

Integrated Ecosystem Assessment (IEA): Overview

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**NWFSC Economics and Human Dimensions
Science Program Review, August 2017**



Marine ecosystems are integrated socio-ecological systems

INTEGRATED SOCIO-ECOLOGICAL SYSTEM OF THE CALIFORNIA CURRENT

FOCAL ECOSYSTEM COMPONENTS

Ecological Integrity

Diversity, Seabirds, Marine mammals, Salmon, Forage species, Groundfish, Species interactions



Human Wellbeing

Conditions, Connections, Capabilities (e.g., safety, community, livelihood)



MEDIATING COMPONENTS

Habitat

Marine, Estuarine, Freshwater



Human Activities

(e.g., fishing, farming, mining, recreation, research, education, activism, restoration, management)



Local Social Systems

(e.g., laws, policies, economies, institutions, social networks, hierarchies, cultural values, built environment)



DRIVERS AND PRESSURES

Climate & Ocean Drivers

(e.g., climate, ocean upwelling)



Social Drivers

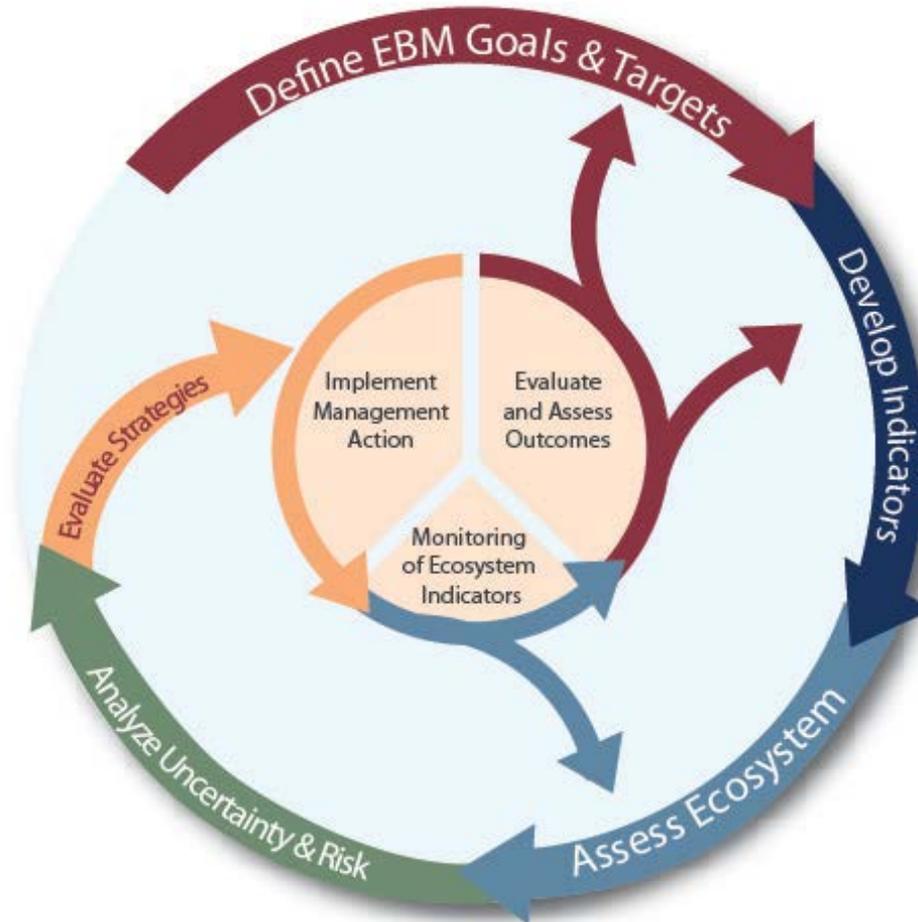
(e.g., population growth and settlement patterns, national and global economic and political systems, historical legacies, dominant cultural values, and class systems)

What is IEA?

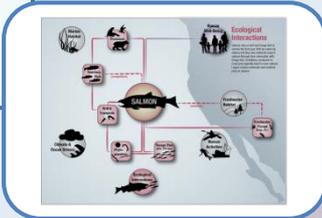


- **IEA definition (Levin et al. 2009, PLoS Biology)**
 - “a **framework for organizing science** in order to inform decisions in marine ecosystem-based management”
 - “a **formal synthesis and quantitative analysis** of information on relevant **natural and socioeconomic** factors, in relation to specified **ecosystem management objectives**”
 - Emphasis is on the **framework, tools** and **products** rather than “**the IEA program**” (Harvey et al. 2017, ICES J Mar Sci)

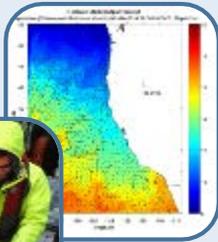
The IEA Framework



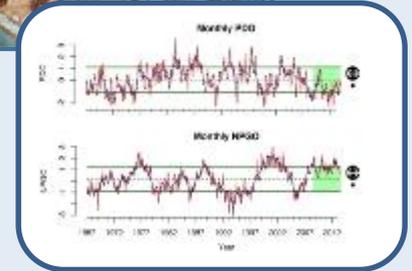
SCOPING EFFORTS and CONCEPTUAL MODELS frame the issues.



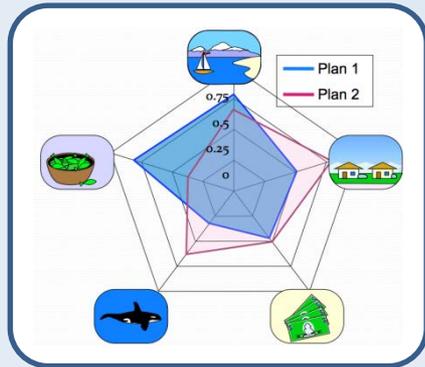
Is the ecosystem "healthy"?



Screen appropriate INDICATORS.
Field and remote data provide indices on **STATUS AND TRENDS.**



ACTIONS are taken and evaluated, and then the next iteration of the IEA loop begins.

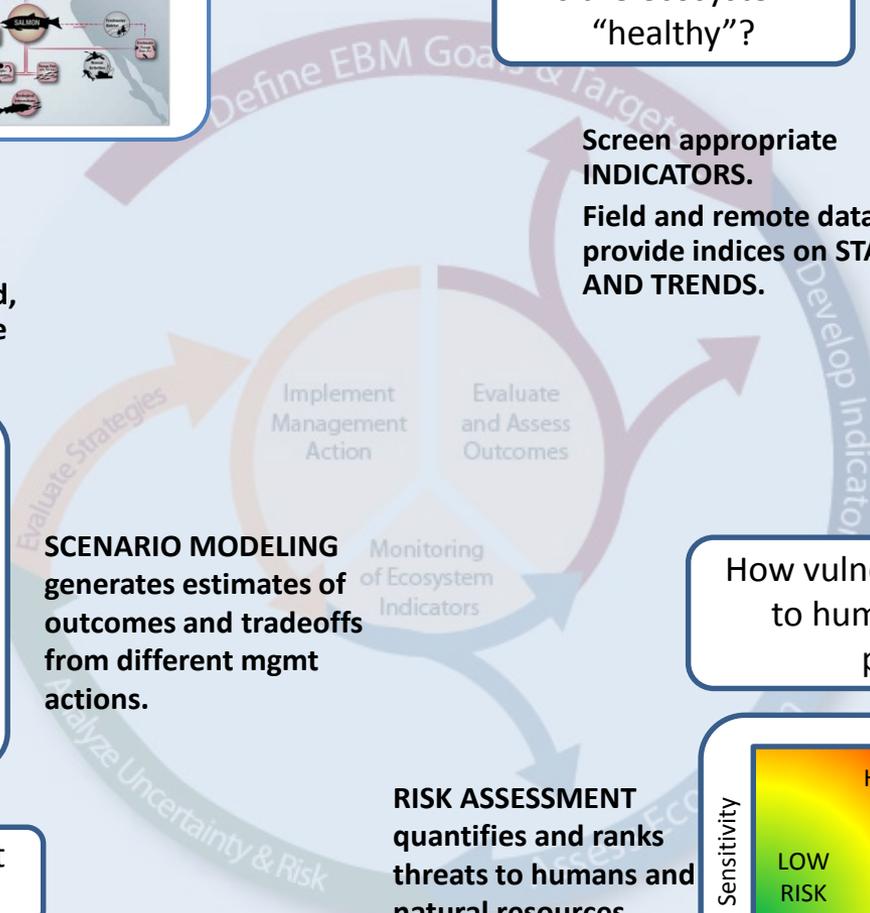
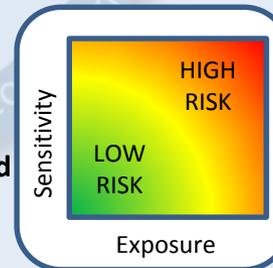


SCENARIO MODELING generates estimates of outcomes and tradeoffs from different mgmt actions.

How vulnerable is the ecosystem to human uses and natural perturbations?

What are the management options?

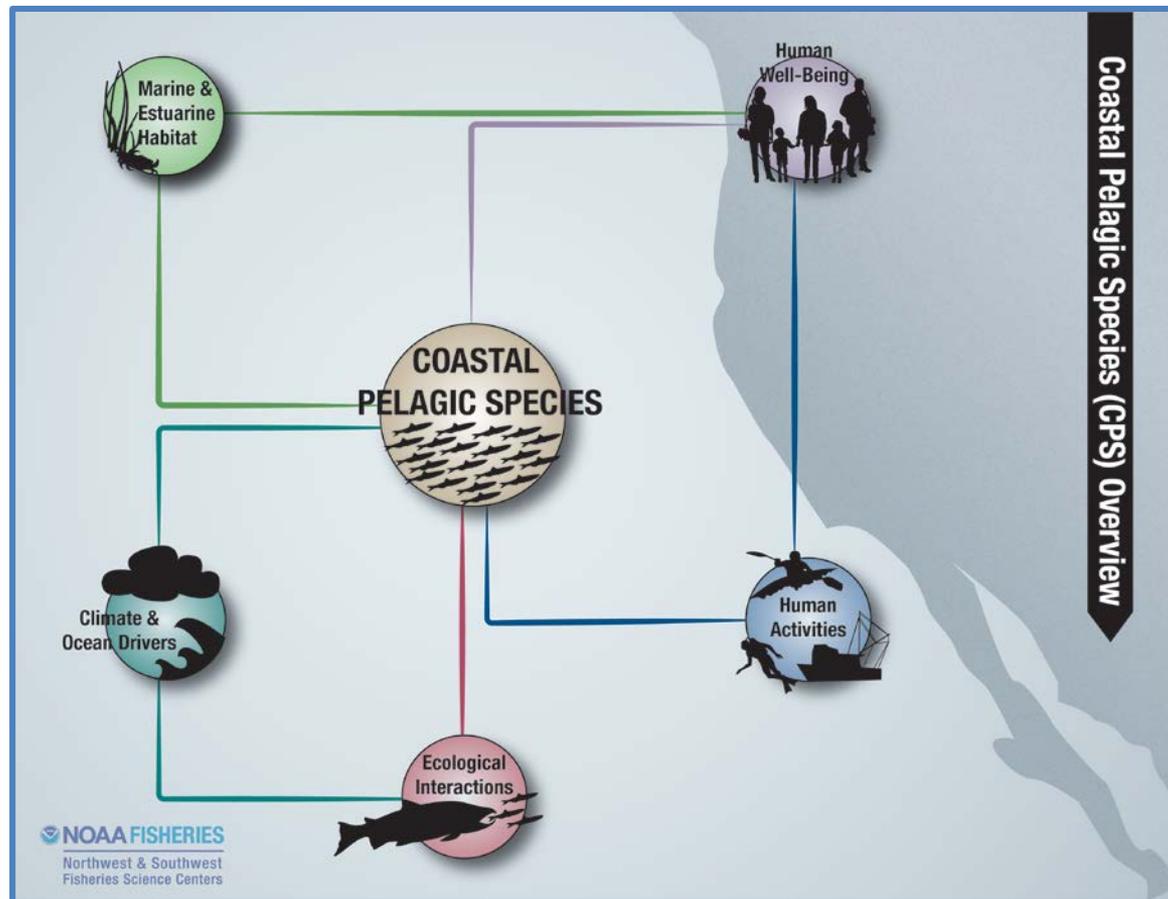
RISK ASSESSMENT quantifies and ranks threats to humans and natural resources.



For example...



SCOPING CONTEXT: climate change/variability is a concern on the West Coast;
MSA mandates that we promote healthy, sustainable fish stocks *and* coastal communities

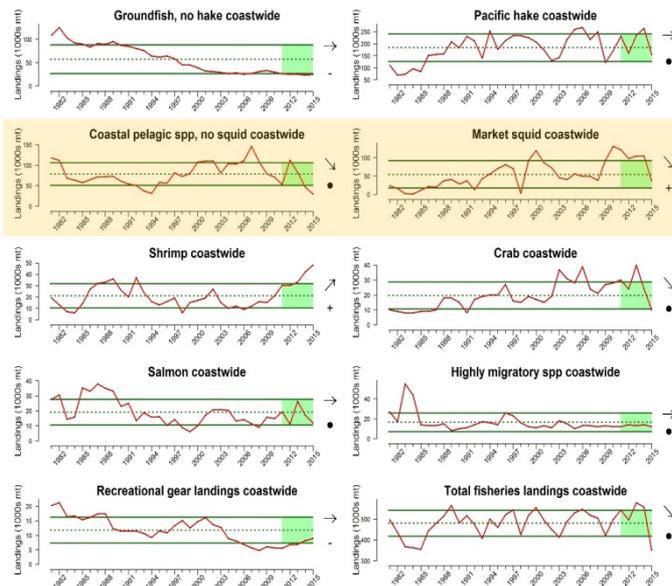
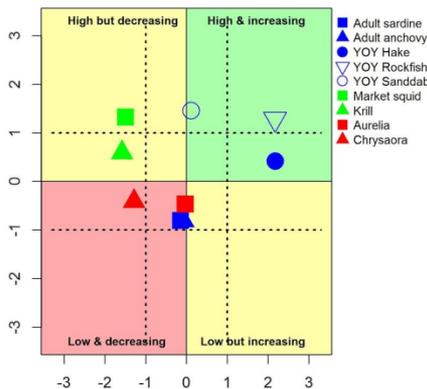
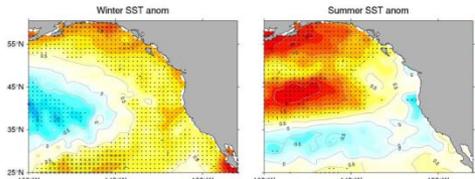
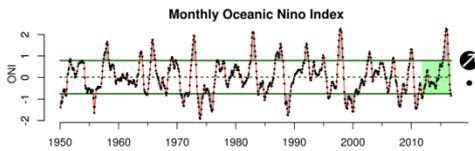


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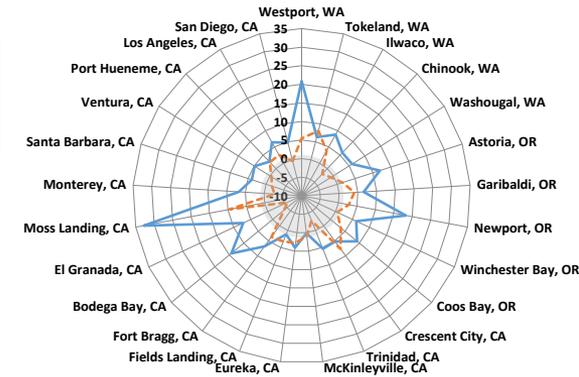


SCOPING CONTEXT: climate change/variability is a concern on the West Coast; MSA mandates that we promote healthy, sustainable fish stocks *and* coastal communities

INDICATORS: we have screened and now track many indicators of local and regional climate, fish stock sizes, fishery landings, revenues, and social vulnerability



— Commercial Fishing Dependence (2014) - - - Vulnerability Index (2015)



For example...

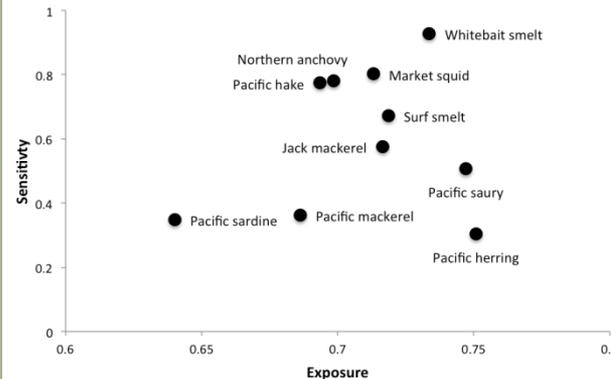


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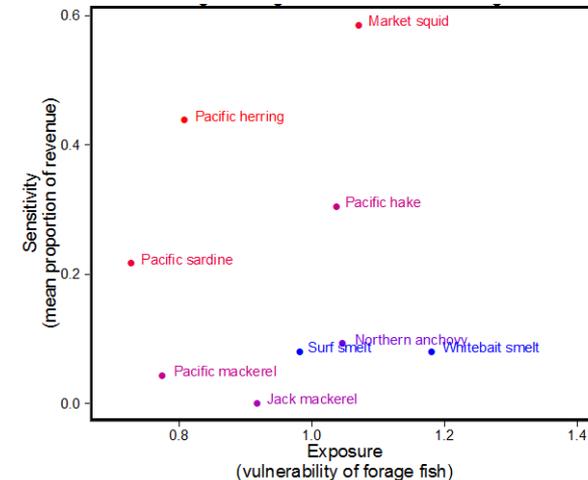
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RISK ASSESSMENT: we're exploring risks that climate change poses both to focal species and to the fisheries and ports that depend on them

Fish stock risk to climate change:



Fishery risk to climate change:



For example...



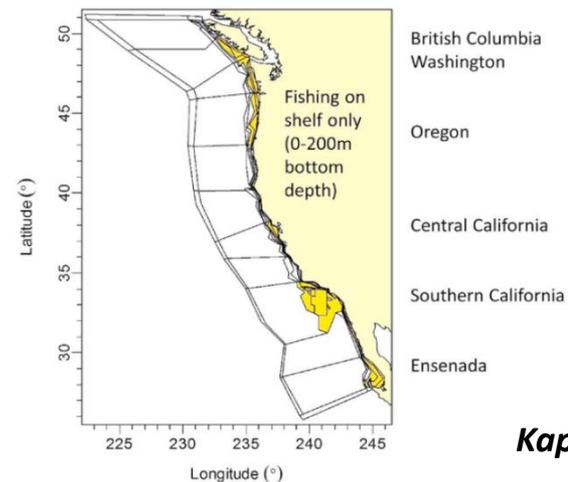
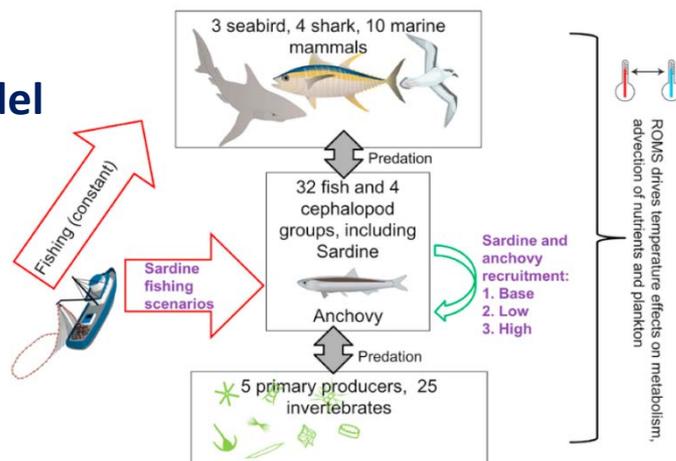
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MANAGEMENT STRATEGY EVALUATION: we have operational models that could be used to explore climate-driven scenarios and tradeoffs in ecology and socioeconomics

ATLANTIS ecosystem model (Isaac Kaplan)



Kaplan et al., in press

IEA engagement with management partners



California Current IEA team engagement with the PFMCM in FY17

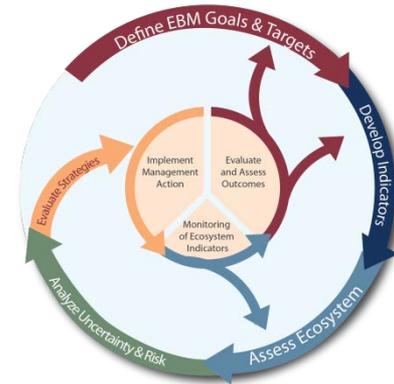


1. Annual ecosystem status report, March 2017

- Highlighted the decline of the Warm Blob and El Niño, and described observed & anticipated ecological responses
- Presented status and trends of indicators of key species, fisheries, non-fishing human activities, and social vulnerability of coastal communities

2. Technical reviews of CCIEA analyses and products by SSC

- Time series analyses of several indicators
- Detection of ecosystem thresholds and early warning indexes
- Fishery participation under changing climate **(Dan Holland)**



3. Described climate and food web drivers of sablefish recruitment

4. Assisting with development of the EBFM Road Map and the Regional Action Plan for climate science

5. Forthcoming FEP initiative will likely involve focus on climate change and/or coastal communities



IEA engagement with management partners



Tribal Communities

- Examining impacts of ocean acidification on tribal communities (**Melissa Poe**)

State of Washington

- Developing conceptual models and indicators for marine spatial planning
- Supporting Puget Sound Partnership with EBM and restoration of Puget Sound

CA Drift Gillnet Fishery

- Providing fishers with near-real time estimates of likelihood of protected species bycatch

West Coast Regional Office

- Assessing human-marine mammal interactions

National Marine Sanctuaries

- Developing conceptual models
- Quantitative indicators for Condition Reports
- Risk assessments

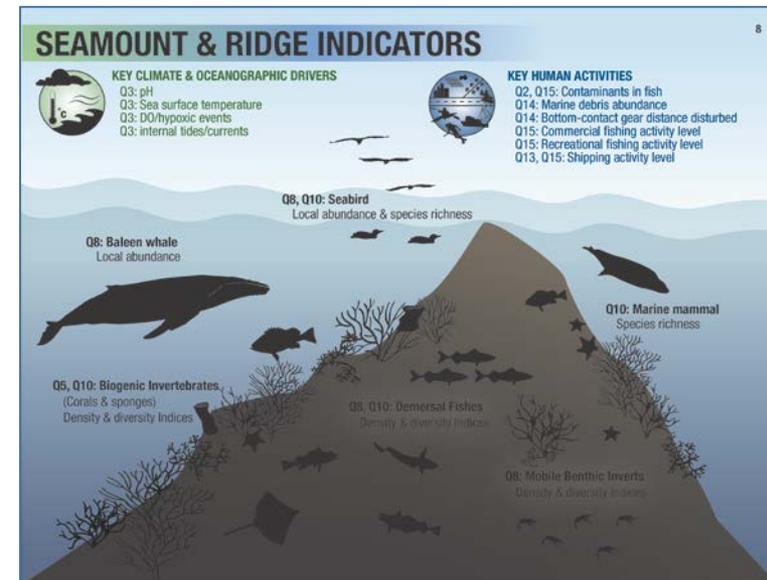
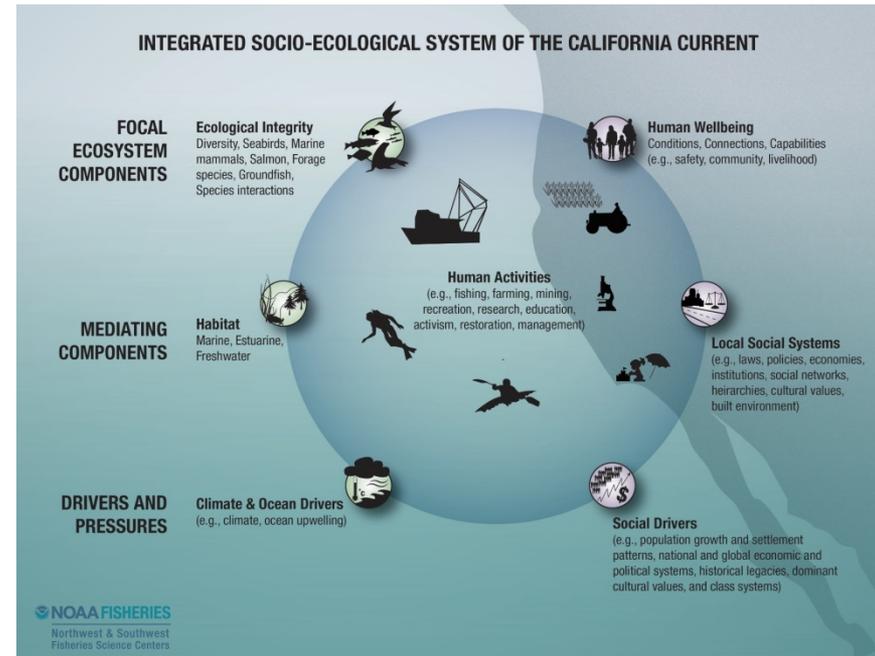


Image: Su Kim

Looking forward



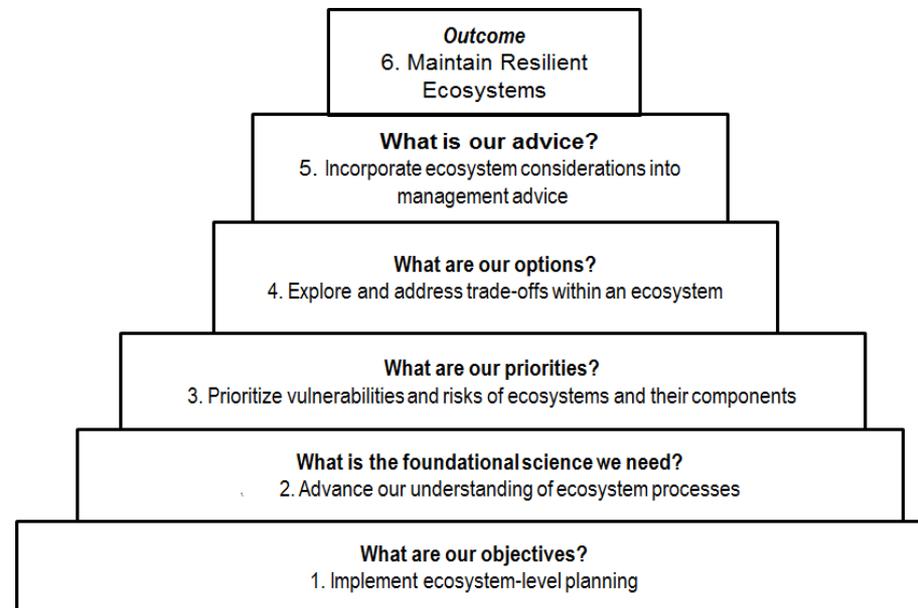
- **IEA team will continue to engage with regional partners and develop science tools that support decision-making**
 - In particular, risk assessments and scenario analyses that emphasize outcomes and tradeoffs spanning ecological and social domains



Looking forward



- **IEA team will continue to engage with regional partners and develop science tools that support decision-making**
 - In particular, risk assessments and scenario analyses that emphasize outcomes and tradeoffs spanning ecological and social domains
- **IEA science will be a key part of new agency initiatives, and hopefully become a more common framework for doing NOAA science**



The six “Guiding Principles” of the NOAA EBFM Road Map

Questions and Discussion

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