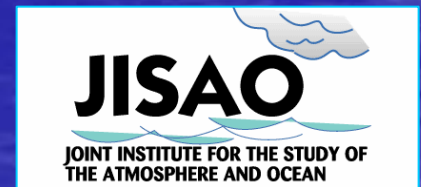


# Overview of Alaska Ecosystem Indicators Relative to EAM/EAF Objectives

Andrea Belgrano<sup>2</sup>, Jennifer Boldt<sup>2</sup>, Patricia Livingston<sup>1</sup>, Jeffrey Napp<sup>1</sup>

<sup>1</sup>Alaska Fisheries Science Center Seattle, WA, USA

<sup>2</sup>JISAO, University of Washington, Seattle, WA USA



# Alaska Objectives for Ecosystem Protection:

- **Maintain predator-prey relationships**
  - pelagic forage availability
  - spatial/temporal conc. of fishery impact on forage fish
  - removals of top predators
  - introduction of non-native species

**CLIMATE and FISHING**



- **Maintain diversity**
  - species diversity
  - functional (trophic, structural habitat) diversity
  - genetic diversity

- **Maintain energy flow and balance**
  - human-induced energy redirection
  - system impacts attributable to energy removal

## What is the definition of an ecosystem approach to management?

NOAA defines an ecosystem approach to management as one that is:

- Adaptive
- Regionally directed
- Takes account of ecosystem knowledge
- Takes account of uncertainty
- Considers multiple external influences
- Strives to balance diverse societal objectives

# National Level Guidance: NOAA EPAP

## NOAA's Ecosystem Principles Advisory Panel

- Ability to predict ecosystem behavior is limited
- Ecosystems have real thresholds and limits
- Change may be irreversible once limits are exceeded
- Multiple scales interact within and among ecosystems
- Components of ecosystems are linked
- Ecosystem boundaries are open
- Ecosystems change with time

# Regional Management Objectives: NPFMC

North Pacific Fishery Management Council EAF objectives after programmatic environmental impacts of groundfish fishery management plans:

- Prevent overfishing
- Promote sustainable fisheries and communities
- Preserve food web
- Manage incidental catch and reduce bycatch and waste
- Avoid impacts to seabirds and marine mammals
- Reduce and avoid impacts to habitat
- Promote equitable and efficient use of fishery resources
- Increase Alaska Native consultation
- Improve data quality, monitoring and enforcement

# Regional Management Objectives: PSMFC

Pacific States Marine Fish Commission review of EAF objectives:

- Employ spatial representation
- Recognize significance of climate/ocean conditions
- Emphasize food web interactions
- Ensure broad societal goals are taken into account
- Utilize and expand scope of monitoring
- Acknowledge and respond to higher levels of uncertainty
- Pursue ecosystem modeling/research
- Seek improved habitat information

FAO	COMPASS	NOAA EAM	PSMFC	EPAP	NPFMC	AK Eco Cons. Section
Limit ecosystem impacts	Protect ecosystem structure, functioning, and key processes,	Takes ecosystem knowledge into account,	Broad scope of monitoring, pursue ecosystem modeling research	Ecosystems have real thresholds and limits	Prevent overfishing, manage incidental catch and reduce bycatch, waste, avoid seabird and marine mammal impacts, avoid habitat impacts	Maintain energy flow and balance
Maintain ecological relationships between species	Account for species interactions	Takes ecosystem knowledge into account	Emphasize food web interactions	Diversity is important, components are linked	Preserve food web	Maintain predator prey relationships
Management measures compatible across entire resource distribution	Place-based	Regionally directed	Employ spatial representation	Multiple scales interact among and within ecosystems, boundaries are open	(regional measures)	(divided into regions)

FAO	COMPASS	NOAA EAM	PSMFC	EPAP	NPFMC	AK Eco Cons. Section
-----	---------	-------------	-------	------	-------	----------------------------

Precaution in decisions due to ecosystem uncertainty		Incremental, adaptive	Acknowledge high levels of uncertainty	Prediction of ecosystem behavior is ltd., change may be irreversible, ecosystems change with time	Improve data quality, monitoring, and enforcement	Maintain diversity
Governance ensures both human and ecosystem well-being and equity	Integrates ecological, social, economic perspectives	Balances diverse societal objectives, collaborative	Account for broad societal goals		Promote sustainable fisheries and communities, equitable use, Native consultation	Understand human impacts
	Interconnect edness among air, land, sea	Multiple, external influences	Recognize climate/ocean conditions			Incorporate climate into analyses



# Common Objectives

## WHAT

- Protect ecosystem structure and function (including diversity and habitat)
- Protect key ecosystem processes
- Account for food web interactions

## HOW

- Manage regionally
- Incorporate precaution into decisions
- Integrate broad societal goals
- Acknowledge multiple, external influences, including climate

## Comparison of Alaska Groundfish FMP Goals to indicators in Alaska Ecosystem Considerations Section.

<b>Groundfish FMP Goals</b>	<b>Ecosystem Considerations Indices</b>
Prevent overfishing	Status of stocks, annual surplus productivity
Promote sustainable fisheries and communities	Fishing overcapacity programs
Preserve food web	Many indices of pelagic forage availability, spatial/temporal conc. of fishery impact on forage fish, removals of top predators, introduction of non-native species
Manage incidental catch and reduce bycatch and waste	Prohibited species, discards, bycatch
Avoid impacts to seabirds and marine mammals productivity, and chronology trends	Seabird and mammal incidental take, population abundance,
Reduce and avoid impacts to habitat	EFH research, effects of fishing gear on habitat research
Promote equitable and efficient use of fishery resources	Fishing overcapacity programs, groundfish fleet composition
Increase Alaska native consultation	Alaska Native Traditional Environmental Knowledge of climate regimes
Improve data quality, monitoring and enforcement	

# Possible Enhancements to Indicators

Improved system level indicators for Predator/prey relationships:

- Body-size
- Predator/prey mass ration (PPMR)
- Trophic efficiency
- Trophic level

# Possible Enhancements to Indicators

## Improved system level indicators for Diversity

- Species body-size
- Beta diversity
- Species richness
- Species rank

# Possible Enhancements to Indicators

Improved system level indicators for Energy flow/balance:

- Trophic efficiency
- Trophic level
- Total system throughput
- Primary production

# Further Considerations

- Restructure Ecosystem Assessment Objectives
- Establish and maintain system level indicators to relate to chosen objectives
- Evaluate strategies/timing of communicating assessment results