



Ecosystem Approach to Fisheries Management Guidance Document

**Sustainable Fisheries Goal
Implementation Team**

June 2, 2016

MAFMC EAFM Decision

- Council decided following National SSC IV to develop an Ecosystem *Approach* to Fisheries Management Guidance Document (PFMC approach)

EAFM Definition

- An Ecosystem Approach to Fisheries Management **recognizes** the biological, economic, social, and physical **interactions** among the components of ecosystems and attempts to achieve optimum yield taking those interactions into account.

EA FM

- Approach is to work within the existing management paradigm to address ecosystem considerations

Box 1. Definitions - ultimately we are **attempting to manage fisheries within a broader ecosystem context compared to traditional single species approaches**

Ecosystem based fisheries management or EBFM attempts to manage the ecosystem as an entity to account for species/interactions of interest.

Ecosystem approach to fisheries management or EAFM attempts to manage species while considering the broader interactions within the ecosystem.

Adapted from Link 2010

EAFM Goal

- To manage for ecologically sustainable utilization of living marine resources while maintaining ecosystem productivity, structure and function

EAFM Goal

- To manage for ecologically sustainable utilization of living marine resources while maintaining ecosystem productivity, structure and function
- **Sustainable utilization – meets the needs of the present without compromising the ability of future generations to meet their own needs.**

(Bruntland Commission, FAO 1987)

EAFM Guidance Document

- Provides an umbrella for coordination of ecosystem considerations across existing FMPs
- Non-regulatory document designed to provide policy guidance with regulatory actions taken through existing FMP structure

EAFM Guidance Document

- Development coincided with Council Visioning project
- Ecosystem related issues ranked high on the list of concerns raised by stakeholders across **all user groups**

EAFM Guidance Document Focus

1. Forage/low trophic level species considerations
2. Effects of climate change and variability on abundance and distribution of fish stocks; ramifications for existing management approaches/programs
3. Interactions - climate, fleets, species (predation, competition) and their effects on sustainable harvest policy

EAFM Guidance Document Focus (cont.)

4. Improve incorporation of habitat conservation and management objectives in the current management process (including water quality issues)

Social and economic considerations were integrated throughout the process

Ecosystem Workshops

Purpose

- Evaluate science (and policy) aspects of each issue
- Developed white papers which include recommendations for best practices to be incorporated into Council's EAFM operational guide

EAFM White Papers

- Detailed description and evaluation of each primary issue (**habitat** write-up incorporated directly into guidance document)
- Guidance document provides summary and synthesis “under one roof”

Guidance v FEP

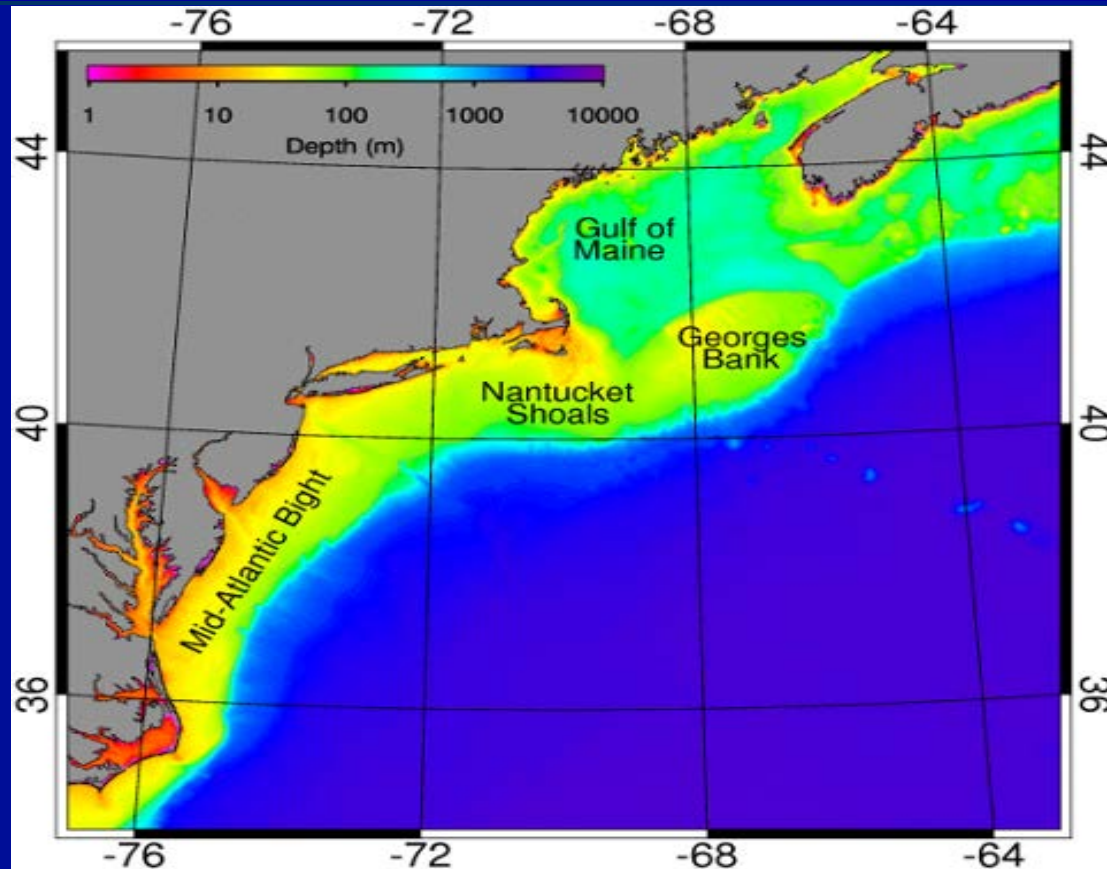
- FEP=Fishery Ecosystem Plan
- MAFMC managed species exist within multiple ecosystems including estuaries (state waters), NELME, South Atlantic and Canadian “ecosystems”
- Council has limited jurisdictional authority (NY-NC)
- Makes FEP development for the ‘Mid-Atlantic’ infeasible

6. Description of the Northeast Large Marine Ecosystem (NELME)

Provided by the Northeast Fisheries
Science Center (given in Appendix i)

Comprehensive treatment of the major
ecosystems provided in Climate White
Paper

Bathymetric map of the Northeast Continental Shelf Large Marine Ecosystem

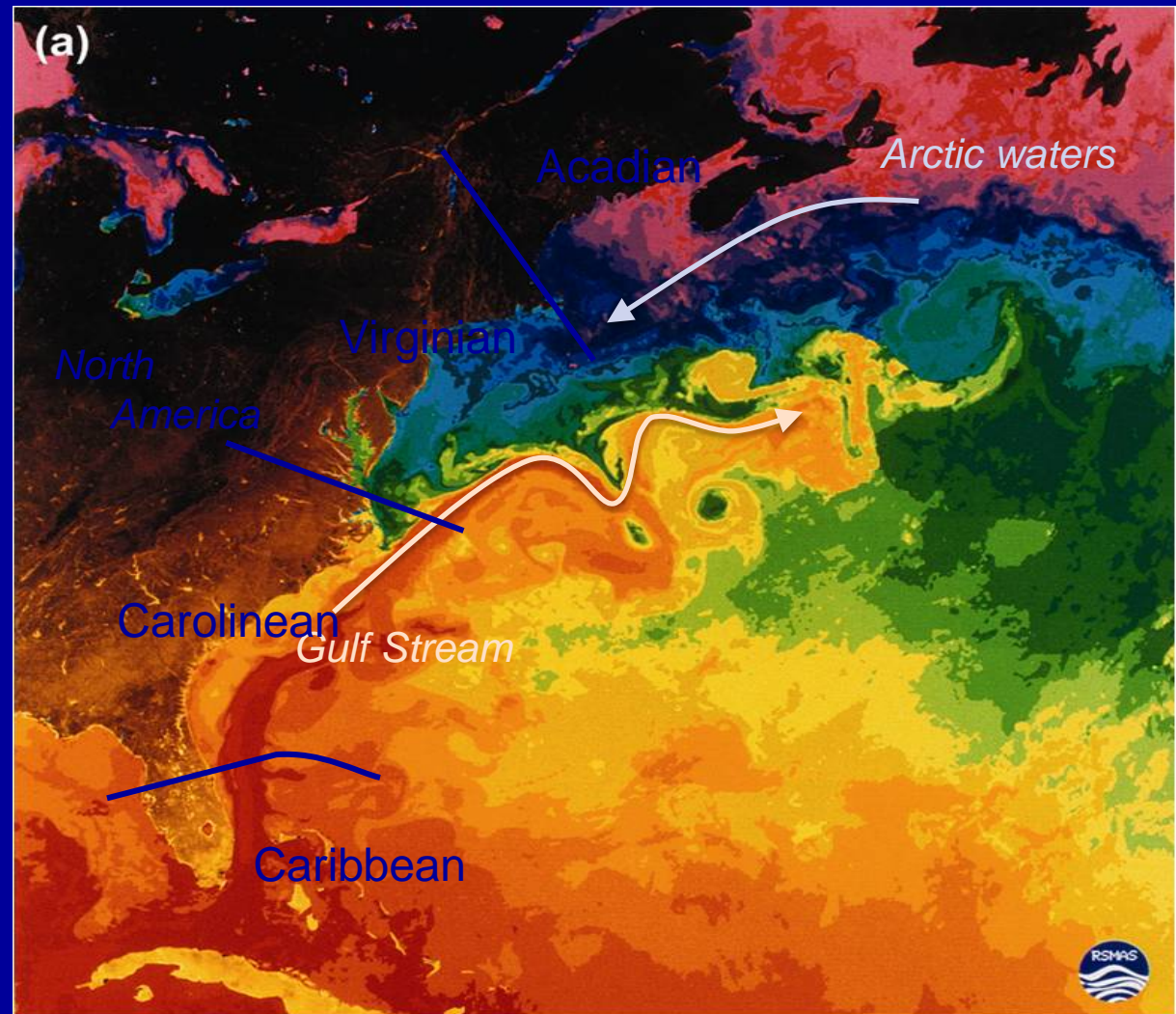


EA FM Document

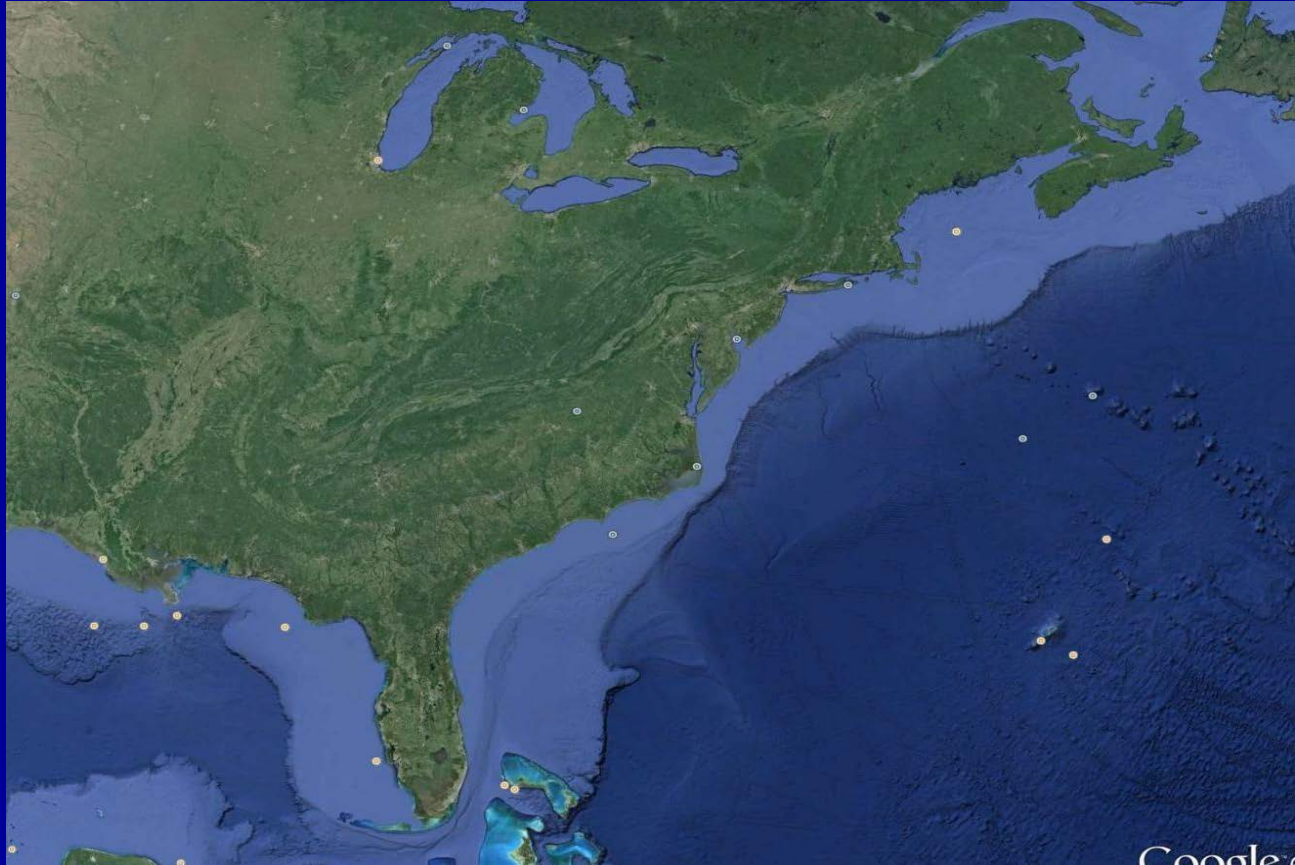
- The boundaries of the NELME extend from Scotian Shelf to Cape Hatteras
- However, some Council managed species extend well north and/or south of that area (bluefish, Atlantic mackerel, spiny dogfish, Illex, etc.)
- Guidelines shall apply to geographical range of management units defined in Council FMPs (species range)

East Coast Marine Ecosystems

- Four biogeographic provinces
- General boundaries not absolute boundaries
- Seasonal patterns
- Species-specific patterns



After Talley et al., 2011



Reach of EAFM Guidance Doc

EAFM Guidelines shall apply throughout geographical range of the management units defined in Council FMPs.

7. Operational Transition to EAFM

- 7.1 Guidelines for management of forage species
- Includes Atlantic mackerel, butterfish, long-finned and short-finned squid

Guidelines for management of forage species

- Emerging consensus that forage species warrant special management consideration
- Environmental factors generally drive forage species stock dynamics
- However, likely that fishing exacerbates environmentally driven declines in forage species abundance

Forage policy statement

- *It shall be the policy of the Council to maintain an adequate forage base in the Mid-Atlantic to ensure ecosystem productivity, structure and function.*

Modifications to biological reference points

Mortality-based reference points (Source)

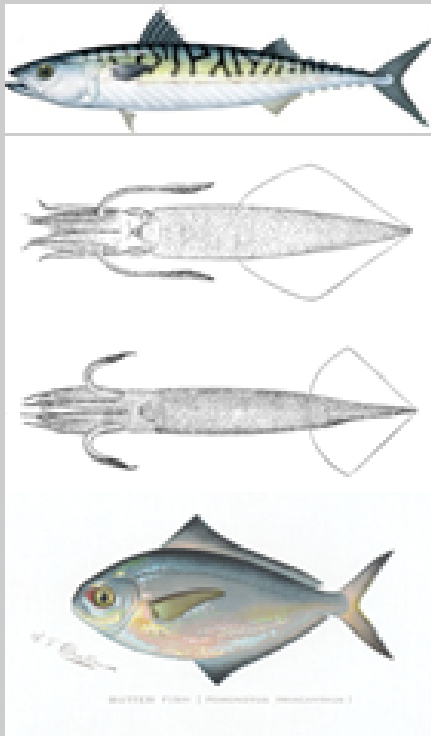
- $F = M$ (Beverton 1990)
- $F = 0.87 M$ (Zhou et al. 2012)
- $F = 0.67 M$ (Patterson 1992)
- $FERP = (0.2, 0.5 \text{ or } 0.75) FMSY$ (Pikitch et al. 2012)

Biomass-based reference points (Source)

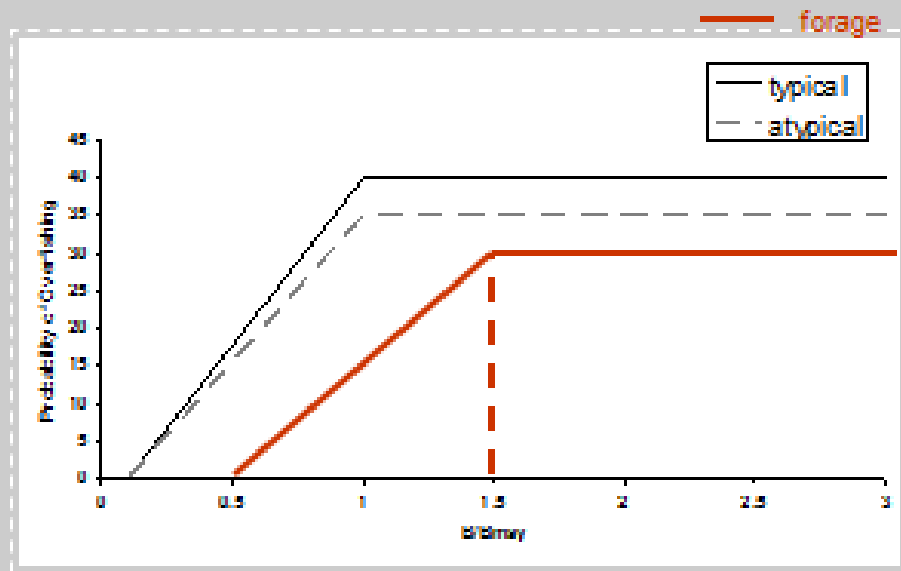
- $BERP = 0.75 B_0$ (FAO 2003, Smith et al. 2011)
- $BERP = (0.8, 0.4, \text{ or } 0.3) B_0$ (Lenfest 2012)

Modifications to Council Risk policy

Managed Forage Species



Modified Council Risk Policy



Can the MAFMC Develop a Forage Policy?

EAFM – evaluation of tradeoffs

Involves evaluation of achieving multiple (often competing) objectives relative to ecosystem services

Management of exploited forage species
good example of tradeoffs associated with special 'ecosystem' management considerations

Exploited Forage species – ecosystem service tradeoffs

- Direct harvest economic value

Versus

- Ecological “value added” by providing larger forage base within the ecosystem (presumably to benefit of higher trophic levels)

Economic data and analyses

- Current state of economic data/analyses are limited to evaluate these tradeoffs
- Staff recommendation to address social and economic

Economic data and analyses

The Council, in conjunction with its SSC and the NEFSC, shall promote the collection of data and development of analyses to support the biological, economic and social evaluation of ecosystem level tradeoffs including those required to establish an optimal forage fish harvest policy.

(MSE type of analysis may be most useful here)

7.2 Ecosystem Level Habitat Guidance

- Habitat fundamental component of marine ecosystems, but.....
- Full integration of habitat conservation into fishery management process has been challenging
- Summarizing findings of Habitat workshop held last October.

EAFM Habitat Recommendations

- **(7.2.1) Demonstrate and communicate the value of habitat to managed fisheries and transition to landscape/ecosystem level habitat descriptions and conservation**

Seafloor Structure	Vegetation Emergent epifauna Biogenic reefs (e.g. coral, oyster, sponge) Geomorphology (e.g. rocky outcrops, pinnacles) Physiography (e.g. seamount, submarine canyon)
Sediments	Grain size Organic content Rugosity Stability Slope
Hydrodynamic Processes	Currents/boundaries/fronts Tidal dynamics Wave dynamics Upwelling
Hydrology	Depth/bathymetry Salinity/haloclines Temperature/thermoclines Density/pycnoclines Turbidity Nutrients Dissolved oxygen/oxyclines pH
Anthropogenic Alterations	Pollutants/contaminants Artificial structures (e.g. artificial reef, oil platform) Created habitats (e.g. restored salt marsh, planted seagrass bed) Fishery impacts Marine debris

Ecosystem level EFH

- To date EFH designated on single species basis based on broad trawl survey work (gives extensive coverage but at a coarse scale)
- Additional focused sampling in habitats at finer scales would also be useful.
- We need to consider EFH more broadly from an ecosystem perspective

EAFM Approach to EFH

- Consider essential from an ecosystem perspective
- Link habitat conservation to fishery outcomes (focus on resilience and productivity)
- Determine if existing Council habitat authorities are being utilized; improve efficacy of implementation

EAFM Approach to EFH

- Identify research needs and actions to support habitat mandates
- Establish goals and metrics (in addition to stock-based metrics like overfished and overfishing)

EFH Policy Statements

- **1. Strengthen EFH designations and consider essential from a multispecies/ecosystem perspective emphasizing the connectivity between species, life history stages, etc. and inshore and offshore habitats.**

EFH Policy Statements

- **2. Demonstrate and communicate the value of habitat to managed fisheries and quantitatively link habitat science and conservation to fishery outcomes.**

Climate change and Variability

- Constituents across all fishery sectors requested the Council to integrate ecosystem considerations, including environmental influences on fish stocks due to climate change and variability, into fishery stock assessments and Council management policy.

Climate Science and Governance Workshops

- Council convened two workshops with science and management partners (NMFS, Councils, States) to discuss potential scientific and management challenges Atlantic Coast fishery managers face as a result of climate variability and change

Past/Future Climate States

First regional climate change projections

- Shelf-wide temperatures warming since 1960 (projected to continue)
- Ocean acidification measurable and PH decreasing
- Precipitation and stream flow increasing (salinity decreasing)
- Sea level rising (infrastructure impacts)

Impacts on Fishery Resources

- Changes in stock productivity (recruitment, growth, maturity, fecundity)
- Changes in species interactions (natural mortality)
- Changes in species distribution (stock definition; availability to fisheries and surveys)



Science Issues

Distribution shifts

- Utility of NEFSC survey data will be affected due to differential availability (fraction of population within survey area may change or become more variable – spatial availability issue)
- Survey abundance estimates will be affected because timing of migrations will change (temporal availability for synoptic surveys)
- NEFOP sampling frame will have to adapt to changing patterns of species/fisheries overlap and subsequent changes in discard

Science Issues

Changes in Productivity

- Manifested at both ecosystem and species level
- Species level productivity changes result from changes in natural mortality, survival, growth and recruitment
- Need to be addressed at stock assessment level (TOR through NRCC process)
- Manifested at level of BRP specification (OFL/ABC)

Management Issues

- Allocations by area based on historical catch distribution problematic (e.g., fluke)
- Seasonal allocations (e.g., scup)
- Trip limits by season/area need to re-evaluated and made more adaptive
- Allocation among directed v incidental fisheries affected due to changing species assemblages and discarding patterns
- Inter-jurisdictional mgt. issues will become more acute both between neighboring Councils and internationally (e.g., Canada – gadoids, mackerel and dogfish)

Management Issues

What's needed?

- An adaptive management approach that will allow Council's to detect and react to changing environmental conditions which affect ecosystems and fisheries (on same time scale)
- A more plastic system of allocation that allows current management system to adapt to changing climate conditions and ecosystems
- Active engagement of mgt. partners to review which fisheries require closer cooperative management across jurisdictions/FMPs (joint Council

Summary Points

- Science more robust relative to understanding and mitigating distributional changes than predicting productivity changes
- MAB exhibits greatest intra-annual variation in temperature of any ocean environment on the planet
- Climate change likely to increase that variance (at least uncertainty about future oceanographic states)

MAFMC Climate Policy

1.. Continue to work with NOAA on the implementation of the NMFS Climate Science Strategy in the Northeast region

2. Develop and evaluate approaches for MAFMC fisheries and their management to become more adaptive to change

MAFMC Climate Policy

3. Continue to advocate for, collaborate on, and support retrospective, field, and laboratory research to understand the effects of climate change on species managed by MAFMC and incorporate those results into assessment and management

EAFM Guidance

Next steps

- Meet with Ecosystems and Ocean Planning Committee (w/advisors)
- Review EAFM Guidance document
- Recommend potential additions and/or changes
- Review/revise/endorse policy statements
- Council review and approval in August

Questions?

