



**ECOSYSTEM INITIATIVES**

**APPENDIX TO THE**  
***PACIFIC COAST***  
***FISHERY ECOSYSTEM PLAN***

**FOR THE U.S. PORTION OF THE**  
**CALIFORNIA CURRENT LARGE MARINE ECOSYSTEM**

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## Table of Contents

<b>1</b>	<b>Completed FEP Initiatives</b> .....	4
1.1	FEP Initiative 1, Protection for Unfished Forage Fish.....	4
1.2	FEP Initiative 2, Coordinated Ecosystem Indicator Review.....	5
1.3	FEP Initiative 3, Climate and Communities Initiative .....	6
<b>2</b>	<b>Potential Future FEP Initiatives for Council Consideration</b> .....	6
2.1	Ecosystem and Climate Information for Species, Fisheries, and FMPs .....	7
2.2	Science Policy and Planning for Understanding the Effects of Oceanographic Conditions and Recruitment on Council-Managed Finfish Species.....	7
2.3	Cross-FMP Dynamic Bycatch Monitoring and Minimization Policy Initiative .....	9
2.4	Cross-FMP EFH Initiative .....	10
2.5	Cross-FMP Safety Initiative.....	10
2.6	Supporting Fishery and Fishing Community Resilience Initiative .....	12
2.7	Developing Indicators to Assess Progress Towards FEP Goals and Objectives Initiative .....	13
2.8	Assess Flexibility in Fisheries Management Process Initiative .....	14
2.9	Optimum Yield Factors Initiative .....	15
2.10	Climate-Informed Fisheries Management Initiative .....	16
<b>3</b>	<b>Sources</b> .....	17

## List of Acronyms and Abbreviations

CCCT	Climate and Communities Initiative Core Team
CCE	California Current Ecosystem, or California Current Large Marine Ecosystem
CCI	Climate and Communities Initiative
CEBA	Comprehensive Ecosystem-Based Management Amendment (of the South Atlantic Council)
CFR	Code of Federal Regulations
COP	Council Operating Procedure
Council	Pacific Fishery Management Council
	Ecosystem component (species)
EC	Exclusive Economic Zone
EEZ	Essential Fish Habitat
EFH	Ecosystem Plan Development Team
	Endangered Species Act
EPDT	Ecosystem Status Report
ESA	Fishery Ecosystem Plan
ESR	Fishery Management Plan
FEP	Fishery management unit
FMP	Habitat Area of Particular Concern
FMU	Integrated Ecosystem AssessmentMagnuson-Stevens Fishery Conservation and Management Act
HAPC	Act
IEA	National Environmental Policy Act
MSA	National Institute for Occupational Safety and Health
NEPA	National Marine Fisheries Service
NIOSH	National Oceanic and Atmospheric Administration
NMFS	Optimum yield
NOAA	Scientific and Statistical Committee
OY	United States of America
SSC	United States Coast Guard
U.S.	
USCG	

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## The Fishery Ecosystem Plan and Ecosystem-Based Fisheries Management Initiatives

The Pacific Fishery Management Council (Council) first adopted a Fishery Ecosystem Plan (FEP) and this appendix in 2013. The Council completed a full update of the FEP in 2022. From its *Purpose and Need* Statement, the FEP is intended in part to “enhance the Council’s species-specific management programs with more ecosystem science, broader ecosystem considerations, and management policies that coordinate Council management across its Fishery Management Plans (FMPs) and the California Current Ecosystem (CCE).” For FMP policies, the FEP is needed to “identify and prioritize research needs and provide recommendations to address gaps in ecosystem knowledge and FMP policies, particularly with respect to the cumulative effects of fisheries management on marine ecosystems and fishing communities.” This appendix’s ecosystem-based fishery management initiatives provide examples of how the Council could address issues that affect two or more Council FMPs or coordinate major Council policies across the FMPs to fulfill identified FEP needs. While ecosystem initiatives are likely to be cross-FMP in scope, some initiatives might primarily affect conservation and management measures within a single FMP.

While the Council reviews and updates the FEP on an infrequent basis, it revisits this appendix annually, with the option of updating its contents. The Council has an annual process for reviewing the ecosystem initiatives and assessing whether changes are needed to this Appendix, or whether analyses are needed to provide background work for new ecosystem initiatives. Annually at its March meetings, the Council and its advisory bodies will:

- review progress to date on any ecosystem initiatives the Council already has underway;
- review the list of potential ecosystem initiatives provided in the appendix to the FEP, receive new ecosystem initiative proposals, assess whether any existing or newly proposed initiatives help implement the FEP’s Goals or Objectives, and determine whether any of those initiatives merit Council attention in the coming year;
- if new initiatives are chosen for Council efforts, request background materials from the appropriate entities;
- identify candidate ecosystem research topics for Scientific and Statistical Committee (SSC) review to support improvements in the indicators included in the Annual Report.

Section 1 of this appendix describes initiatives that the Council has completed. Section 2 provides brief descriptions of potential initiatives for cross-FMP action by the Council. Descriptions of the potential initiatives in Section 2 include: 1) a brief discussion of the question or issue considered, 2) suggestions on background analysis or materials the Council may wish to see in advance of developing the potential initiative, and 3) suggestions on the type of personnel and expertise that may be useful in an ad hoc committee tasked with developing the initiative. The Council will discuss whether to take on new initiatives each year at its March meetings. If the Council wishes to make changes to its regulatory programs after analysis and discussion of a cross-FMP initiative, those changes would need to be implemented under the authority of one or more of the Council’s existing FMPs.

## 1 Completed FEP Initiatives

FEP Initiatives, or “ecosystem initiatives,” are multi-species or multi-fisheries science and policy processes to help coordinate Council policies across its FMPs and improve our understanding and management of the CCE. It is a living list that will change as some initiatives are completed and as new potential initiatives are added. This Section 1 describes completed FEP Initiatives. Potential future initiatives are described in Section 2.

### 1.1 FEP Initiative 1, Protection for Unfished Forage Fish

The Council began FEP Initiative 1 in September 2013 and completed it as Comprehensive Ecosystem-Based Amendment 1 (CEBA 1) in March 2015. The Council adopted the following purpose and need statement for CEBA 1:

*The purpose of this action is to prohibit new directed commercial fishing in Federal waters on unmanaged, unfished forage fish species until the Council has had an adequate opportunity to both assess the scientific information relating to any proposed directed fishery and consider potential impacts to existing fisheries, fishing communities, and the greater marine ecosystem. This action is needed to proactively protect unmanaged, unfished forage fish of the U.S. West Coast Exclusive Economic Zone (EEZ) in recognition of the importance of these forage fish to the species managed under the Council’s FMPs and to the larger CCE. This action is not intended to supersede tribal or state fishery management for these species, and coordination would still occur through the existing Council process.*

CEBA 1 amends each of the FMPs to bring these species and species groups into the FMPs as ecosystem component (EC) species shared between all four of the Council’s FMPs:

- Round herring (*Etrumeus teres*) and thread herring (*Opisthonema libertate* and *O. medirastre*)
- Mesopelagic fishes of the families *Myctophidae*, *Bathylagidae*, *Paralepididae*, and *Gonostomatidae*
- Pacific sand lance (*Ammodytes personatus*)
- Pacific saury (*Cololabis saira*)
- Silversides (family *Atherinopsidae*)
- Smelts of the family *Osmeridae*
- Pelagic squids (families: *Cranchiidae*, *Gonatidae*, *Histioteuthidae*, *Octopoteuthidae*, *Ommastrephidae* except Humboldt squid (*Dosidicus gigas*), *Onychoteuthidae*, and *Thysanoteuthidae*)

In the Council’s FMPs, this group of species is collectively referred to as the “Shared EC Species.” CEBA 1 includes these FMP amendments: Amendment 15 to the Coastal Pelagic Species FMP, Amendment 25 to the Pacific Coast Groundfish FMP, Amendment 3 to the Highly Migratory Species FMP, and Amendment 19 to the Pacific Coast Salmon FMP. CEBA 1 prohibits the development of new directed commercial fisheries for Shared EC species within the U.S. West Coast EEZ, while allowing existing incidental harvest of these species to continue to occur. However, CEBA 1 also includes Council Operating Procedure (COP) 24, which specifies

conditions for exempted fishing permits to collect scientific information on the feasibility of future fisheries targeting Shared EC Species. COP 24 does not assume that future fisheries for Shared EC Species will occur; instead, it sets out conditions for collecting scientific information in case there is future public interest in beginning new fisheries for Shared EC Species.

## *1.2 FEP Initiative 2, Coordinated Ecosystem Indicator Review*

FEP Initiative 2 was a Council-wide review of the annual California Current Ecosystem Status Report (ESR) of the National Oceanic & Atmospheric Administration (NOAA) Fisheries Northwest and Southwest Fisheries Science Centers (Centers). Section 1.4 of the FEP asks that the Centers provide the Council, its advisory bodies, and the public with an annual report on the state of the CCE, with a focus on Council-managed species and fisheries, and their associated fishing communities. Under this initiative, the Council facilitated a year-long scoping process involving ecosystem scientists, fishery managers, and the public in a conversation about ecosystem science within the Council process.

The Council began FEP Initiative 2 in September 2015 and completed it in September 2016 as a suite of comments on and requests for information in the annual ESR. In its initial directions on this initiative, the Council tasked its Ecosystem Workgroup with coordinating a review of the ESR that would ask these questions:

- i. What can we reasonably expect to learn from or monitor with the existing indicators in the ESR?
- ii. How well do the existing indicators accomplish their intent? Are any redundant?
- iii. Are there alternate indicators (or information or analysis) that may perform better in context? Are there additional indicators that could help inform Council decision-making under each of its fishery management plans (FMPs) and consistent with the purpose of the FEP?

In winter 2015-16, the Ecosystem Workgroup hosted a series of webinars to review and discuss the various sections within and scientific information behind the Centers' annual ESR. Through these public webinars, the Centers briefed listeners on: physical and oceanography indicators; biological indicators; human dimensions indicators; freshwater, estuarine and marine habitat indicators; and risk assessments and applications of indicators to decision-making.

Through spring and summer 2016, the Council's advisory bodies and the public reviewed the annual ESR and discussed their needs and goals for future ESRs. At the Council's September 2016 meeting, the advisory bodies and the public provided the Council and the Centers with their comments on future directions for the annual ESR. Part of that direction for future reports included the suggestion that the Council and Centers consider new focal areas for future reports, so that the Centers could revise report contents over time rather than all at once. In March 2017, the Centers presented an updated and revised ESR, taking into account revisions and additions requested through this initiative process.

Although this initiative focused on the ecosystem status report, it generated discussions about a host of other science products and tools that might support future Council decision-making. The Council particularly asked that the Centers develop a pilot management strategy evaluation on the

effects of changes in the physical environment on sablefish productivity. The Centers also presented the results of this sablefish-focused work in March 2017.

### ***1.3 FEP Initiative 3, Climate and Communities Initiative***

The Council launched FEP Initiative 3, the Climate and Communities Initiative (CCI) in September 2017. This initiative combined ideas from two of the potential initiatives in the FEP appendix, one on the socioeconomic effects of fisheries and one on the effects of climate variability and change on managed fish stocks. The goal of the CCI was to “consider, develop, and implement strategies for improving the flexibility and responsiveness of our management actions to near-term climate shift and long-term climate change, and strategies for increasing the resiliency of our managed stocks and fisheries to those changes.” In 2018, the initiative began with educational webinars on the state of scientific information on the potential effects of climate change on the physical, biological, social and economic environments.

Over 2018-19, it became apparent that the Council needed to engage in a larger conversation about the effects of climate on fish stocks, fisheries, and fishing communities with its membership, its advisory bodies, and the public. To support that conversation, the Council held a scenario planning process for the effects of climate variability and change on its managed stocks from November 2019 through September 2021. Scenario planning is a strategic planning process that helps organizations think about and meet new challenges through discussions around a suite of different possible descriptions of future conditions. For this initiative, four scenarios were designed to help the Council think creatively about the risks and opportunities associated with relatively greater or lesser year-to-year climate variability, and generally increasing or decreasing abundance of our managed stocks. In September 2021, the Council reviewed reports on the completed scenario planning process and closed out the first phase of this initiative.

Although much progress was made during the CCI, the Council endorsed the Climate and Communities Initiative Core Team’s (CCCT) recommendation to continue to address the goal of the CCI through other potential initiatives, advisory body work, and other Council actions (September 2021 Council Meeting, [Report H.2.a](#)). The CCCT recommended that the Council consider: 1) initiating a range of science-focused activities, 2) implementing revisions to ongoing management processes, and 3) continuing collaboration with partner agencies and stakeholder groups. In 2022, the Council updated this FEP appendix and, among other things, added new potential initiatives and revised prior potential initiatives to address recommendations from the Council at the close of the CCI.

## **2 Potential Future FEP Initiatives for Council Consideration**

During its development process for the FEP, the Council and its advisory bodies discussed how a cross-FMP or ecosystem approach to management might assist the Council’s long-term planning on a broad range of issues. Potential initiatives are based in the FEP’s visionary language in Chapter 1, major themes of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and consider cross-FMP issues, including: harvest level policies and overfished/overfishing, bycatch, essential fish habitat (EFH), and community effects of fisheries management.

## *2.1 Ecosystem and Climate Information for Species, Fisheries, and FMPs*

The Council concluded the Climate and Communities Initiative described in Section 1.3 with guidance on potential follow-on initiatives, including an initiative that would: (i) review the incorporation of climate and ecosystem information into the Council’s harvest-setting and fisheries management processes, (ii) determine the need and appropriate timing for additional, FMP-specific ecosystem and climate information, and (iii) where there is a need for additional ecosystem and climate information, develop clear pathways for it to be used in the setting of scientific uncertainty, harvest policy, and specific management actions. Under this initiative, the Council would facilitate and prioritize a process for Integrated Ecosystem Assessment (IEA) scientists, stock assessors, management teams, and advisory bodies to collaborate on assessing the need for and developing climate and ecosystem information in support of annual or biennial fisheries harvest-setting processes. This initiative would therefore also address FEP Objectives 1a, 1b, 2a, 6a, and 6b.

Ecosystem and climate reporting developed out of this initiative would be distinct from and in addition to the annual ESR, and would be targeted for use in management under particular FMPs. Reporting could build off examples from the annual ESR, such as the salmon-focused spotlight charts, but with applications developed and articulated through FMP-specific work between scientists and Council advisory bodies. This initiative could result in development of automated, FMP-specific indicator reports (similar to automated landings reports from the Pacific Fisheries Information Network) that document concerns about assessment models, population dynamics, and the ecosystem or environment. These indicators could be derived from the array of indicators available from the annual ESR on the status and trends of components of the CCE and beyond, with a goal of making the information available when needed during harvest-setting processes and for specific management actions.

To implement this initiative, Council staff would map out the harvest-setting processes for the four FMPs to help the Council consider its harvest-setting schedule separate from its other work. The Council would then ask for advice from its advisory bodies on which of the FMPs, and the particular target stocks within FMPs, might be best suited to be the first to begin discussions on FMP-specific reporting of ecosystem and climate information in support of harvest-setting processes and specific management actions. After prioritizing the FMPs, the EWG and ecosystem scientists would collaborate with the FMP-specific advisory bodies to schedule separate scoping discussions for each FMP, as prioritized by the Council. Based on those scoping discussions, FMP-specific indicators could be developed into suites of indicators, projections, or decision tables to assess scientific uncertainties and inform harvest-setting processes (e.g., Dorn and Zador 2020) and specific management actions. Ecosystem scientists would periodically check in with the appropriate advisory bodies on tailoring information for use in each FMP’s annual or biennial management process. The initiative would be considered complete with the first round of FMP-specific ecosystem and climate reporting, although the contents and formats of those reports would likely need regular adjustments to suit their users.

## *2.2 Science Policy and Planning for Understanding the Effects of Oceanographic Conditions and Recruitment on Council-Managed Finfish Species*

This cross-FMP initiative responds to issues raised during the Council’s work on both the second (ecosystem indicators) and third (scenario planning for climate change) ecosystem initiatives,

particularly addressing the need to better understand and integrate climate and ocean conditions information affecting the abundance of fish stocks into the fisheries management process. Under the scenario planning portion of the CCI, the Council considered future management challenges under greater climate variability and more or less species' abundance. This initiative would build from those scenarios to ask about the potential effects of climate variability on Council-managed species' recruitment. This initiative would also address FEP Objectives 1a, 1b, 2a, 3a, 6a, 6b, and 6c by identifying research and monitoring needs explored in the FEP, helping to better understand trophic energy flows, availability of harvestable stocks to fishing communities, and sharing information across species and fisheries management challenges.

Many factors, including harvest rates, affect abundance of adult fish populations. A major influence on adult population dynamics for finfish species is recruitment year class strength. Mortality of fish larvae is extremely high, but once a fish survives its first year, rates of natural mortality are greatly reduced, and it is relatively likely that the individual will survive to become an adult and reproduce. If recruit abundance is high in a given year, then it is also likely that adult population sizes will be high in the years following until the year class reaches senescence.

Understanding the mechanistic causes of fluctuations in fish population abundances, including any potential links to climate and oceanographic conditions, is of utmost importance for multiple FMPs and for ecosystem-based management. Despite more than a century of research, the factors driving recruitment strength have been elusive for most fishes worldwide and in the CCE in particular. The Council has extensive experience with the challenges of managing fisheries in the face of ecological surprises associated with unpredicted shifts in recruitment class strength, including the extraordinarily strong recruitment classes of overfished rockfish species in the early 21st century, and the dramatic recent fluctuations in anchovy year class strength. Although understanding processes driving recruitment is difficult, the time is right to make significant progress in this field.

Over the past two decades, technologies have emerged that give us a novel perspective on factors impacting stock abundances. For example, environmental DNA technology can provide unprecedented clarity on the prey field of larval fishes and the effects of those prey fields on larval mortality (testing the Hjort 1926 classic critical period hypothesis). In addition, high powered Individual Based Models that use Regional Ocean Modeling output are being developed to track fish from "cradle to grave," with the objective of identifying ocean conditions that facilitate high recruitment. At present, multiple researchers on the West Coast are pursuing these and many other lines of research seeking to elucidate recruitment drivers for myriad fishes.

This initiative would bring together various researchers that traditionally have not worked together and would leverage new developments in ocean modeling and observation to examine recruitment dynamics from multiple perspectives with the goal of identifying the most important factors dictating year class strength. To implement this initiative, the Council would assemble an ad hoc science advisory committee to convene a workshop or series of workshops to coordinate science planning and foster collaboration on understanding the effects of near- and medium-term oceanographic conditions on juvenile survivability and recruitment of commercially- and recreationally-important finfish species to West Coast fisheries. The advisory committee could consist of Federal, state, tribal and academic scientists, and others the Council deems appropriate to the task. Depending on the interest and availability of the Council's SSC, this project could be led, facilitated, monitored, or reviewed by the SSC or SSC members.

An intermediate objective for these workshops would be:

1. An inventory and planning process for developing new indicators of larval recruitment. The inventory of available tools to model recruitment dynamics could include, for example, such emerging tools as:
  - a. High resolution video monitoring
  - b. eDNA to resolve larval and juvenile predator and prey fields
  - c. Chemical biomarkers such as compound-specific stable isotope analysis
  - d. Regional Ocean Modeling System models to fuel Individual Based Modeling
2. An assessment of the feasibility of combining the inventoried tools to produce robust forecasts of year class strengths.

If developing such a multi-method framework proves feasible, further development would also integrate the effects of oceanographic variability on larval survivability and recruitment. The goal would then be to help the Council, scientists, and the public better understand the status of managed stocks and the effects of environmental drivers on the statuses of different stocks. More significantly, scientific work growing out of this initiative could identify how and whether to incorporate information on environmental drivers into stock assessments, and could refine our ideas about the relevance of ESR indicators to the abundance of managed stocks.

### *2.3 Cross-FMP Dynamic Bycatch Monitoring and Minimization Policy Initiative*

Catch and bycatch monitoring programs vary among Council fisheries, as do the quantity and quality of information provided by these programs. In 2021, the Council conducted a cross-fishery review of its standardized bycatch reporting methodologies, in keeping with 50 CFR 600.1610. Consistent with National Standard 9, many of the Council’s fishery-specific regulations focus on achieving harvest levels of target species while minimizing bycatch of non-target species. Under this initiative, the Council would build on that 2021 work to consider whether spatial bycatch reduction approaches (area-based management, seasonal closures, dynamic management) could be more easily extended across fisheries with bycatch species in common.

FMP-based bycatch minimization policies necessarily focus on the bycatch within particular fisheries. Responding to the MSA by reducing the volume and rate of bycatch in individual Council-managed fisheries has resulted in an overall reduction in the total volume of incidentally-caught and discarded CCE marine life over recent decades. Yet at the same time, there have been economic costs to some fisheries and fishing communities as a result of bycatch reduction efforts, which has hampered MSA goals of sustained food security. However, moving beyond the fishery-by-fishery approach could allow the Council to address issues like: the cumulative effects of the bycatch of species taken in Council-managed fisheries; whether gear innovation programs or products in one fishery could benefit other fisheries; whether the migration patterns of major bycatch species could be better tracked to avoid interactions with fisheries generally; and whether the timing and interactions of multiple Council-managed fisheries increase or decrease the likelihood of bycatch in these fisheries.

Background information for this initiative is already available in Council stock assessment and fishery evaluation documents and in National Marine Fisheries Service (NMFS) reports, particularly in the National Bycatch Report and follow-on work (NMFS 2011, Savoca et al. 2020).

Building upon national efforts (Savoca et al. 2020), if agency staff were to review available West Coast data to provide a cross-comparison of bycatch management programs within Council-managed fisheries, including an evaluation of where fisheries management and regulations for different fisheries might intersect to affect bycatch rates, that review could provide the Council with a priority group of bycatch species affecting multiple fisheries. Species avoided as potential bycatch in multiple Council-managed fisheries would become higher priority for cross-fishery potentially dynamic bycatch management. This initiative would address FEP objectives 3a and 5b.

To implement this initiative, the Council could assemble an ad hoc advisory committee to assess: the availability of spatial data/information on migration patterns of non-target species that fishing vessels are trying to avoid in multiple fisheries; ocean conditions that may alter migration patterns of non-target species; and, technology available for sharing at-sea bycatch conditions in real time. That advisory committee could consist of Federal, state, and tribal catch monitoring, gear development, and protected species programs; fishery participants across Council-managed fisheries; enforcement professionals (including those from the Council’s Enforcement Consultants); and others the Council deems appropriate to the task. Ultimately, cross-FMP efforts could extend across fishery management councils and management areas for highly migratory species and other shared stocks to ensure that bycatch reduction and species management efforts are aligned in the face of shifting stocks and shifting fisheries. While cross-fishery management council work is beyond the scope of this FEP, considering bycatch across different management areas could better support our Council members and agency representatives working on fisheries conservation and management nationally and globally.

#### **2.4 Cross-FMP EFH Initiative**

The MSA defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity” [16 U.S.C. §1802]. All four of the Council’s FMPs have described EFH for managed species, with the groundfish FMP having the most detail, including closed areas to protect EFH. Because of the widely ranging level of EFH detail across FMPs, documenting where habitat actions have big ecosystem impacts is difficult without a cross-FMP understanding of habitat.

This initiative takes a species distribution modeling approach to understand where spatial and temporal overlaps occur for species included in each of the FMPs. Many species distribution models have been completed as part of compiling data and projecting species distributions for stock assessments; additional effort could focus on the appropriate suite of species from FMPs and standardizing oceanographic and climate predictors for use across species distribution models. In addition, working through the NOAA Fisheries Distribution Mapping and Analysis Portal (DisMAP), this initiative could highlight both current areas of habitat overlap as well as lead to predictions for how these overlaps may change under different climate scenarios.

This initiative would help identify commonalities to EFH across FMPs, identify habitat areas that are considered highly productive or biodiverse under more than one FMP, help predict potential impacts of climate variability and change to multi-species EFH, and help identify future research needs. Habitats of importance to species from multiple FMPs could serve as focal points for Council efforts to assess and mitigate for fishing and non-fishing effects on EFH, and for research to better understand the complex interactions between FMP species and their shared habitat. One

possible result of an integrated EFH review would be cross-FMP Habitat Areas of Particular Concern (HAPC) designations for areas that are important to species from multiple FMPs. Another result could be consideration of spatially and temporally variable EFH and HAPCs that align with when managed species are using important habitat at key life stages, with consideration of non-static habitat and marine features such as upwelling fronts. This initiative would address FEP Objectives 1a, 3c, and 4a.

With the impending rise of offshore non-fishing activities, a cross-FMP EFH review could help the Council, other agencies, and the public better understand how those activities might interact with and affect ocean habitat and prioritize those habitats that are most important to Council-managed species and fisheries. Council attention to EFH across its FMPs could spur improvements in digitizing multi-species EFH maps for a better understanding of where our species' EFH overlap, and could support work on models to forecast range shifts due to ocean conditions.

This initiative would build on work proposed under Initiative 2.2, Science Policy and Planning for Understanding the Effects of Oceanographic Conditions and Recruitment on Council-Managed Finfish Species. To implement this initiative, the Council could task its Habitat Committee, science center representatives, or members of an ad hoc advisory committee, to cooperatively review species distribution models from different FMPs to develop a suite of species with which to incorporate in this initiative. The juvenile life history stages of many species are less well understood, so this approach might best be applied to pre-recruit or adult life stages. The cross-FMP distributions could be used by the Council, advisory bodies, and state and Federal authorities to better project potential habitat and climate impacts across FMPs.

## 2.5 Cross-FMP Safety Initiative

The MSA's National Standard 10 states: *Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.* National Standard 10 guidelines may be found at 50 CFR 600.355. The United States Coast Guard (USCG) and the National Institute for Occupational Safety and Health (NIOSH) regularly assess the causes of loss of life at sea for U.S. waters nationwide. Information on fishing vessel safety may be found on the [NIOSH website](#). [The most recent NIOSH summary of fatalities in West Coast fisheries](#) was published in 2017, covering the period 2010-2014.

The purpose of this initiative is to assess how Council fishery management policies, in concert with the activities conducted or authorized by other Federal and state agencies, affect West Coast fishing vessel safety. By looking across fisheries, the Council will be better able to assess how fisheries regulations interact with each other, whether those interactions compromise fishing vessel safety, and how safety concerns might change in the face of a variable and changing climate. West Coast fishing vessels commonly engage in multiple fisheries, which means that vessel owners, captains, and crew have to think about the tradeoffs in participating in various fisheries throughout the year. Taking a broad, ecosystem-based approach to a safety review would better account for the challenges fisheries participants face as they plan their work in various West Coast fisheries.

To implement this initiative, the Council could first ask its Enforcement Consultants Committee, particularly those representatives from the USCG, to coordinate an ad hoc advisory committee that

would assess safety incidents and hazards in West Coast fisheries. The Council, its advisory bodies, and the public might be interested in knowing whether fishing vessel safety varies by: fishery or gear type, weather or ocean conditions, age/experience of vessel captains and crew; age or condition of vessels; port location; or management program. The advisory committee could consist of Federal, state, and tribal safety and enforcement experts; fishing vessel operators; safety of life at sea trainers; advisors from NIOSH; and social scientists with experience assessing safety incidents in U.S. fisheries.

The advisory committee for this initiative would share the results of its assessments with the Council, advisory bodies, and the public to both make recommendations on and seek ideas for revisions to fishing regulations that could improve West Coast fishing vessel safety while continuing to meet fishery conservation and management goals. This process may also shed light on measures outside Council authority, such as ways to foster technological innovation in weather forecasting and reporting and increase participation in, and compliance with, safety improvement programs.

## *2.6 Supporting Fishery and Fishing Community Resilience Initiative*

The MSA's National Standard 8 requires that fisheries management measures "take into account the importance of fishery resources to fishing communities by utilizing economic and social data . . . in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities." Many Council decisions, however, have been necessarily focused on meeting the conservation requirements of the Act, with little room for considering how best to provide for the sustained participation of fishing communities.

This initiative would address National Standard 8 across FMPs and would follow up on the CCI by addressing part of that initiative's original goal to "develop strategies for increasing the resiliency of our managed stocks and fisheries" in the face of near-term climate shift and long-term climate change. It would evaluate the resilience of West Coast fishing communities to climate change in the context of current or potential harvest policies under consideration by the Council. Additionally, it would engage the Council, Council staff, management teams, advisory bodies, IEA scientists, and others to consider existing vulnerabilities of communities, climate forecasts, and the CCI scenarios in light of existing or emerging harvest-setting processes and approaches.

Background work for this initiative would assess the current state of knowledge about available indices of fishing community vulnerability and resilience to changes in availability of fishery resources. The Council would also need to know which fishing communities are most closely tied to which fisheries, and whether those communities undergo cyclical within-year effects from shifts in fishery management programs. Council advisory bodies would need to be consulted to identify one or more Council decision processes that may discernibly impact community resilience.

The Council could begin this initiative with a review of the discussion materials and comments received during the CCI on the potential effects of climate change on fishery resources and fishing communities. Further implementing the initiative could include: (i) review and adoption of a set of attributes to use for understanding vulnerability and assessing resilience of fishing communities, and a baseline assessment of resilience for specific communities; (ii) development of conceptual

models for how Council actions have affected or may affect these attributes, aligned with current or possible future Council actions under consideration; (iii) identification of current or potential future harvest-setting processes of interest, and analysis of their impacts on community resilience under climate change and the CCI scenarios; (iv) determination of actions that could be taken to bolster community resilience, with a clear delineation between those that are either within or beyond the Council’s authorities. The outputs from (iii) and (iv) could be used alongside other, conventional outputs to inform Council processes. This initiative would be relevant to FEP objectives 1b, 2b, 3c, and 6c.

## ***2.7 Developing Indicators to Assess Progress Towards FEP Goals and Objectives Initiative***

The FEP goals and objectives are intended to provide more details on the Council’s Vision for the ecosystem, “a thriving and resilient CCE that continues to provide benefits to current and future generations and supports livelihoods, fishing opportunities, and cultural practices that contribute to the wellbeing of fishing communities and the nation.” In Chapter 4, the FEP discusses the complex interactions within the CCE, including the physical environment, biological environment, and the social and economic environment. Additionally, this chapter examines the interacting effects of human and environmental forces through the lens of the FEP’s Goals and Objectives. In essence, this initiative would address all FEP objectives.

Under this initiative, the Council and its advisory bodies would assess the connections between the FEP’s Goals and Objectives and the indicators from the annual ESR and other data sources and analyses. This initiative could build on the Council’s work on Initiative 2, the *Coordinated Ecosystem Indicator Review*, which included a Council-wide review of the ESR indicators and content. This initiative would begin with the Council and its advisory bodies reviewing Chapter 4 and the indicators included in the ESR to discuss which of those indicators might best help the Council evaluate whether it is achieving the FEP’s Goals and Objectives.

Reviewing the ESR’s indicators against FEP’s Goals and Objectives may spur ideas on whether new indicators could be developed or added to the ESR to better evaluate the Council’s progress towards the FEP’s Goals and Objectives. Ultimately, this initiative could help the Council to assess whether shifts in management measures are needed to help achieve the FEP’s Goals and Objectives, as well as assist in the prioritization of future initiatives to buffer against uncertainties resulting from the cumulative effects of human activities on the environment, and to support greater long-term stability within the CCE and for its fishing communities.

Background work for developing this initiative could include:

- An assessment of the current indicators used in the ESR in relation to the FEP’s Goals and Objectives;
- A qualitative evaluation and inventory of cross-FMP Council actions that address the FEP’s Goals and Objectives;
- Evaluation of similar efforts (e.g., indices that forecast stock recruitment dynamics) in other regions and other fishery management councils; and,
- Identification of other sources of data as needed.

To implement this initiative, the Council could assemble an ad hoc advisory committee to begin the review of FEP Chapter 4, the FEP's Goals and Objectives, and the ESR's indicators. This committee could report back to the Council with initial recommendations on: the utility of existing ESR indicators in evaluating progress towards the FEP's Goals and Objectives; potential background research that might be needed to consider or develop new indicators addressing the FEP's Goals and Objectives; and, recommendations on a process for developing reference points, and tracking status and attainment of FEP's Goals and Objectives. Recommendations on processes for assessing the need for and developing indicators for the ESR would follow the schedule laid out in Chapter 2 of the FEP for the SSC's annual review of science in support of the ESR. That advisory committee could consist of scientist contributors to the California Current Integrated Ecosystem Assessment, fisheries managers, and others the Council deems appropriate to the task.

## ***2.8 Assess Flexibility in Fisheries Management Process Initiative***

The purpose of this initiative is to identify whether Council decision-making and NMFS review and regulatory processes should be made more dynamic to respond to rapidly changing environmental conditions. This initiative is intended to respond to the CCI goal to develop and implement strategies for improving the flexibility and responsiveness of our management actions to near-term climate shift and long-term climate change.

A dominant theme emerging from the CCI scenario planning exercise was interest in developing a more flexible fishery management process. Flexibility encompasses two ideas, both affected by procedural limits: the potential scope of action and the speed at which it occurs. If climate change presents novel situations that arise rapidly and may be ephemeral, both scope and speed are of the essence. Assessing how the management process could be improved will require an understanding of both statutory and bureaucratic constraints at the Federal level. Since tactical decisions are implemented through regulation, one must understand the limits imposed by the Administrative Procedure Act and its [judicial review provisions](#) (Gaffney 2020). Understanding existing process constraints is key to finding flexibility in both other procedural requirements like those of the National Environmental Policy Act and Regulatory Flexibility Act and in statutory requirements derived from the MSA, Endangered Species Act, Marine Mammal Protection Act, and other legislation. Beyond these statutory constraints, bureaucratic processes usually require review at multiple organizational levels. Finally, decision-making itself may be protracted, especially for controversial and complicated actions.

To begin this initiative, the Council could first ask for background research from Council staff working together with NOAA General Counsel, and with regulatory process experts from NMFS and from states and tribes participating in the Council process. Draft reports on that research would be made available to the Council, its advisory bodies, and the public, to provide opportunities for fisheries participants to share their knowledge on regulatory processes that constrain flexibility in fishing operations.

Case study or scenario planning methods would be used to identify feasible, more flexible management processes, drawing on Bell et al. 2021, which outlined flexibility in the Council's FMPs. The case study approach evaluates past decisions while scenario planning evaluates plausible futures. Exercises for this initiative, whether retrospective or prospective, would focus on a single scenario in terms of the resource(s), fisheries, and fishing communities involved. These methods would be used to examine the current management response to a specified perturbation

and explore alternatives. This would be the basis for identifying choke points in the management process. Once those are identified, alternative processes, feasible under statutory constraints, could be described. The scope of the environmental effect in time and space would need to be assessed to determine whether there is in fact a mismatch between it and the responding management intervention.

Case studies or scenarios could focus on management interventions like (but not limited to):

- Allocation of harvest opportunity due to a change in the distribution of a stock.
- Bycatch mitigation due to a change in the distribution of a stock or stocks. Increased bycatch could occur because of the appearance of the bycatch stock in the fishery or because of a shift in the geographic range of the fishery in response to a change in target stock distribution.
- Changes to fishery participation limits (increase or decrease) due to a transboundary shift in stock distribution.
- Measures to mitigate the effects of the permanent depletion or commercial extinction of a stock.
- Use of exempted fishing permits to promote innovation given impacts from changing ocean conditions.

In a case study approach, it would be necessary to identify a proximate environmental change (e.g., change in stock status) that may be attributed to climate change or meso-scale variability. The case study subject should also include effects such as marine heat waves that are likely to occur at higher frequency in the future due to climate change. Similarly, scenarios need to have a plausible basis. Climate change-related impacts to stocks or fisheries should be derived from quantitative or qualitative projections of the interplay between physical drivers and the affected stock(s). This initiative would be relevant to FEP objectives 1b, 3c, and 6c.

## *2.9 Optimum Yield Factors Initiative*

As described in National Standard 1 of the MSA, optimum yield (OY) must be assessed and specified in the FMPs and Councils should determine what the relevant social, economic, and ecological factors are in determining OY. An OY Factors Initiative would provide a mechanism to fulfill National Standard 1 by identifying and describing the social, economic, and ecological factors relevant to each FMP. In the future, on a periodic basis as needed, FMP management and Integrated Ecosystem Assessment teams could assess relevant OY factors and update information related to those factors. Specifying these social, economic, and ecological factors in the FMP could more clearly and transparently inform future decision-making on matters such as annual catch limits and fishery conservation and management measures necessary to achieve OY on a continuing basis. This initiative would address FEP Objectives 1b, 3a, and 6c.

The MSA mandates that fisheries be managed at OY, defined as the amount of fish which “will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems.” OY is prescribed as maximum sustainable yield “as reduced by any relevant economic, social, or ecological factor.” The MSA further establishes National Standard 1, which states that OY shall be achieved “on a continuing basis.”

National Standard 1 interprets OY as a decisional mechanism for resolving the MSA’s conservation and management objectives, with the most important feature of OY being that it must prevent overfishing. National Standard 1 defines OY as a long-term average and states that FMPs must contain conservation and management measures to achieve OY on a continuing basis. An FMP “must contain an assessment and specification of OY” and Councils should consider the objectives of their FMPs and their management framework to “determine the relevant social, economic, and ecological factors used to determine OY.” The assessment and specification of OY should be reviewed on a continuing basis so that it is responsive to changing circumstances in the fishery. National Standard 1 guidelines include a list of potential considerations for social, economic, and ecological factors to take into account when reducing MSY to achieve OY.

## ***2.10 Climate-Informed Fisheries Management Initiative***

This initiative would build on the CCI by developing and implementing strategies to improve the responsiveness of fisheries management to climate variability and change, and is intended to set the stage for consideration of climate-informed fisheries management actions. The Council would use a collaborative process that includes IEA scientists, stock assessment scientists, and FMP Management Teams and Subpanels to: (a) evaluate existing indicators and refine or develop climate and ecosystem indicators to inform scientific uncertainty when setting harvest policies; (b) assess and understand the resilience of West Coast fishing communities to climate change and explore and consider management strategies to improve resilience; and (c) explore and develop mechanisms to incorporate nimbleness or increased responsiveness into fisheries management to enhance the capacity of individuals or communities to adapt to climate. Implementation of these three action areas will occur in multiple phases, described below. Execution of the initiative will be mindful of transboundary coordination needs, addressing safety issues, and inclusion of co-managers and stakeholders in the process with the intent of making significant progress within four years from the Council’s initial adoption of the initiative. This initiative would address FEP Objectives 1a, 1b, 2a, 2b, 3c, 6a, 6b, and 6c.

To implement the three action areas of this initiative, the Council would:

- a) *Develop climate and ecosystem indicators to inform fishery management decisions at the FMP level, which may be stock-specific* – Ecosystem and climate reporting developed through this initiative could occur with and/or in addition to the annual ESR, tailored to support management under particular FMPs. Reporting could build on examples from the ESR, such as the salmon-focused spotlight charts, but the applications would be developed through FMP-specific processes. This initiative could result in development of FMP-specific indicator reports (similar to automated landings reports from the Pacific Fisheries Information Network) that inform assessment models and further understanding of the dynamics of marine species and the ecosystem. Information should be available during harvest-setting processes for proactive management.
- b) *Evaluate the resilience of West Coast fishing communities to climate change* – Using social indicators mapping techniques, fish stock climate vulnerability assessments (existing, and as they become available), identify which coastal communities and fish stocks are most vulnerable to climate change. Prioritize communities and stocks for initial focus, ensuring that we look at multiple stocks across FMPs. Develop pilot

- portfolios of ecosystem/climate indicators for each prioritized stock for each community and review those through the Council’s FMP-specific advisory bodies. Work with FMP-specific advisory bodies to develop an automated ecosystem/climate indicators reporting system that provides management-targeted information for specific communities and stocks with schedules and formats useful to fisheries managers.
- c) *Explore mechanisms to incorporate nimbleness or increase responsiveness into fisheries management* – Using the results of the CCI workshops, draft Council-specific standards for fisheries and fishing community resilience and assess Council-managed fisheries against those standards. Build on ideas from the CCI workshops and from action areas (a) and (b) to draft FMP-specific recommendations for revising fisheries management processes and regulations to improve responsiveness to climate variability and change.

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