



NOAA Habitat Conservation

Conserving Habitat for Future Generations

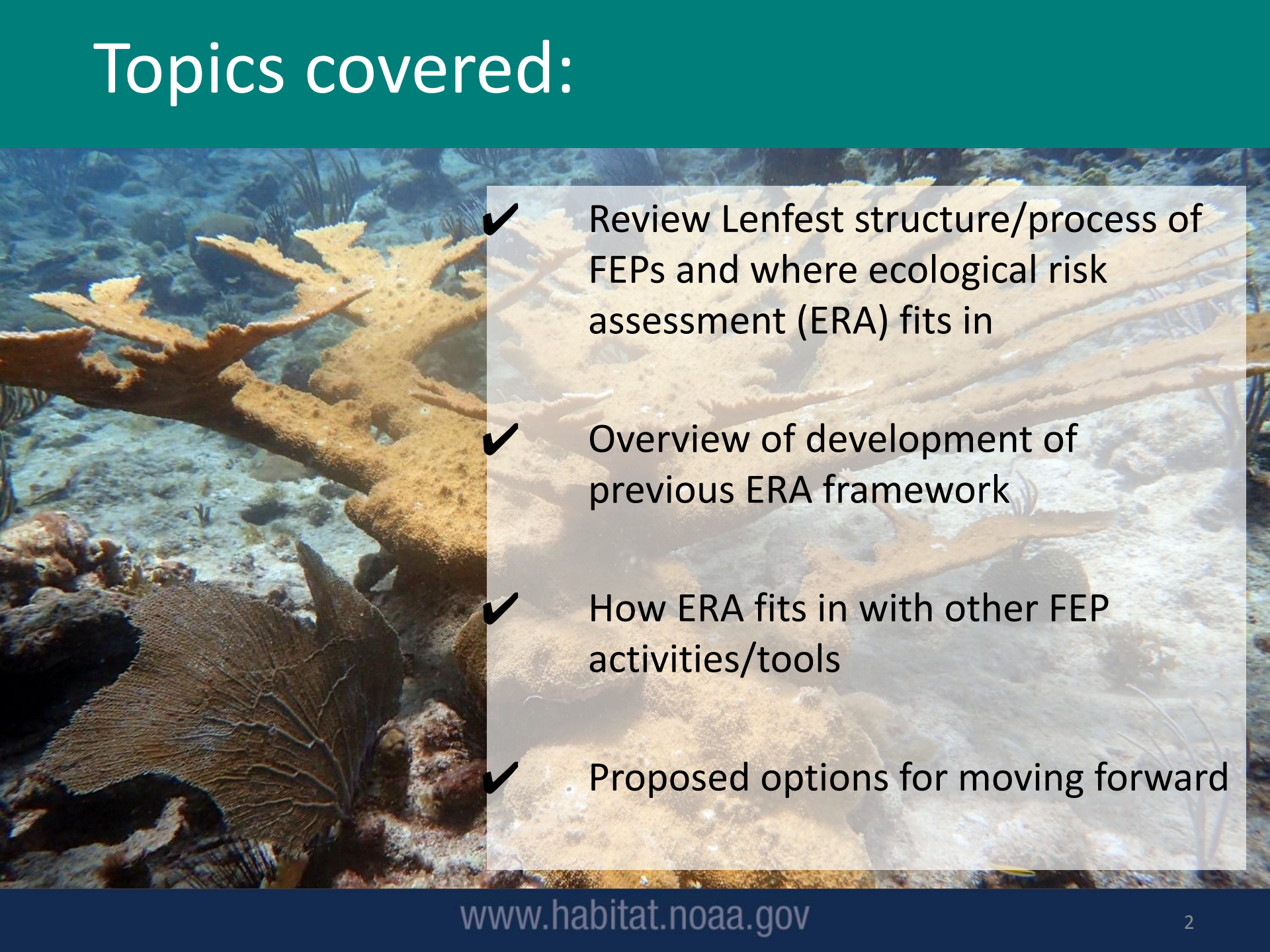
Ecological risk assessment approach to inform the CFMC Fishery Ecosystem Plan

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Topics covered:

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- The background of the slide is an underwater photograph of a coral reef. In the foreground, there is a large, branching, yellowish-orange coral structure. Below it, a brown, fan-shaped coral is visible. The water is clear, and other smaller coral and fish can be seen in the background.
- ✓ Review Lenfest structure/process of FEPs and where ecological risk assessment (ERA) fits in
 - ✓ Overview of development of previous ERA framework
 - ✓ How ERA fits in with other FEP activities/tools
 - ✓ Proposed options for moving forward

Structure/Process of FEPs



Levin, P. S., Essington, T. E., Marshall, K. N., Koehn, L. E., Anderson, L. G., Bundy, A., ... Smith, A. D. M. 2018. Building effective fishery ecosystem plans. Marine Policy. <https://doi.org/10.1016/j.marpol.2018.01.019>

Lenfest Blueprint Steps

- 1) ***Conceptual Model*** – guide planning by identifying ecological, economic, & social endpoints **of concern**
- 2) ***Indicators*** – to capture status and trends of **important** ecol/econ/social components (“vital signs”)
- 3) ***List threats*** – include pressure in human systems, on land, in air, in ocean
- 4) ***Vision statement*** – encompasses **stakeholders’ and management core values**/purpose/foundation of goals
- 5) ***Strategic Objectives*** – translate vision statement to action; focused on particular ecol/econ/social domains
- 6) ***Risk assessment*** – analyze the risks to meeting strategic objectives

Benefits of ERAs

- Provides a standardized, yet flexible and transparent framework
- First step is triage and uses the information you have in hand
- Forces you to think through the threats (step 3)
- Can help inform what is important to include in the conceptual model (step 1)
- Can help with developing and refining strategic objectives (step 5)
- Captures uncertainty and can inform where data collection efforts should be focused

Example ERAs

- Best practice adopted originally from the business world and encoded by the International Standards Organization (ISO)
- Ecological Risk Assessment for the Effects of Fishing (ERAEF) been applied to over 30 fisheries in Australia to guide fishery management strategies in a Ecological Risk Management (ERM) framework ([Hobday et al. 2007](#))
- MAFMC applied an ERA to focus on the highest risk issues for further evaluation and mitigation, including to prioritize further EAFM analyses as well as research plans over the coming 5 years ([Gaichas et al. 2018](#), [Muffley et al. 2020](#))
- For more examples see [Holsman et al. 2017](#)

ERA Process

1) Scoping

- ID units of analyses
- Select Objectives
- Select risk elements

2) Risk Assessment Level 1

- Qualitative assessment
- Uncertainty analyses

3) Risk Assessment Level 2

- Semi-quantitative assessment
- Uncertainty analyses

4) Risk Assessment Level 3

- Quantitative assessment
- Uncertainty analyses

Adapted from:

Hobday, A.J., Smith, A.D.M., Webb, H., Daley, R., Wayte, S., Bulman, C., Dowdney, J., Williams, A., Sporcic, M., Dambacher, J., Fuller, M., Walker, T., 2007. Ecological Risk Assessment for the Effects of Fishing: Methodology. Report R04/1072 for the Australian Fisheries Management Authority, Canberra. July 2007.

Level 1 Scale, Intensity & Consequence Analysis

- SICA - a qualitative assessment that screens out risk elements that are judged to have low impact
- Where judgments about risk are uncertain, the highest level of risk still regarded as plausible is chosen
- Frame as, “What is the risk (intensity and consequence) of not achieving the *management objective* for the *unit of analysis* due to the *risk element*?”
 - *E.g., What is the risk of not maintaining structure and function of EFH in Puerto Rico’s mangrove community due to shoreline alteration?*

Unit of Analyses

- Component of the ecosystem that you want to evaluate risk against;
- E.g., biological communities by habitat:
 - *Mangroves*
 - *Seagrass*
 - *Shallow reef (< 40 m)*
 - *“Deep” reef (> 40 m; includes mesophotic)*
 - *Pelagic*
- Also:
 - Region/ecosystem
 - Islands (PR, STX, STT/J)
 - Stocks (168/78 species)

Management Objectives

- Important to ID objectives that managers, fishing industry, & other stakeholders can agree on, & scientists can quantify and assess
- have an unambiguous operational definition
- be accessible to prediction & measurement
- the quantities they relate to are exposed to the risk elements
- E.g., derived from MSA:
 - *Achieving Optimum Yield for managed species*
 - *Maintaining structure and function of Essential Fish Habitat*
 - *Maintaining fishery resilience (diversity, stability, employment/revenue)*

Risk Elements

- A risk element is an aspect that may threaten achieving the desired management objectives
- Can be human activities, but can also be natural processes (e.g, climatic, oceanographic, biological)
- Can be within or outside management control of the Council
- Proposed 66 risk elements across 7 categories:
 - *Climate/oceanographic forces*
 - *Ecological interactions*
 - *Fishing activities*
 - *Other in-water activities*
 - *Land-based activities*
 - *Conservation and management actions*
 - *Socio-economic drivers*

Sample Scoring Sheet

2												Mangrove Community				
3	Category	Risk Element	Regional Presence (1) Absence (0)		Spatial scale of Hazard (1-5)	Temporal scale of Hazard (1-6)	Core Management Objective	Secondary Management Objective	Risk Similar Throughout Region (Y/N)?	Risk Similar Throughout Island (Y/N)?	Risk Similar in Same Habitat Across Islands (Y/N)?	Presence (1) Absence (0)	Intensity Score (1-6)	Consequence Score (1-6)	Confidence Score (1-2)	Rationale
4	Climate	increased degree heating weeks (duration of SST above highest	1	5	2	Achieving OY for managed specie	Maintaining structure and function of EFH									
5	Climate	increased storm frequency &/or intensity	1	5	2	Achieving OY for managed specie	Maintaining structure and function of EFH									
6	Climate	precipitation anomalies	1	5	2	Achieving OY for managed specie	Maintaining structure and function of EFH									
7	Climate	decreased ocean pH/net calcification	1	5	6	Achieving OY for managed specie	Maintaining structure and function of EFH									
8	Climate	increased sea level rise/ tidal flooding	1	3	3	Achieving OY for managed specie	Maintaining structure and function of EFH									
9	Climate	reduced upwelling/ increased temperature stratification/reduc	1	5	2	Achieving OY for managed specie	Maintaining structure and function of EFH									
10	Climate	increased water turbidity (kd) from organic and nonorganic sour	1	4	3	Achieving OY for managed specie	Maintaining structure and function of EFH									
11	Climate	changes in wind energy and ocean circulation (e.g. increase in S	1	5	2	Achieving OY for managed specie	Maintaining structure and function of EFH									
12	Climate	increased sargassum events (Frequency and Strength)	1	5	3	Achieving OY for managed specie	Maintaining structure and function of EFH									
13	Ecological	depensatory population effects (of keystone species?)	1	5	1	Achieving OY for managed specie	Maintaining structure and function of EFH									
14	Ecological	changes in food web interactions (including forage species)	1	5	6	Achieving OY for managed specie	Maintaining structure and function of EFH									
15	Ecological	changes in habitat distribution or health	1	5	4	Achieving OY for managed specie	Maintaining structure and function of EFH									
16	Ecological	bioaccumulation of ciguatoxin	1	3	6	Achieving OY for managed specie	Maintaining structure and function of EFH									
17	Ecological	other harmful algal blooms	1	3	2	Achieving OY for managed specie	Maintaining structure and function of EFH									
18	Ecological	increased disease events	1	3	2	Achieving OY for managed specie	Maintaining structure and function of EFH									
19	Ecological	alien/invasive species introduction/expansion	1	5	2	Achieving OY for managed specie	Maintaining structure and function of EFH									
20	Fishing	IUU fishing	1	4	6	Achieving OY for managed specie	Maintaining structure and function of EFH									
21	Fishing	legal fishing	1	4	6	Achieving OY for managed specie	Maintaining structure and function of EFH									
22	Fishing	gear-habitat interactions	1	4	6	Achieving OY for managed specie	Maintaining structure and function of EFH									
23	Fishing	gear selectivity/bycatch	1	4	6	Achieving OY for managed specie	Maintaining structure and function of EFH									
24	Fishing	fishing frequency	1	4	6	Achieving OY for managed specie	Maintaining structure and function of EFH									
25	Fishing	reduction/change in fishing capacity/expertise	1	4	6	Achieving OY for managed specie	Maintaining structure and function of EFH									
26	In-Water	marine construction (docks, piers, ramps, navigation, etc.)	1	2	4	Achieving OY for managed specie	Maintaining structure and function of EFH									
◀ ▶ Puerto Rico St Croix St Thomas-John Spatial Scale Temporal Scale Intensity Consequence Confidence ⊕ ▶																

Related Products in Development

- Conceptual models by the DAPs, SSC, and stakeholders – identifying risk elements and unit of analyses
- Ecosystem Status Report – producing candidate indicators to use in ERA
- Lenfest multivariate analyses – identifying important indicators to include in the ERA
- Draft FEP – developing objectives to assess risk against

Proposal for moving forward

- 1) Form a steering committee that will help guide implementation of the ERA
- 2) Use results of the conceptual models, multivariate analyses, and ESR to restructure the ERA
 - Components in the conceptual models become risk elements in the ERA
 - Use quantitative indicators when possible
 - Use agreement among models as a measure of uncertainty

Proposal for moving forward



- 3) Assess risk against draft FEP goal/subgoals
 - ☐ Increase human community resilience
 - ☐ Promote ecosystem resilience
 - ☐ Prevent overfishing and/or ecosystem overfishing
 - ☐ Achieve optimum yield
- 4) Use the results of the ERA to draft strategic objectives that address high risk/high uncertainty elements in the FEP

Discussion Questions

- ☐ What are your reactions to the proposal?
- ☐ Do you agree that the ERA should inform the development of strategic objectives?
- ☐ How well does the proposed process fit into the timeline of related products and FEP development?
- ☐ Are you willing to devote time on a steering committee?
- ☐ What other considerations am I missing?



Questions & Discussion