

# NOAA's Integrated Ecosystem Assessments: Using ecosystem services to improve decision making

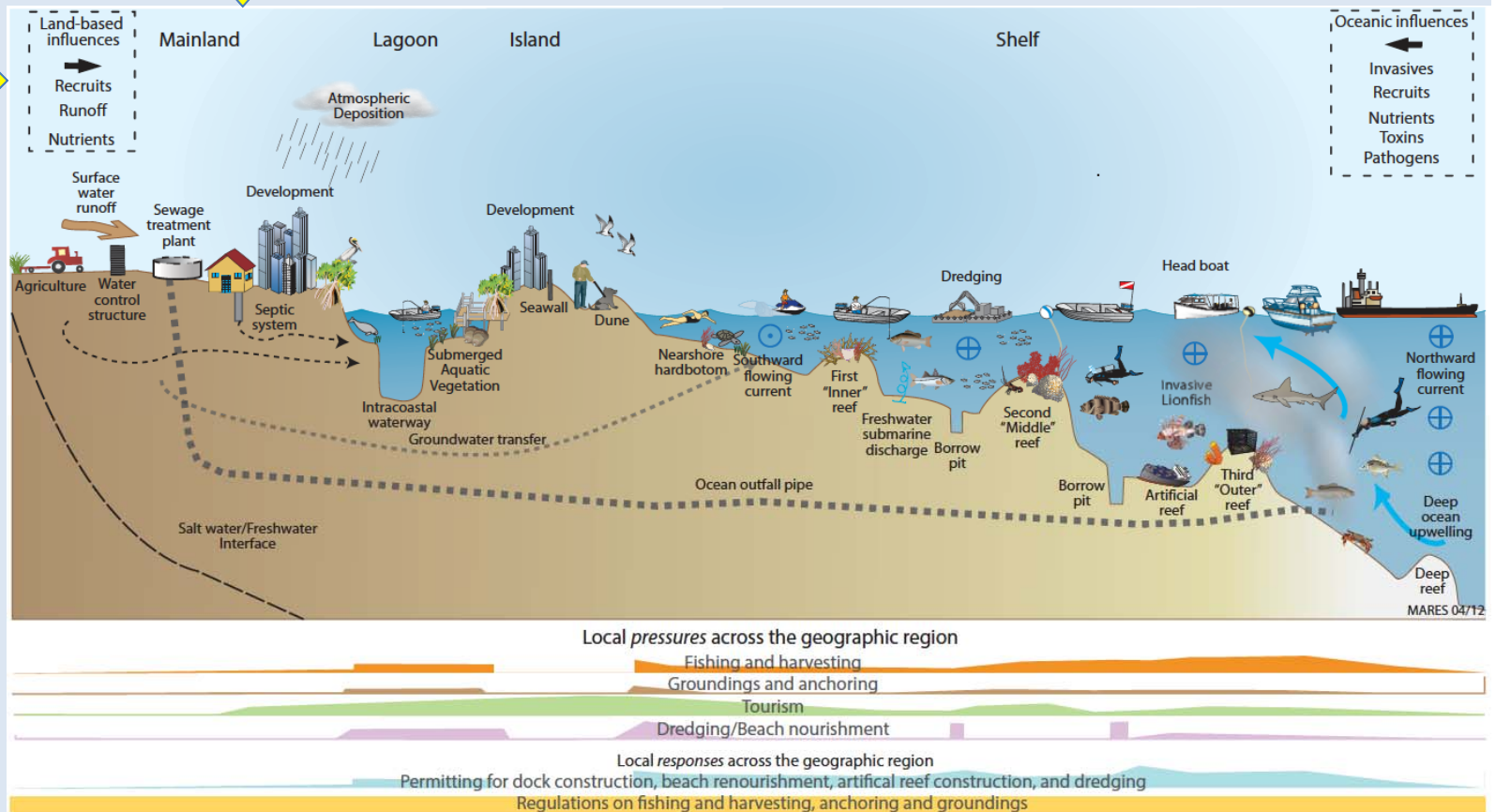
Christopher Kelble



# A New Era of Ocean Stewardship



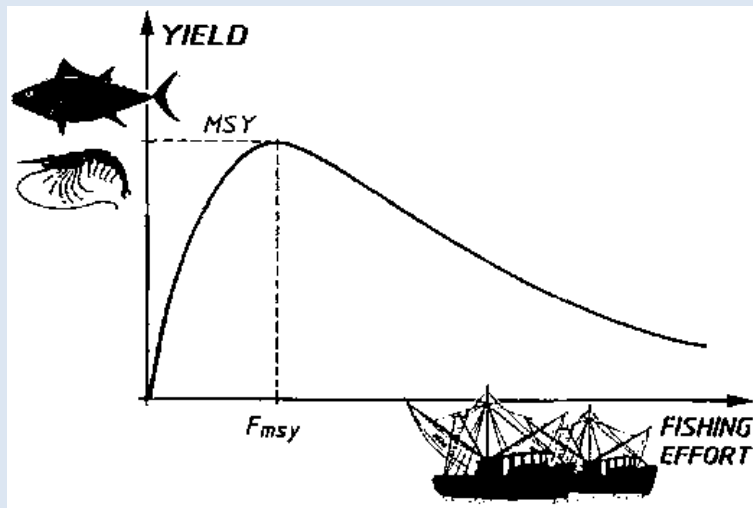
Single Species Management



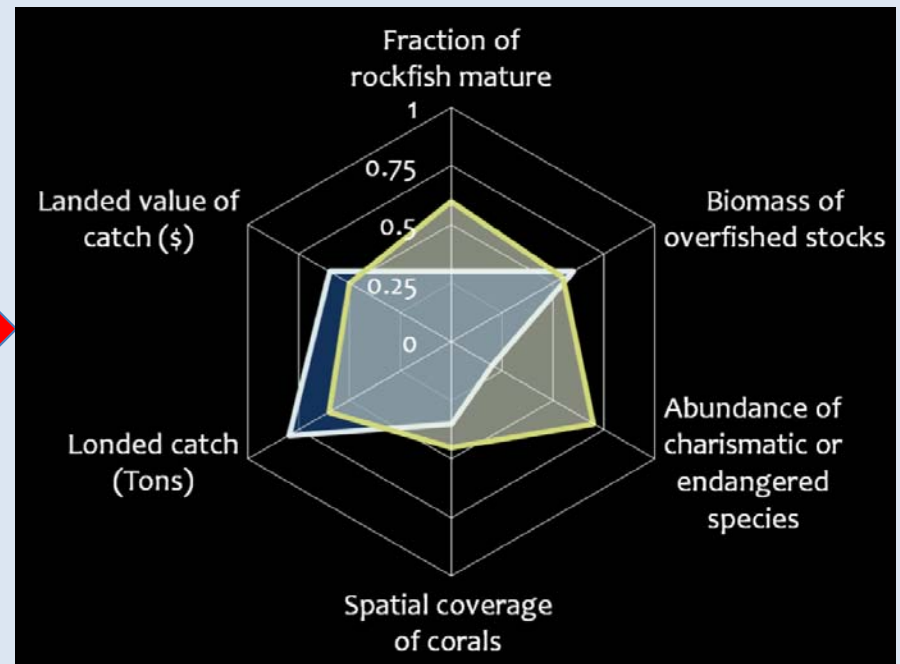
Ecosystem  
-Based  
Mgmt  
(EBM)

# IEAs are the Science to Inform EBM

**Stock Assessment Process :  
Single-Species Management**



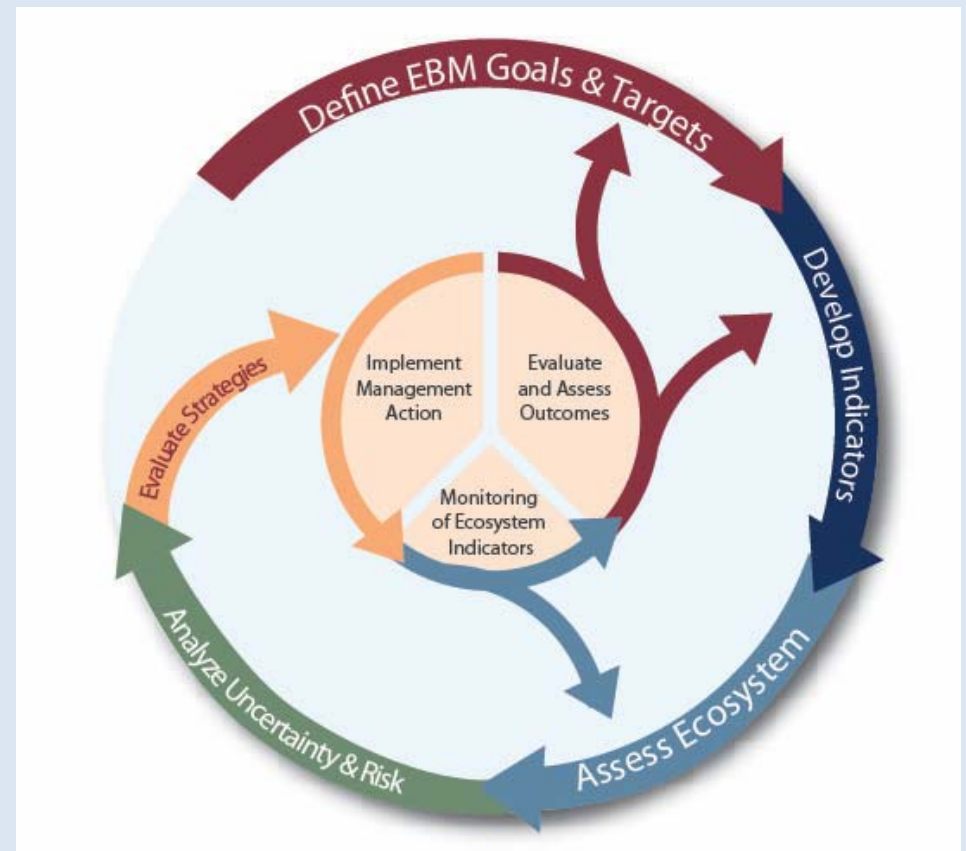
**Integrated Ecosystem Assessment:  
Ecosystem-Based Management**



# What is an IEA?

*A structure to assess ecosystem status relative to societal objectives and evaluate the holistic impact of potential management actions, thus informing management decisions*

- A decision-support process that synthesizes and analyzes diverse data and ecosystem model outputs
- It is modular, iterative, scaleable, and adaptable
- It shares a common national framework, yet with regional variation in implementation
- It provides assessments of the ecosystem across and within multiple ocean-use sectors



# Initial South Florida IEA = MARES



“reach a science-based consensus about the defining characteristics and fundamental regulating processes of a South Florida coastal marine ecosystem that is both sustainable and capable of providing the diverse ecosystem services upon which our society depend”

## 1. Define EBM Goals and Targets

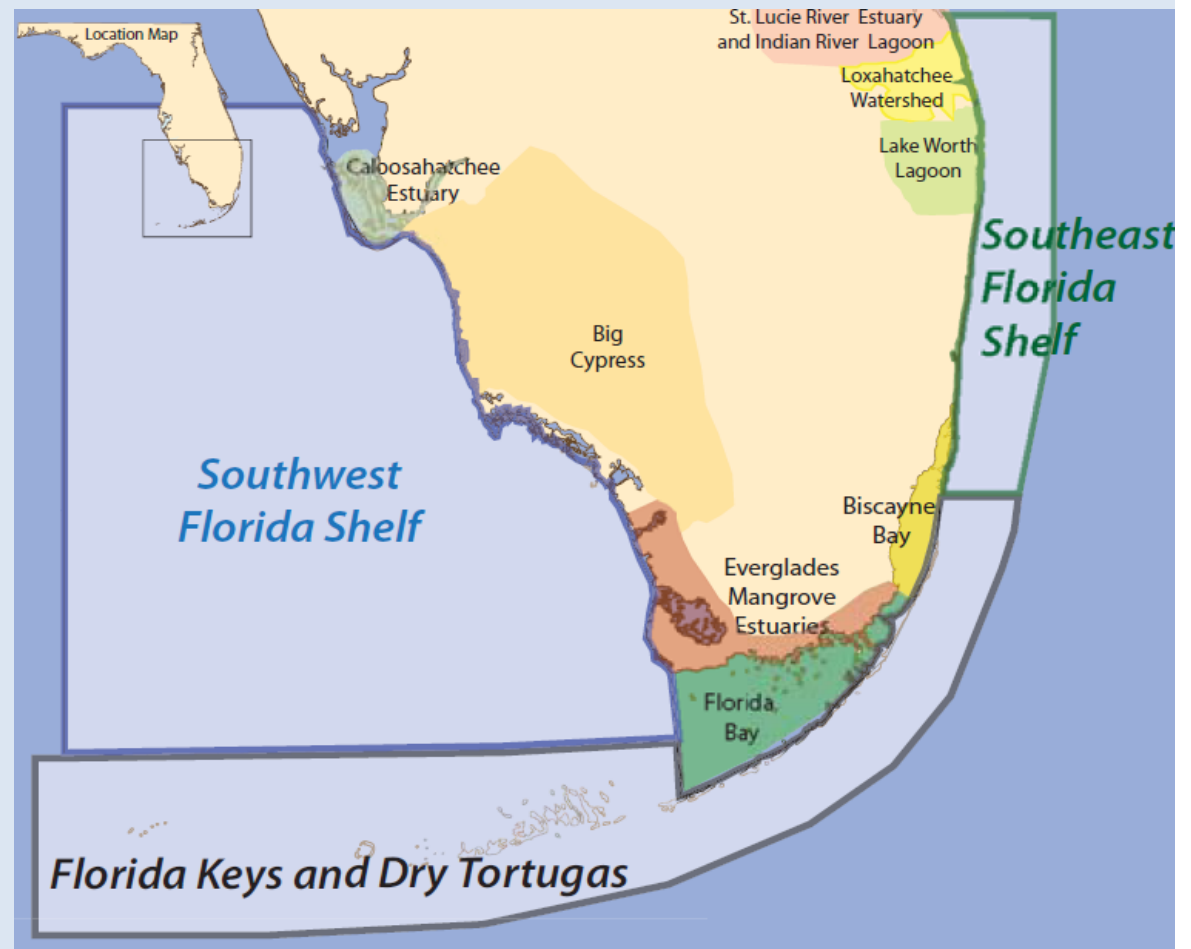
- Articulate EBM objectives
- Identify Ecosystem Threats
- Conceptualize the Ecosystem

## 2. Develop Ecosystem Indicators

- Both Biophysical and Human Dimensions, including Ecosystem Services
- Evaluate Potential Indicators

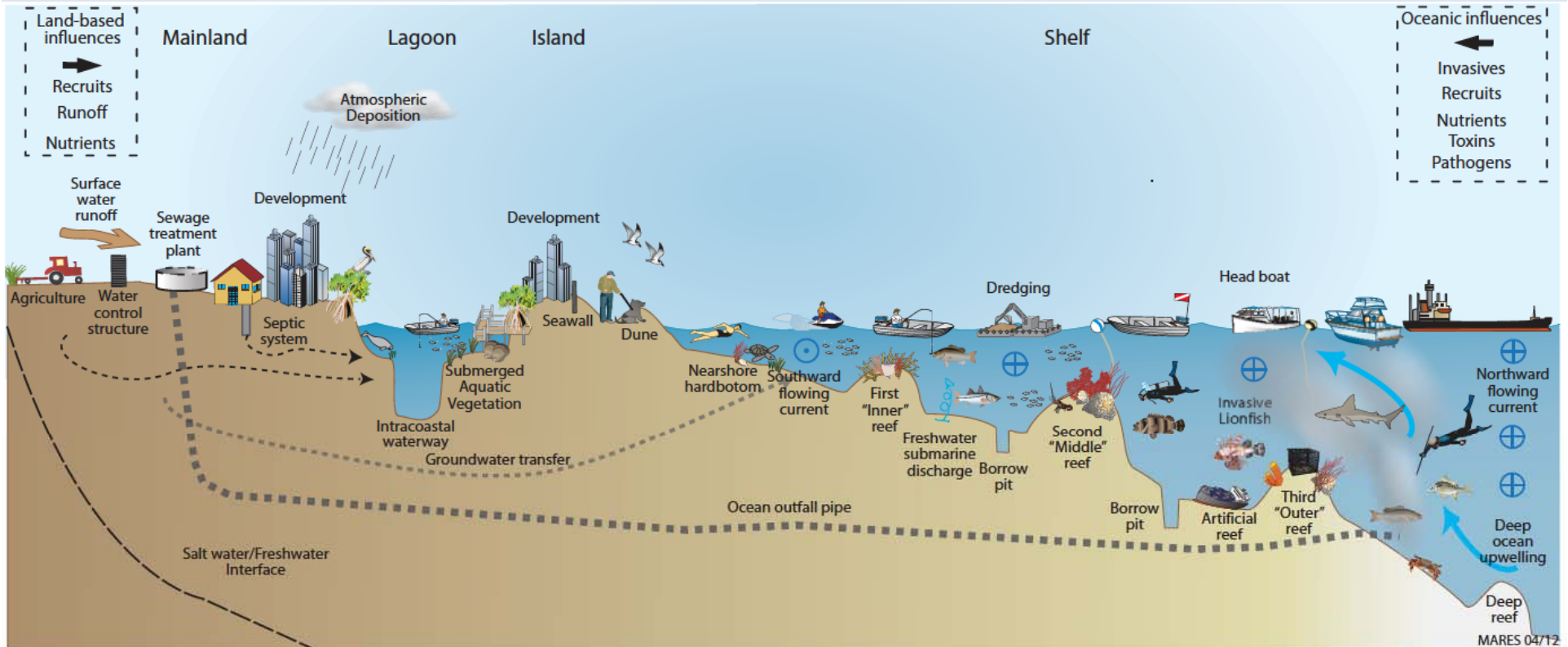
## 4. Analyze Risk and Uncertainty

- Semi-quantitative risk assessment for ecosystem states and services

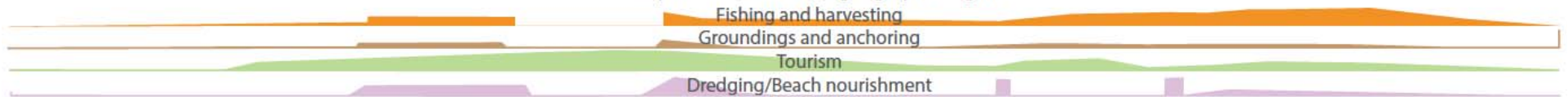




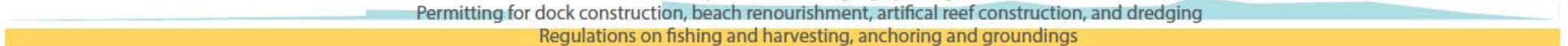
# Conceptualizing The Ecosystem



## Local pressures across the geographic region



## Local responses across the geographic region

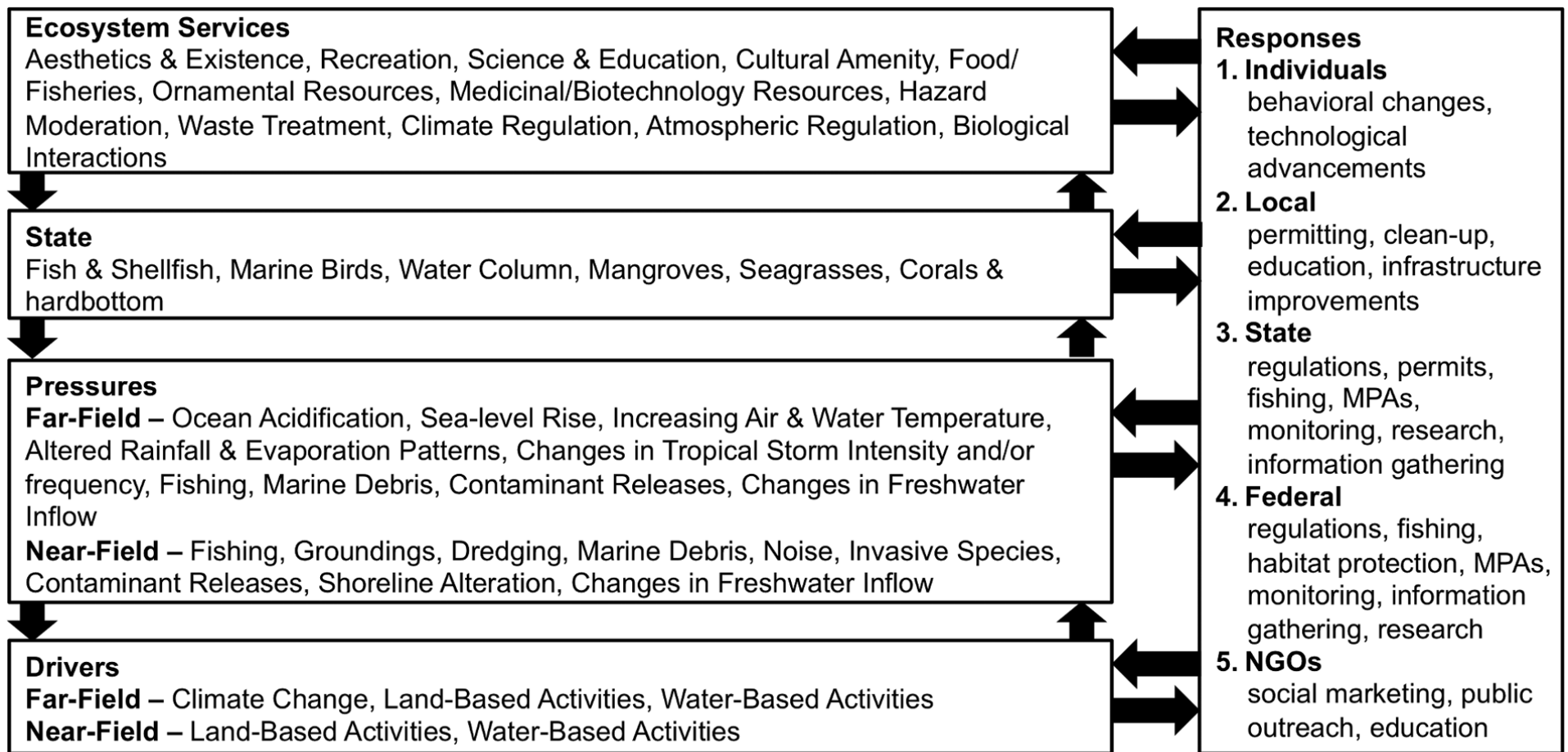


# EBM-DPSER Model



Identifies Focal Ecosystem Components

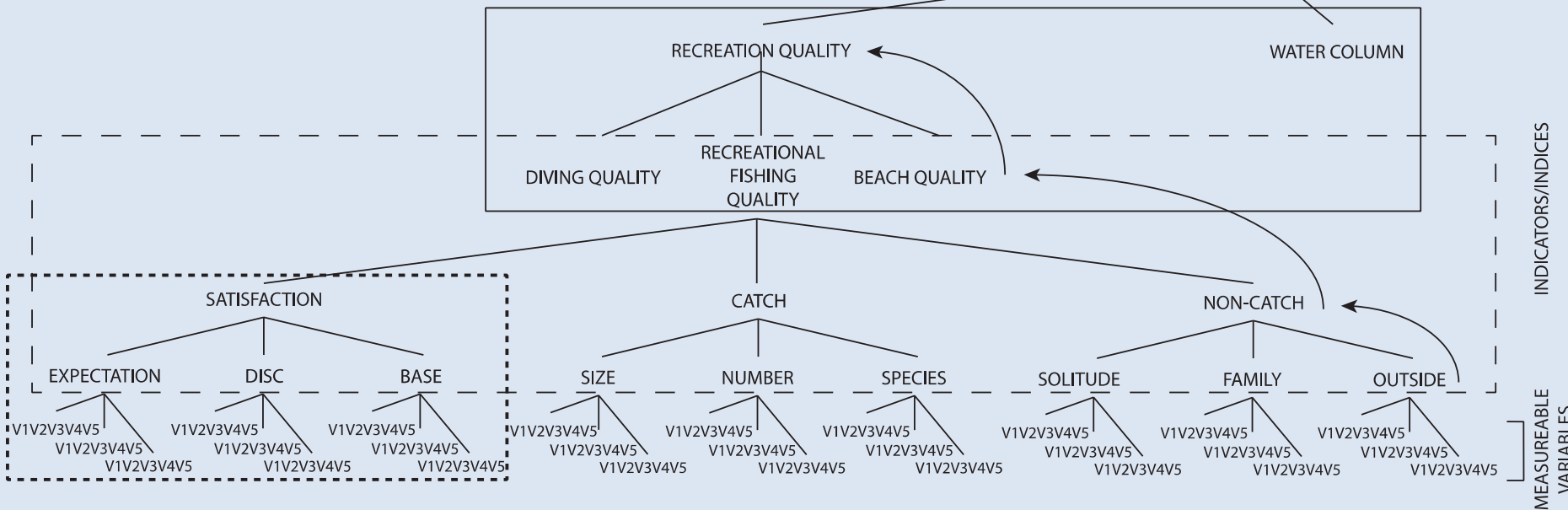
Merges ecosystem services with DPSIR



# Indicators:

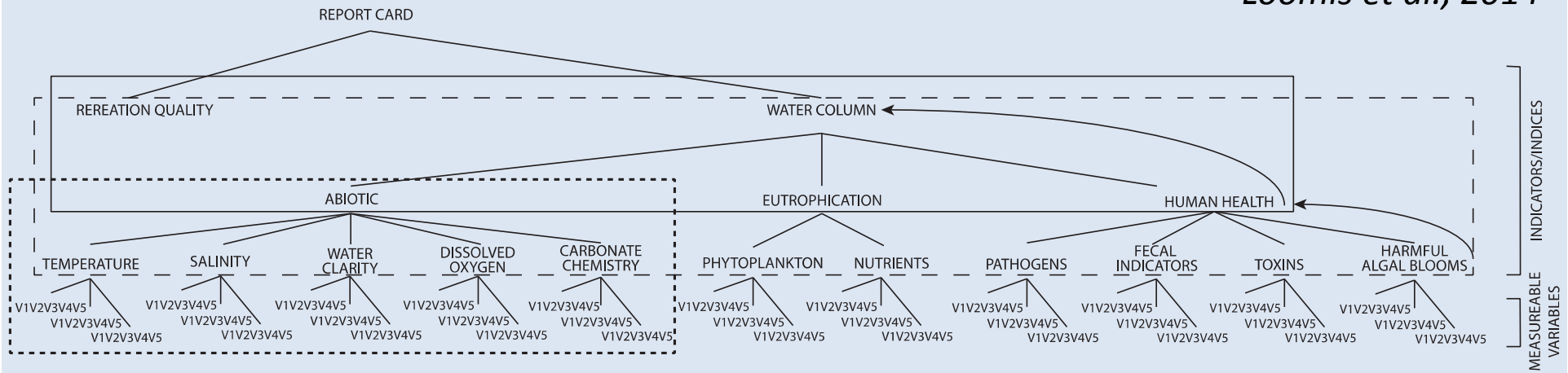
## Hierarchical, Recursive Relationship

### Social: Recreation Quality



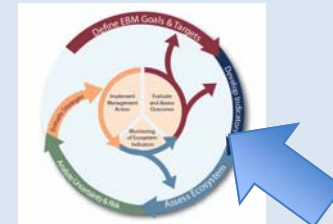
### Biophysical: Water Column

Loomis et al., 2014





# Setting Indicator Targets



## Vision

*Sustainable, producing desired levels of ecosystem services;  
Enhance ecological, economic values, & Human Well-Being*

## Conceptual Objectives

*Improve Habitat & Functional Quality, Provide Recreational Opportunities, Protect Cultural & Social Activities*

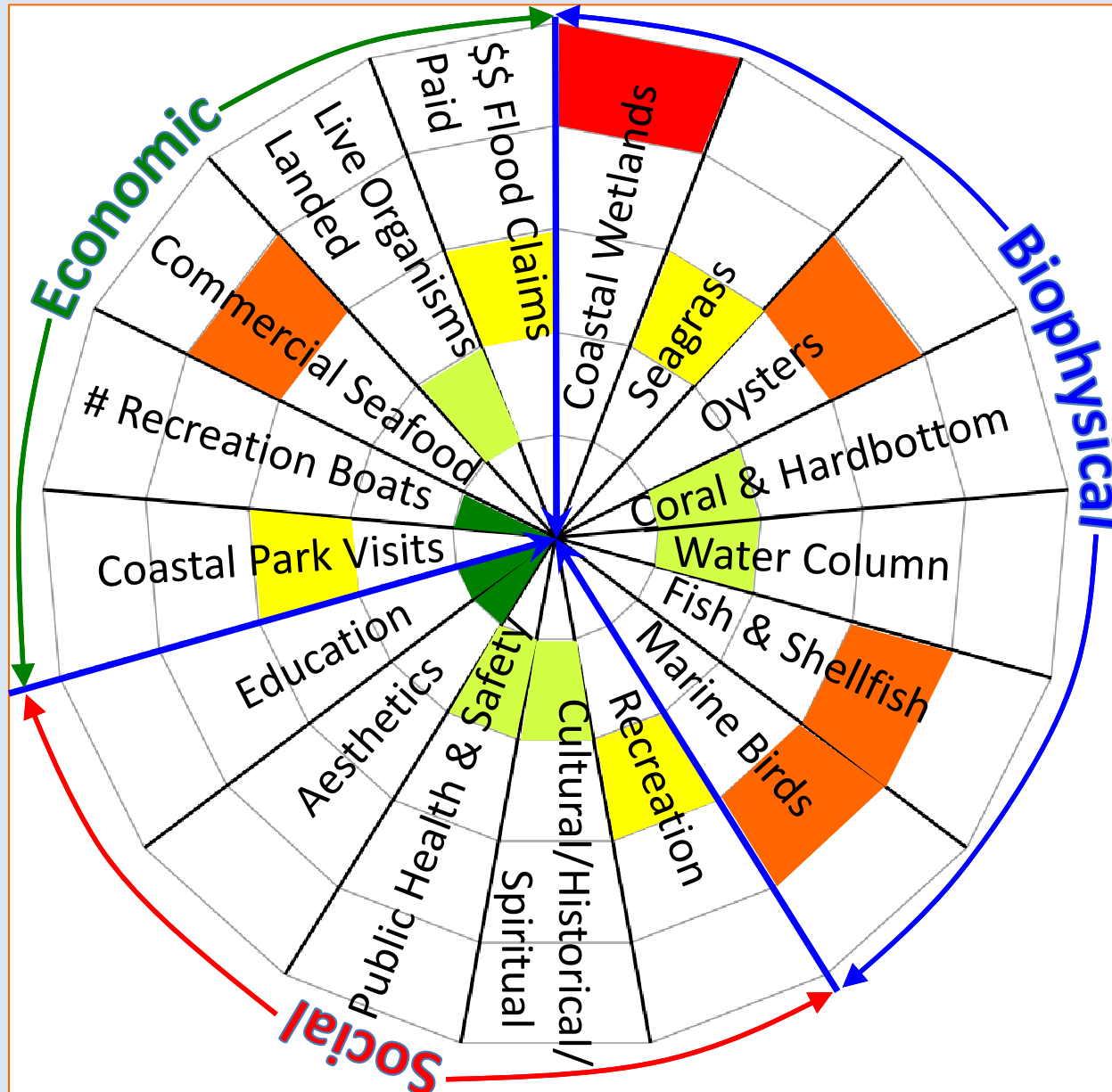
## Operational Objectives

*Minimize the magnitude, duration, and spatial extent of algal blooms in Florida Bay*

## Targets

<i>Optimal:</i>	<u>Chlorophyll <math>a</math> concentration:</u> Below Baseline
<i>Good:</i>	Equal to baseline
<i>Fair:</i>	Significantly above baseline, but trend is improving
<i>Poor:</i>	Significantly above baseline, with no trend
<i>Critical:</i>	Significantly elevated from baseline with degrading trend

# Ecosystem Assessment



# South Florida Coastal Ecosystem Services

## Cultural

Aesthetic and Existence—Provide aesthetic quality of aquatic and terrestrial environments (visual, olfactory, and auditory), therapeutic benefits, pristine wilderness for future generations.

Recreation—Provide suitable environment/setting for beach activities and other marine activities such as fishing, diving, snorkeling, motor and non-motor boating.

Science and Education—Provide a living laboratory for formal and informal education and for scientific research.

Cultural Amenity—Support a maritime way of life, sense of place, maritime tradition, spiritual experience.

## Provisioning

Food/Fisheries—Provide safe-to-eat seafood.

Ornamental Resources—Provide materials for jewelry, fashion, aquaria, etc.

Medicinal/Biotechnology Resources—Provide natural materials and substances for inventions and cures.

## Regulating

Hazard Moderation—Moderate to extreme environmental events (i.e., mitigation of waves and storm surge in the case of hurricanes).

Waste Treatment—Retain storm water, remove nutrients, contaminants, and sediment from water, and dampen noise. etc.

Climate Regulation—Moderate temperature and influence/control other processes such as wind, precipitation, and evaporation.

Atmospheric Regulation—Exchange carbon dioxide, oxygen, mercury, etc.

Biological Interactions—Regulate species interactions to maintain beneficial functions such as seed dispersal, pest/invasive control, herbivory, etc.

# Next Steps

- Evaluate ecosystem services under different Management and Climate Scenarios
- Connect Biophysical Ecosystem State to Service Production (Ecosystem Service Production Functions)
- Develop model frameworks that include prediction of ecosystem services

# Acknowledgements

