products and Peer Review

Products

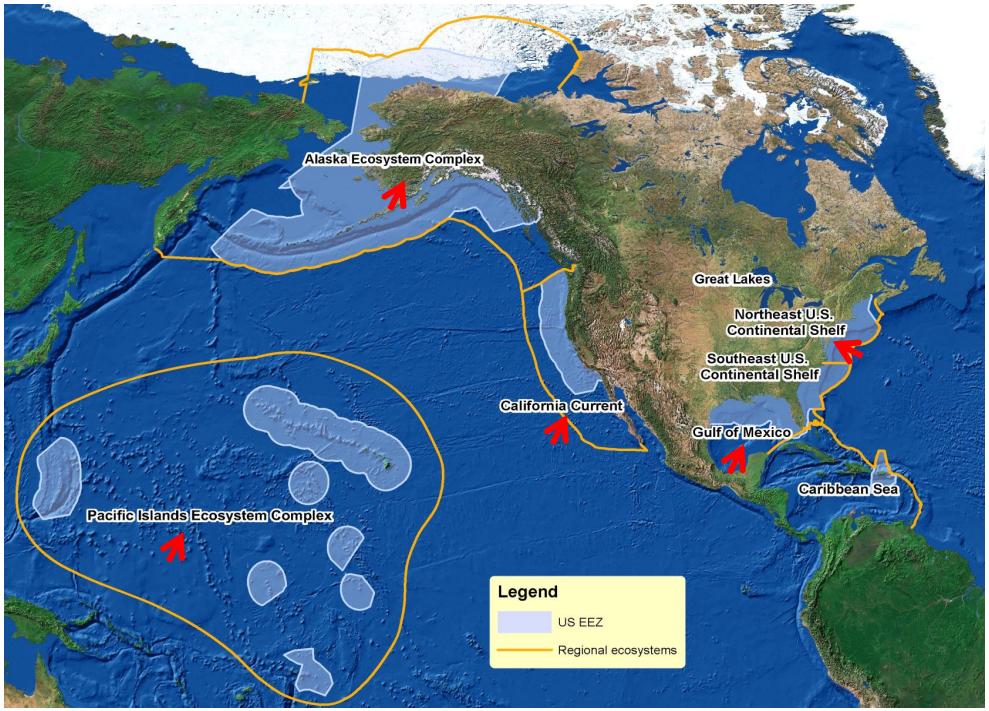
- The ultimate aim of the IEA is to improve decision-making in resource management.
- To help achieve this, there are a variety of outputs or products of the process that are relevant to policy-makers, managers, stakeholders. For example:
  - Communication of science through technical reports and scientific papers;
  - Direct (verbal and written) communication with managers and stakeholders of results of the IEA process to inform their management decisions (e.g. briefs on forecasted outcomes and trade-offs of alternative management strategies);
  - Web-based products with different levels of information to accommodate multiple audiences; easily updated;
  - Media such as webinars and videos for both technical and non-technical audiences.

Peer Review

- Rigorous science is the core of any IEA.
- Thus peer-review is essential for any technical products of the IEA.
- The diverse IEA products (including models and ecosystem and socio-economic analyses) will require distinct review structures and expertise, and in general such structure does not yet exist; these should come in time as the products see increasing use and application.
- In the meantime there are many mechanisms for review already used by NOAA that can be adopted and adapted as needed (some internal, some external, and some a mixture).

Progress Towards Implementation in the US

- Implementation is following a staged approach.
- Five of eight proposed regions currently are working on IEAs at various stages.
  - California Current
  - Gulf of Mexico
  - Northeast
  - Alaska
  - Pacific Islands
- The strategy reflects budget realities; each of the five has received some funding, those earlier in the sequence having received more.
- Each of the regions will be tailored to individual objectives, data availability, model choices, etc. (therefore distinctive); However all will address all steps in the process.



NOAA Coordination & Views

- This document has been developed in coordination with:
  - IEA program partners in multiple line office programs within NOS, OAR, NMFS, and NESDIS
  - Academic Program Partners (e.g. USF)
  - The SAB ESMWG

- Views: NOAA's IEA program is a cross-Line Office initiative that, following the process outlined in the "guidance" document, will continue to be developed, implemented, and informed by all partners to address a diverse suite of ecosystem management objectives nationwide.

Backup

NOAA's Proposed IEA Schedule

- California Current
- Gulf of Mexico
- Northeast Shelf
- Alaska Complex
- Pacific Islands

Followed by:

- Caribbean Sea
- Southeast Shelf
- Great Lakes

Order determined by series of criteria:

- regional NOAA capabilities to support IEA development
- emerging regional needs
- strength of NOAA statutory missions
- broad-based external partnerships (states, academia, regional govts., federal agencies)