

**NOAA
FISHERIES**



Ecosystem Based Fisheries Management Alaska Region Implementation Plan

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NOAA Fisheries

Ecosystem Based Fisheries Management

Alaska Region Implementation Plan

NOAA Fisheries has long recognized the importance of ecosystem-based fisheries management (EBFM). The [Ecosystem Based Fisheries Management Policy](#) and [Road Map](#) describe how NOAA Fisheries implements EBFM based on six guiding principles. NOAA Fisheries defines EBFM in the Policy as “a systematic approach to fisheries management in a geographically specified area that contributes to the resilience¹ and sustainability of the ecosystem; recognizes the physical, biological, economic, and social interactions among the affected fishery-related components of the ecosystem², including humans; and seeks to optimize benefits among a diverse set of societal goals.” To implement EBFM, the Policy identifies and outlines six guiding principles:

1. Implement ecosystem-level planning
2. Advance our understanding of ecosystem processes
3. Prioritize ecosystem vulnerabilities and risks
4. Explore and address trade-offs within an ecosystem
5. Incorporate ecosystem considerations into management advice
6. Maintain resilient ecosystems.

The EBFM Roadmap calls for the development of implementation plans to guide NOAA Fisheries’ efforts in implementing EBFM over the next 5 years. **The purpose of this Alaska EBFM Roadmap Implementation Plan is to identify and coordinate priority EBFM milestones among the NOAA Fisheries Alaska Regional Office (AKRO), the NOAA Fisheries Alaska Fisheries Science Center (AFSC) and our partners in the Alaska Region.**

NOAA Fisheries supports implementation of EBFM to better inform and enable decisions regarding trade-offs among and between fisheries (commercial, recreational, and subsistence),

¹ NOAA Fisheries EBFM policy (NMFS 2016a) defines resilience as the capacity of an ecosystem to persist or maintain function in the face of exogenous disturbances. That is, the capacity of an ecosystem to tolerate disturbance without collapsing into a different state that is controlled by a different set of processes. This is primarily encapsulated by two elements, resistance to and recovery from pressure.

² In the NOAA Fisheries context, the term “ecosystem” means a geographically specified system of fishery resources, people that participate in that system, the environment, and environmental processes controlling that ecosystem’s dynamics (NMFS 2016a). Fishermen and fishing communities are included in the definition.

aquaculture, protected species, biodiversity, and habitats. Recognizing the interconnectedness of these ecosystem components will help maintain resilient and productive ecosystems (including the human communities on which they depend), even as they respond to climate, habitat, ecological, and other environmental changes. The primary purpose of EBFM as viewed by the Alaska Region's partners and stakeholders is to better to manage and conserve fish stocks in the context of the ecosystem as a whole. Recent EBFM considerations in the Alaska Region have included a focus on the role of humans in the ecosystem and the importance of maintaining healthy fishing communities.

Section 1: The Alaska Region

Geographic Scope of EBFM in the Alaska Region

The Alaska Region includes State of Alaska (State; 0-3 nm) and Federal exclusive economic zone (EEZ; 3-200 nm) waters off the coast of Alaska (Figure 1).

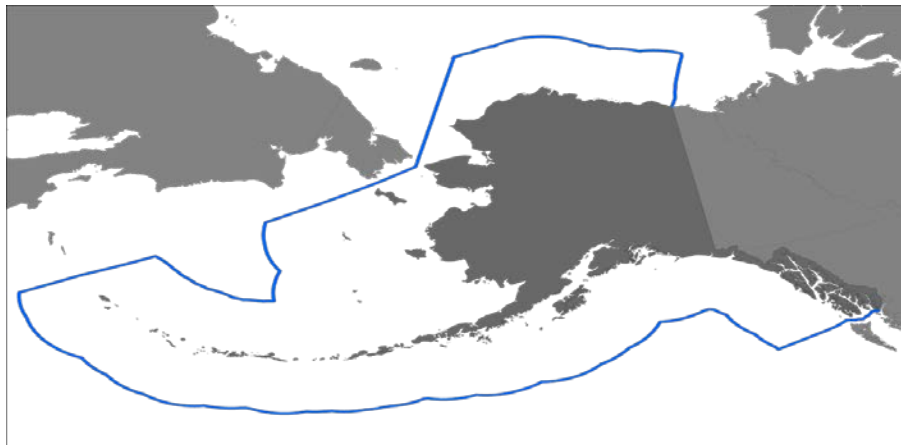


Figure 1. North Pacific fishery management area (U.S. EEZ shown in blue outline).

[Large marine ecosystems](#) (LME) are areas of coastal oceans delineated on the basis of ecological characteristics. Five distinct LMEs are encompassed within that large area, including the Gulf of Alaska (GOA), Aleutian Islands, Eastern Bering Sea, and the Chukchi and Beaufort Seas of the U.S. Arctic (Figure 2). Collectively, these areas are often referred to together as the North Pacific fishery management area.

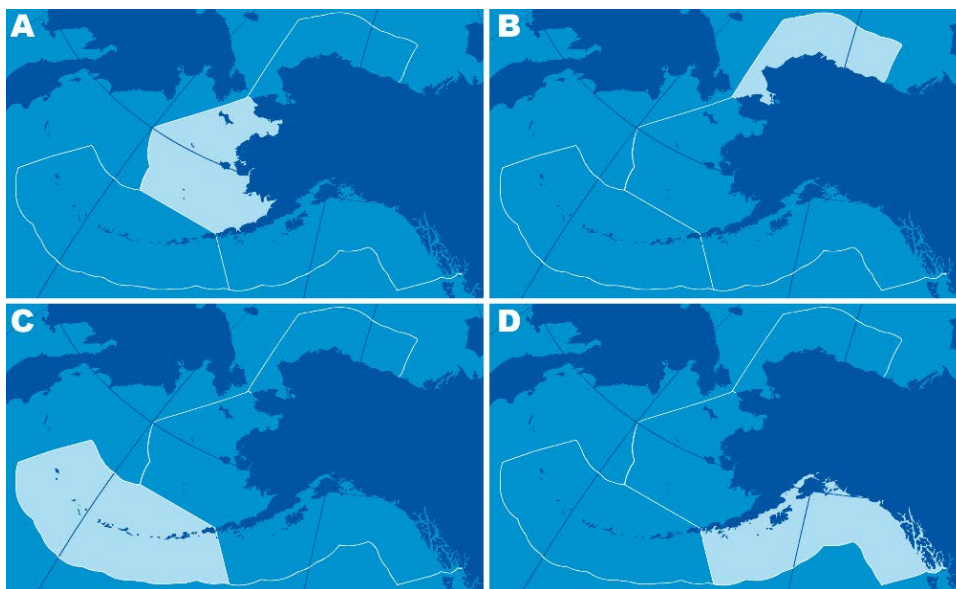


Figure 2. Large Marine Ecosystems of the U.S. EEZ off Alaska: A) Eastern Bering Sea; B) Chukchi and Beaufort Seas (shown here combined as the U.S. Arctic); C) Aleutian Islands; and D) Gulf of Alaska.

Key Partners and Stakeholders

Living marine resource management in the Alaska Region depends on collaborative partnerships among Federal, State, and international management agencies, scientific and research institutions, the North Pacific Fishery Management Council (Council), and non-governmental organizations. Fishery management decisions and programs in the Alaska Region are developed and implemented in partnership by the Council, AKRO, the State of Alaska's (State) Department of Fish and Game (ADFG), and the International Pacific Halibut Fishery Commission (IPHC), based on best available science provided by the agencies' science bodies (e.g. AFSC and IPHC stock assessment scientists, and ADFG scientists) within those organizations and other Federal and academic research organizations. Research funding entities such as the North Pacific Research Board (NPRB) are also considered key partners. A high level of public involvement with stakeholders is also critical to the legacy of successful fishery management in the Alaska Region. Key stakeholders include individuals, cooperatives, and organizations associated with the commercial and recreational fishing industries, Alaska Native and Tribal Organizations, communities, and non-governmental organizations working on behalf of healthy marine ecosystems.

Overarching fishery management policy for the U.S. EEZ (3-200 nautical miles (nm)) off Alaska is established by the Council. The Council has a long history of incorporating EBFM principles into its policy and annual catch limit recommendations. The Council's jurisdiction includes five distinct LMEs described above (Figure 2). The Council has prepared fishery management plans (FMPs) under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) for groundfish and crabs of the Bering Sea and Aleutian Islands (BSAI), groundfish of the GOA, scallops, salmon, and fish resources of the U.S. Arctic EEZ (the Northern Bering, Chukchi, and Beaufort Seas, Figure 2B). The IPHC, established by international convention between the U.S. and Canada, sets the annual area catch limits for Pacific halibut (halibut) and specifies legal gear types for halibut fishing. The Council, per the provisions of the Northern Pacific Halibut Act of 1982³, establishes halibut sector catch allocations, halibut bycatch limits, and fishery management programs for all halibut fisheries off Alaska (including State waters).

The ADFG is a key partner with NOAA fisheries in managing fisheries in waters off the coast of Alaska. Generally, ADFG has jurisdiction in waters from 0-3 (nm) from shore and NOAA Fisheries has jurisdiction in the U.S. EEZ. However, in many cases ADFG and NOAA Fisheries work together to responsibly manage fisheries in all waters of Alaska. Each year state waters are opened for fishing of federal groundfish species, allowing vessels to participate in federal fisheries inside 3 nm. Such fishing, known as "parallel fishing" is deducted from the Federal Total Allowable Catch (TAC) and the State generally mirrors federal regulations during those openings. In addition, ADFG directly manages several fisheries inside state waters with separate quotas from the federal TACs. ADFG often works with federal managers to ensure that transitions from parallel to State managed fisheries occur in an orderly manner (i.e. generally state and parallel fisheries do not occur concurrently, which helps to reduce confusion during the

³ The Northern Pacific Halibut Act of 1982 is the implementing legislation for the Convention between the United States and Canada for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea Convention). For more information regarding halibut management, see the IPHC Web site: <https://www.iphc.int/the-commission>.

fisheries by both fisheries managers and fishery participants). NOAA Fisheries authorized the Council to delegate full or partial management authority to ADFG for salmon, scallops, and crab. BSAI crab and scallop fisheries are jointly managed by ADFG and NOAA Fisheries in waters off Alaska. The State sets overall TACs, has an observer and dockside sampling program, and enforces regulations implemented by the Alaska Board of Fisheries. NOAA Fisheries determines the individual fishing quotas and regulates how these quotas may be fished. Additionally, management of commercial salmon fishing in the U.S. EEZ off Alaska is delegated to the State. ADFG and NOAA Fisheries work together throughout the Council process to determine groundfish TACs and federal fishery regulations in Alaskan waters to ensure sustainable fisheries.

The Western Alaska Community Development Quota (CDQ) Program, an economic development program associated with federally managed BSAI fisheries, is an example of community-based management. Communities in the CDQ Program are predominantly remote, isolated Alaska Native villages with strong ties to fishing. The program provides these communities the opportunity to participate and invest in BSAI fisheries, support economic development, alleviate poverty and provide economic and social benefits for residents, and achieve sustainable, diversified economies. The six CDQ groups represent 65 western Alaska villages and allocates to them a portion of the annual catch limit for BSAI groundfish, halibut and sablefish, crab, and prohibited species. CDQ groups use harvest revenue to fund economic development activities and employment opportunities. The CDQ groups are nonprofit corporations that manage and administer CDQ allocations, investments, and economic development projects. The Board of Directors of the nonprofit corporation Western Alaska Community Development Association (WACDA), comprised of one member from each CDQ group, acts as the Administrative Panel for the program and has largely replaced the State and NOAA Fisheries as the body responsible for managing the CDQ program. As such, the WACDA Panel and individual CDQ groups are key stakeholders in fisheries management in the Alaska Region. Input from the WACDA Panel and CDQ groups is an integral part of the process to establish annual groundfish CDQ allocations and reserves included in annual groundfish harvest specifications setting process conducted by the Council and NOAA Fisheries.

Additional key stakeholders integral to the fisheries management process in the Alaska Region include commercial fishing cooperative entities, such as the American Fisheries Act, Amendment 80, and crab cooperatives, other commercial fishing associations, and coastal fishing communities and associations, as well as non-harvesting, non-governmental organizations that advocate on behalf of healthy marine ecosystems.

A key component in keeping with the shift to integrated science, and EBFM in particular, is the Council's and NOAA Fisheries' reliance on original research from Federal, state, and academic organizations to evaluate potential management actions. Management plans and fishery regulations are continuously changing as new information or problems arise. The NPRB plays a key role in facilitating ongoing research through its funding mechanism. The NPRB's mission is 'To develop a comprehensive science program of the highest caliber that provides a better understanding of the North Pacific, Bering Sea, and Arctic Ocean ecosystems and their fisheries.' The NPRB has historically funded basic and applied science that has relevance to Council management actions, and its protocol for the development of requests for proposals

includes several avenues for Council priorities to be considered. The NPRB has significant interest in developing and strengthening relationships with the Council, NOAA Fisheries, and the State that promote effective application of funded research and contribute to the development of robust research programs. A standard practices document that outlines current formal and informal avenues for communications has been drafted to serve as a template to incorporate both general and specific information sharing.

Current Approaches of Ecosystem Considerations in the Alaska Region's North Pacific Fishery Management Policies

The BSAI and GOA groundfish fishery management policies shared by the AKRO and the Council have long incorporated ecosystem considerations into a broad ecosystem view of the fisheries. Groundfish FMPs are based on ecosystem principles reflected in policy goals and objectives. These policy goals and objectives were unchanged from 1981 through 2004. In 2005, through the 2004 Alaska Groundfish Programmatic Supplemental Environmental Impact Statement (Alaska Groundfish PSEIS) (NMFS 2004), the management approach and objectives for BSAI and GOA groundfish fisheries were updated. This update included measures to accelerate a precautionary, adaptive management approach through community or rights-based management, ecosystem-based management principles that protect managed species from overfishing, and as appropriate and practicable, increase habitat protection and bycatch constraints. The AKRO and the Council use the management objectives in the 2004 Alaska Groundfish PSEIS as guideposts when considering groundfish FMP amendments. Forty-five management objectives are organized in nine categories: prevent overfishing, promote sustainable fisheries and communities; preserve the 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; and improve data quality, monitoring and enforcement. Fishery policy decisions and annual catch limits are informed by the best scientific information available and management is continually adjusted to account for emerging information.

In 2014, the AKRO and the Council underscored the commitment to EBFM by formally adopting an ecosystem approach for fisheries management in the EEZ off Alaska. This approach includes a vision statement adopted by the Council that applies to all long-term planning initiatives, fishery management actions, and science planning to support EBFM (Figure 3). The 2014 overarching ecosystem approach statements and strategy extend the broad EBFM principles, similar to those in the groundfish FMPs, to all fisheries in the Council's jurisdiction.

Value Statement

The Gulf of Alaska, Bering Sea, and Aleutian Islands are some of the most biologically productive and unique marine ecosystems in the world, supporting globally significant populations of marine mammals, seabirds, fish, and shellfish. This region produces over half the nation's seafood and supports robust fishing communities, recreational fisheries, and a subsistence way of life. The Arctic ecosystem is a dynamic environment that is experiencing an unprecedented rate of loss of sea ice and other effects of climate change, resulting in elevated levels of risk and uncertainty. The North Pacific Fishery Management Council has an important stewardship responsibility for these resources, their productivity, and their sustainability for future generations.

Vision Statement

The Council envisions sustainable fisheries that provide benefits for harvesters, processors, recreational and subsistence users, and fishing communities, which (1) are maintained by healthy, productive, biodiverse, resilient marine ecosystems that support a range of services; (2) support robust populations of marine species at all trophic levels, including marine mammals and seabirds; and (3) are managed using a precautionary, transparent, and inclusive process that allows for analyses of tradeoffs, accounts for changing conditions, and mitigates threats.

Implementation Strategy

The Council intends that fishery management explicitly take into account environmental variability and uncertainty, changes and trends in climate and oceanographic conditions, fluctuations in productivity for managed species and associated ecosystem components, such as habitats and non-managed species, and relationships between marine species. Implementation will be responsive to changes in the ecosystem and our understanding of those dynamics, incorporate the best available science (including local and traditional knowledge), and engage scientists, managers, and the public. The vision statement shall be given effect through all of the Council's work, including long-term planning initiatives, fishery management actions, and science planning to support ecosystem-based fishery management.

Figure 3. Council Value, Vision, and Strategy Statements to implement ecosystem approach; Adopted 2014.

NOAA Fisheries and the Council retain management authority for groundfish fisheries in the U.S. Arctic, and management of these fisheries reflect the Alaska Region's most advanced EBFM policies and practices. For example, recognizing the potential for development of commercial fisheries in the U.S. Arctic EEZ due to rapidly changing ecological conditions, the U.S. Arctic FMP was implemented, but closed the U.S. Arctic EEZ to commercial fishing until information is available to support sustainable management of any authorized fishery. The Alaska Region's management policy for the U.S. Arctic EEZ proactively applies judicious and responsible ecosystem-based fisheries management practices, based on sound scientific research and analysis, to ensure the sustainability of fishery resources, to prevent unregulated or poorly regulated commercial fishing, and to protect associated ecosystems for the benefit of current users and future generations.

Ongoing approaches for EBFM in the Alaska Region are summarized in Figure 4. The Council has recommended and NOAA Fisheries has implemented numerous management measures to protect fishery ecosystem components. All fishery management decisions are supported by a robust analytical process, which considers effects on the various aspects of the ecosystem (as required by the National Environmental Policy Act (NEPA) and the Marine Mammal Protection Act (MMPA)), small businesses (as required by the Regulatory Flexibility Act (RFA)), and the U.S. economy (as required by E.O. 12866). Figure 4 also includes legal requirements pertaining to EBFM when establishing new fishery management policy and conservation measures.

Alaska Region EBFM Practices

MSA and Applicable Laws and Executive Orders

- MSA: All optimum yield (OY) amounts account for protection of marine ecosystems; FMPs identify and include measures to conserve, protect, and enhance Essential Fish Habitat;
- National Standards 1 (OY and marine ecosystems), 8 (fishing communities), and 9 (minimize bycatch)
- NEPA: Consider effects of Federal actions on the environment
- RFA: Consider effects of Federal actions on small business entities
- ESA: Ensure actions are not likely to jeopardize threatened or endangered species or adversely modify critical habitat
- MMPA: Responsibility to conserve marine mammals and maintain the healthy and stability of the marine ecosystem
- EO 12866: Assess costs and benefits of federal actions
- EO 13175: Consultation and coordination with Tribal Governments
- EO 13186: Take action to implement the Migratory Bird Treaty Act

Specific Management Actions Implemented

- Prohibition on directed fishing for forage fish
- Large areas closed to directed fishing with trawl gear
- Numerous closed areas and catch limits to conserve prey for endangered Steller sea lions
- Select "Habitat Areas of Particular Concern" closed to all fishing, some closed to fishing with bottom-tending gear
- Closed areas to conserve halibut, crab, herring, and salmon
- "Prohibited Species Catch" limits on halibut, crab, herring, and salmon
- Mandatory seabird avoidance gear in hook-and-line fisheries
- Mandatory bottom trawl gear modifications to avoid damage to benthic habitat
- Seasonal TAC apportionments to temporally disperse catch & prevent local depletion
- Transit closures around walrus haulouts to prevent disturbance
- Industry agreements including measures to avoid salmon and halibut bycatch
- Implementation of catch share programs to control effort and reduce waste and bycatch
- Prohibition on directed fishing in the U.S. Arctic EEZ
- Ecosystem-based limits on total groundfish removals in the Bering Sea/Aleutian Islands and Gulf of Alaska
- Accounting of fisheries bycatch against total allowable catch
- Development of Fishery Ecosystem Plans for the Aleutian Islands and Bering Sea

Key Science and Monitoring

- Frequent, ongoing resource assessment surveys
- Continual refinement of stock assessment methods
- Annual Stock Assessment & Fishery Evaluation Reports and Ecosystem Status Reports
- Continual salmon bycatch genetic information
- Ecosystem modeling and System Process Research
- Species vulnerability assessments
- Habitat suitability and vulnerability modeling and mapping
- Annual marine mammal stock assessment reports, including human-caused mortality estimates
- Development and refinement of integrated ecosystem assessments for the EBS and GOA
- Industry-funded observer programs for groundfish and halibut fisheries

Figure 4. Current approaches to EBFM within the Alaska Region.

Many of the existing EBFM measures have been developed and implemented as a result of an ongoing or emerging problem in a fishery or the ecosystem. However, a few measures, such as prohibiting fishing in the U.S. Arctic, setting the upper limit of the Bering Sea optimum yield to two million metric tons (mt), and closing Habitat Areas of Particular Concern to bottom-trawling have been implemented as proactive, precautionary conservation measures to protect the ecosystem. The Council and its partners initiated development of a Fishery Ecosystem Plan (FEP) for the Bering Sea in December 2015 to augment ongoing EBFM science and monitoring work summarized in Figure 4. The initiation of the FEP was intended to accelerate and guide proactive, comprehensive implementation of EBFM across all Bering Sea fisheries in the coming years. The Bering Sea FEP was adopted by the Council at its December 2018 meeting.

Long-term vision for and benefits of EBFM in the Alaska Region

A key aspect of EBFM is connecting a holistic view of ecosystem processes and interconnections to management actions. In the Alaska Region, this has been promoted through the NPRB-led Integrated Ecosystem Research Programs (IERPs). The Bering Sea IERP was completed in 2012, the GOA IERP in 2018, and the Arctic IERP targeting 2021 for completion. These projects were integrated partnerships between multiple government agencies and academic institutions, and included studies of oceanography, plankton, fish, birds, marine mammals, and importantly human dimensions, with the scientists collaborating to produce integrated top-to-bottom syntheses of ecosystem understanding.

While the completion of each IERP is a significant milestone for EBFM in each ecosystem, turning the results into successful management actions requires extended scoping with agency scientists, stakeholders, and managers working in partnership to operationalize scientific findings and best practices. Following the model of the Bering Sea, it is anticipated that each Alaska Region ecosystem will follow its IERP with the development of an ecosystem-specific FEP (GOA, Arctic, and a re-visitation of the Aleutian Islands FEP) in subsequent EBFM work plans (Figure 5).

The science/management/stakeholder collaborative work plan development is crucial to the adoption of EBFM decision making. As an example of the need, the Council adopted an FEP for the Aleutian Islands in 2007. While this was a groundbreaking document, detailing our ecosystem knowledge at the time and assessing ecosystem drivers, pressures, and risks, it was primarily aspirational and did not lay out a public process for incorporating EBFM actions; this has resulted in the Aleutian FEP's limited impact on management over time. Conversely, the Bering Sea FEP develops a formal and public process for prioritizing the adoption of EBFM. It is hoped that establishing this process as an ongoing, operational collaboration will greatly aid the adoption of EBFM as a living process.

Given the cycle described above, the current version of the Alaska Region EBFM Roadmap Implementation Plan focuses on the Bering Sea, specifically using the Bering Sea FEP as a guide to action items and focusing on ongoing rather than aspirational actions. However, it should be recognized that (1) subsequent updates to the Alaska Region EBFM Roadmap Implementation Plan will expand to the other Alaska Region ecosystems and (2) much of the work described in

this implementation plan for the Bering Sea will be quickly applicable to the other ecosystems, due to the commonality of management structures and stakeholder/management needs.

This implementation plan represents a snapshot of current capacity for EBFM research and management adoption under current resource constraints; it is expected that long-term ecosystem research needs will continue to be identified through the FEP process, either through the existing Bering Sea FEP or through the development of FEPs in the other ecosystems, and that such work will be reflected in subsequent updates of the roadmap. Importantly, when considering the expansion of current capacity to include all of Alaska ecosystems, the long-term vision for EBFM implementation needs to include sustainable funding for science that complements (but does not divert funds from) stock assessment research.

Therefore, EBFM actions and research in the Alaska Region for the next five years will be guided by the Bering Sea FEP, the Bering Sea Climate Science Regional Action Plan (RAP), the GOA Climate Science RAP, the Alaska Integrated Ecosystem Assessment Programs (IEA), and other priorities identified by the Council. Given the Council's adoption of the Bering Sea FEP and its role as an active process, the milestones in this Alaska Region EBFM Roadmap Implementation Plan are specified for the Bering Sea. The Bering Sea FEP establishes a broad, ongoing framework for EBFM incorporation in Council management actions designed to:

1. Create a transparent public process for the Council to identify ecosystem goals and management responses;
2. Serve as a communication tool for ecosystem science and Council policy;
3. Provide a framework for strategic planning that would guide and prioritize fishery, habitat, and ecosystem research, modeling, and survey needs;
4. Identify connected Bering Sea ecosystem components, and their importance for specific management questions;
5. Assess Council management with respect to EBFM best practices, and identify areas of success and areas for improvement on a regular basis;
6. Provide a framework for considering policy options and associated opportunities, risks, and tradeoffs affecting FMP species and the broader Bering Sea ecosystem (e.g. evaluation of management tradeoffs among FMPs, fisheries, or with other activities); and
7. Build resiliency in Council management strategies, including options for responding to changing circumstances (e.g. climate change-driven changes to fish distribution and abundance, changes in shipping patterns, etc.).

Section 2: Expected Outcomes and Benefits

The current Alaska Region EBFM initiatives are numerous (Figure 4), with long-established policies and procedures. The EBFM science programs conducted and coordinated by the AFSC, such as ecosystem modeling and field research, are mature and have provided actionable results to the Council for many years. Given the strong establishment of EBFM in the Alaska Region, this Alaska Region EBFM Roadmap Implementation Plan should be seen as evolutionary rather than revolutionary in the guidance it provides to the Federal fishery management systems in Alaska. Still, documenting and describing the long-standing programs provides an opportunity for developing “transformative” elements that specifically respond to challenges faced in Alaska.

Primarily, this Alaska Region EBFM Roadmap Implementation Plan serves to:

- Document ongoing EBFM activities in the Alaska Region for each guiding principle of the Alaska Region EBFM Roadmap Implementation Plan;
- Describe additional Alaska Region EBFM management and research milestones for each guiding principle of the Alaska Region EBFM Roadmap Implementation Plan; and
- Highlight the Council’s role in establishing Alaska Region EBFM policy.

A specific set of challenges is identified in the current Alaska EBFM Roadmap Implementation Plan:

- **Ecosystem coverage** - The 5 LMEs in the Alaska Region span from subarctic to arctic systems, include wide continental shelves, deep ocean basins, and archipelagos, and encompass a great range of species and human uses which differ between ecosystems. However, ecosystem science is not “balanced” between LMEs. While it is appropriate that the distribution of research efforts across LMEs reflects management priorities, which may differ by ecosystem, it is also important that ecosystem research is not neglected in any LME. The Alaska EBFM Roadmap Implementation Plan recognizes that EBFM is place-based, and follows the Climate Regional Implementation Plans and the Alaska IEA Plans by developing an Alaska EBFM Implementation Plan specific to the Bering Sea.

OUTCOME & BENEFIT: This implementation plan will serve as a framework for future implementation development for the other LMEs, essentially by “adding columns” to the tracking spreadsheet as the other ecosystems are scoped. This will allow gaps in management needs and priorities between ecosystems to be identified.

- **Research and policy coordination and prioritization arising from integrated ecosystem research** - As shown in Figure 5, ecosystem research has been ongoing at AFSC, and the Council has received regular indicator-based ecosystem status reports (ESRs), maintained a standing ecosystem committee, and evaluates ecosystem and other research priorities on an annual basis. From 2006 through 2012, the AFSC participated in a large-scale Bering Sea IERP, jointly-funded by the National Science Foundation and the NPRB. The results from this research greatly improved understanding of the Bering

Sea ecosystem, developed modeling tools and management strategy evaluations, and influenced the development of the Bering Sea IEA Program, and the development of the Bering Sea FEP and Climate RAP (bottom of Figure 5). Beginning in 2014, the AFSC instituted an annual activity planning and funding cycle for research coordination and setting priorities used in funding decisions.

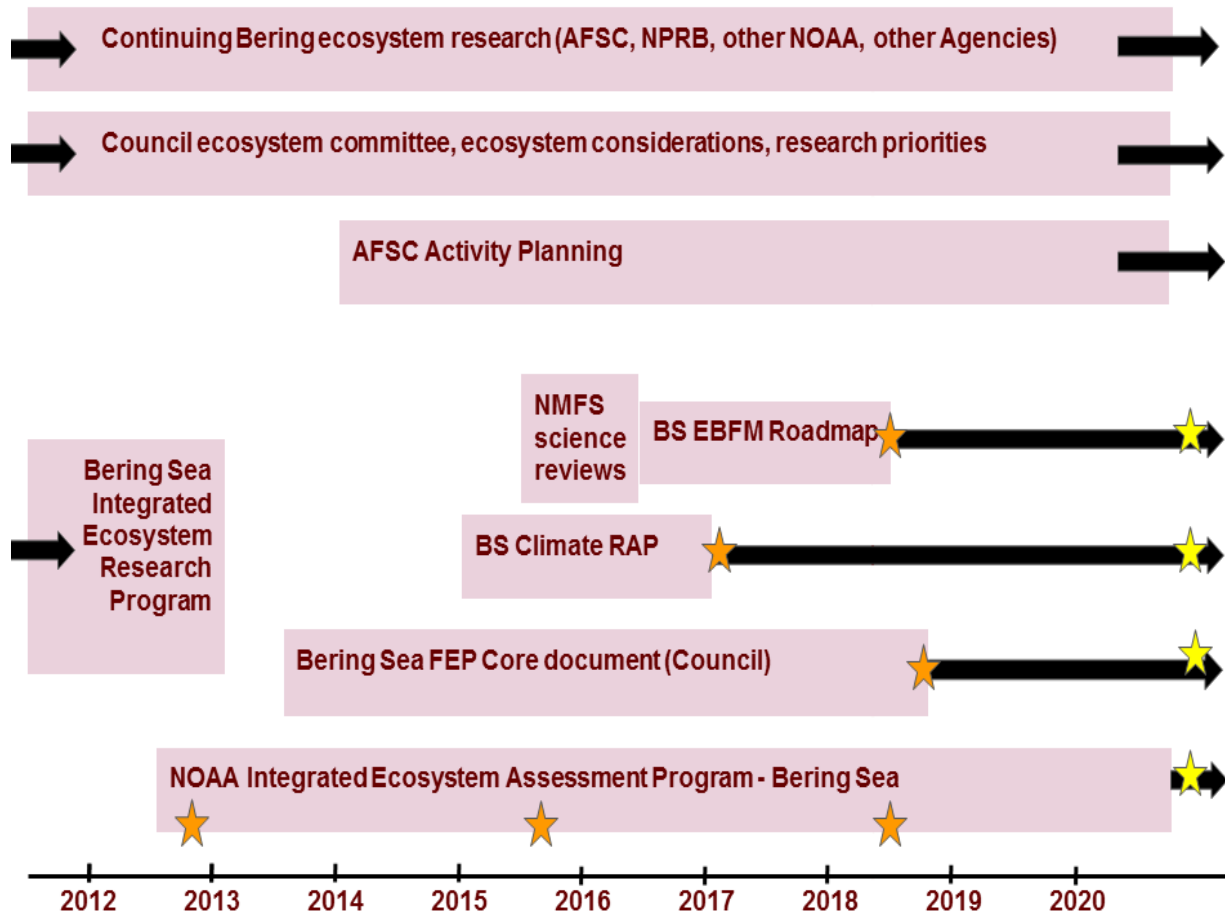


Figure 5. Programs and guidance documents for implementing EBFM in Alaska. Orange stars indicate publication of guidance documents and yellow stars indicate programs with annual tracking.

Similarly, the GOA IERP was completed in 2018 and the Arctic IERP is underway and will contribute to the development of EBFM efforts. *However, these programs and guidance documents were developed in parallel and were not completely mapped back onto the AFSC Activity Planning and prioritization.*

OUTCOME & BENEFIT: The Alaska EBFM Roadmap Implementation Plan envisions a more linked process and a “transformative” change in prioritization that completes the

loop between stakeholder and agency planning, guidance documents, conducted and prioritized research, and feedback (Figure 6). For example the “Action Module” process outlined in the Bering Sea FEP will ensure that it is a living guide for EBFM work, in which stakeholders and researchers develop research, priorities, and agree to uptake of EBFM, and outcomes are tracked.

- **Moving from crisis-based to operational ecosystem responses** - This is the most “transformational” element envisioned in the current Alaska EBFM Roadmap Implementation Plan. While planning and guidance can be established via implementation plans, too often scientific and management responses are a response to crisis. In the context of Alaska Federal fisheries management, a crisis may be triggered when a bottom-trawl survey results indicate a steep drop in a species biomass. For instance, as bottom-trawl survey results become available to the stock assessment process approximately 2-months before final quota-setting, steep drops in quota may happen at relatively short notice with relatively little understanding of the drivers and pressures behind the drop. This can cause both financial stress to stakeholders and management stress within the Council system.

OUTCOME & BENEFIT: The Alaska EBFM Roadmap Implementation Plan emphasizes specific developments to greatly temper this cycle. This includes the establishment of species-specific ecosystem indicators with reference points and conceptual models in Ecosystem-Socioeconomic Profiles (ESPs), bolstered by gap analyses and vulnerability assessments to determine species that may be prone to crises for which research has not been prioritized. Further, the Alaska EBFM Roadmap Implementation Plan includes the development of a standing Council FEP Team. It is envisioned that the FEP Team will be able to use ESRs, ESPs, and other data to determine “watch” species ahead of crises in order to improve the timeliness of both research and management response.

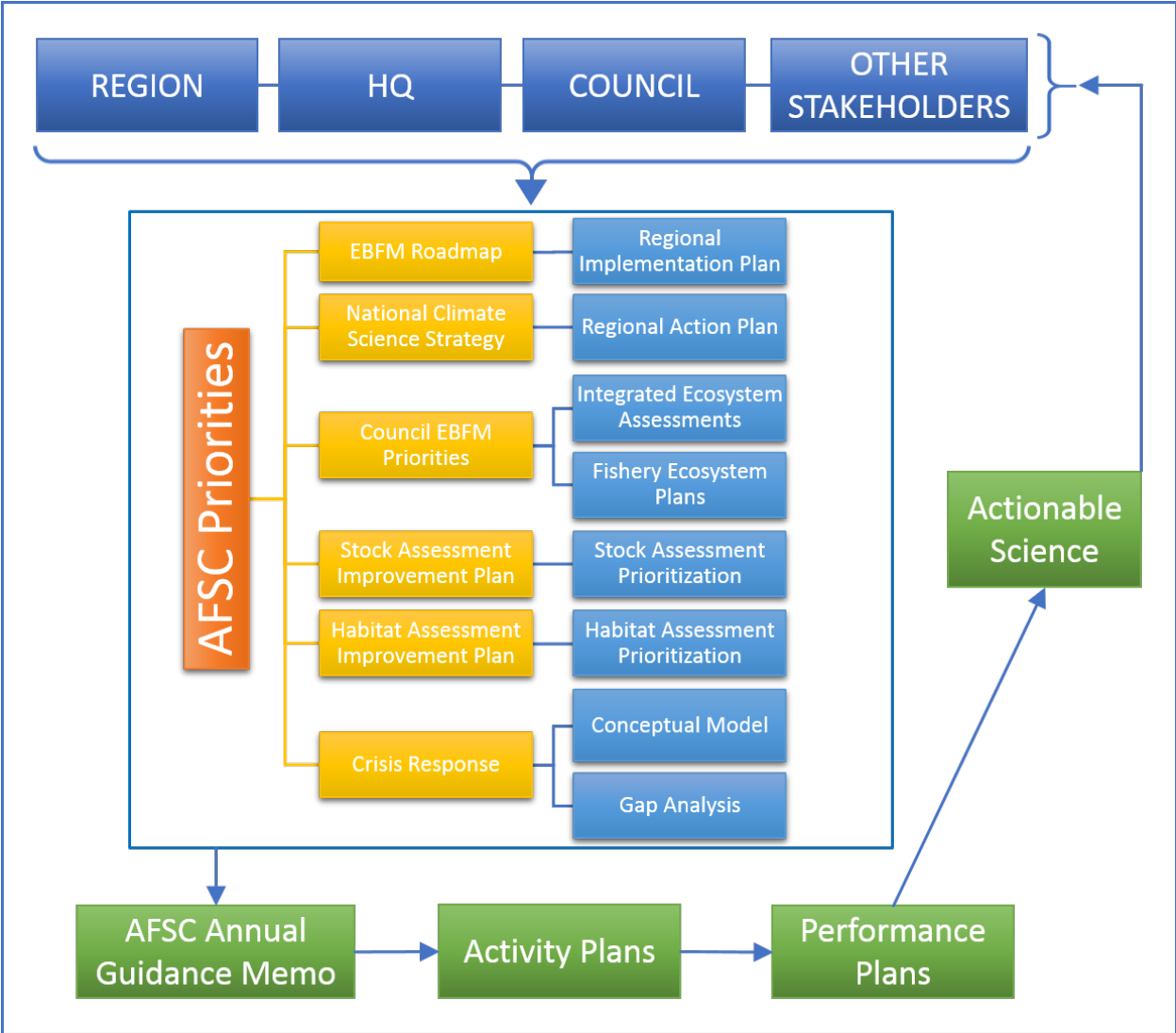


Figure 6. An envisioned planning and prioritization loop to encompass and coordinate multiple guidance programs and stakeholders.

Section 3: Milestones by Guiding Principles

The milestones that are anticipated for the next five years, to the extent this can be specified given the Council's stated intentions to date, are contained in the attached table (Table 1). The guiding principles of the NMFS EBFM Policy follow with description of milestones completed and in progress.

Implement ecosystem-level planning

Many of our milestones that implement ecosystem-level planning for the Bering Sea have been completed through coordinated actions by the Council, AKRO, and AFSC. The Bering Sea FEP was adopted by the Council in December, 2018. The Climate Action Module included in the Bering Sea FEP will substantially guide incorporating climate and ecosystem information in fishery management decisions going forward. For example, climate-enhanced stock assessments have been implemented or are in development for key stocks managed under the Bering Sea and Aleutian Islands Groundfish FMP.

Advance our understanding of ecosystem processes

Knowledge of the Bering Sea was advanced considerably through the Bering Sea IERP. Collaborative research groups such as the Alaska Climate Integrated Modeling (ACLIM) project are continuing to advance understanding in new areas, particularly the responses of fishery practices and ecological processes to changes in climate. An action module of the Bering Sea FEP is developing protocols for incorporating local knowledge and traditional knowledge into the fishery management process. Ongoing advances in our understanding of ecosystem processes are reported annually to the Council through the ESRs. All efforts to advance understanding are reliant on the continuation of resource surveys and advancements in survey technique.

Prioritize vulnerabilities and risks of ecosystems and their components

A regional habitat risk assessment was developed for the Bering Sea ecosystem and included in the Bering Sea FEP Climate Action Module. The risk assessment evaluated species distribution shifts under future climate scenarios, using species distribution model based essential fish habitat maps and ACLIM. Regional

habitat risk assessment protocols will continue to be explored for those areas known to serve important ecological functions for multiple species groups or that will be especially vulnerable or important with climate change in the Bering Sea and other Alaska LME.

Explore and address trade-offs within an ecosystem

A suite of modeling tools has been developed for the Bering Sea, including single-species assessment models coupled to climate drivers, a model of technical interactions (gears and bycatch), and a set of multispecies and ecosystem models. Through ACLIM, multispecies management reference points are being tested for robustness under climate change scenarios - tradeoffs revealed by these simulations will be part of a management strategy analysis. The models include tradeoffs between species, sectors, and communities, and include the examination of spatial shifts of stocks. The Bering Sea FEP, through its climate action module,

has established a framework for working with stakeholders throughout the process. A similar suite of models is under development for the GOA.

Incorporate ecosystem considerations into management advice

Methods to incorporate ecosystem considerations into management advice have developed over time. ESRs have been the primary source of contextual ecosystem information for managers, and the delivery, format, and content are continually evolving to best fit managers' needs. ESPs are in development as appendices to stock assessments. These will include quantifiable metrics relating ecosystem indicators to managed stocks, allowing for the development of reference points and threshold delineation. The prototype was completed for sablefish in 2017 and 2018. Three annual workshops (2019-2021) have been funded by the AFSC to develop ESPs for other stocks. Risk tables that rank concerns about model structure, population dynamics and ecosystem concerns that are not addressed in the recommended stock assessment model, will be used to track when ecosystem considerations are used to recommend allowable biological catch below the maximum permissible. Prototypes were introduced to the Council and adopted in 2018. Risk tables will be completed for all stock assessments beginning in 2019.

Maintain resilient ecosystems

There are ongoing efforts to expand and refine indicators and other metrics of ecosystem resilience. Many are reported annually to the Council through the ESRs and the Economics SAFE document. There was a notable expansion of human dimensions indicators in 2017 in these reports. These include aspects of community well-being (e.g. school enrollment, population trends) as well as provisions of goods and services grouped by ecological foraging guilds. There was another set of new indicators of ecosystem health introduced in 2018. These include mean length and mean lifespan of the fish community. The Bering FEP documents current practices for evaluating ecosystem, community resilience, well-being, and opportunities for improvement.

Section 4: Engagement Strategy

The NOAA Fisheries EBFM Roadmap includes the development of engagement strategies for the purpose of raising awareness about EBFM and engaging partners in advancing EBFM. NOAA Fisheries and the Council agree that meaningful engagement should occur consistently throughout the process of implementing EBFM. The EBFM Roadmap provides a general vision for an EBFM engagement strategy - essentially to receive input from stakeholders about what is and is not working well, and for coordinating across jurisdictional bodies to advance EBFM where necessary and appropriate.

Engagement and coordination with stakeholders and key partners by the science and management bodies is a well-integrated standard practice in the Alaska Region and critical to the success of the fishery management process here (Figure 7). However, more can be done to build relationships and improve engagement with a greater diversity of key partners and stakeholders. As noted in Section 1, key stakeholders include individuals and organizations associated with the commercial fishing industry, coastal communities, Alaska Native and Tribal Organizations, non-governmental organizations working on behalf of healthy ecosystems, and others. Partners include the Council, ADFG, IPHC, and the NPRB.



Figure 7. Examples of information flow between NMFS science and management, the Council, and key partners and stakeholders for EBFM engagement opportunities in the Alaska Region.

Within the Council process, recurring opportunities for engagement among the Council, NOAA Fisheries scientists, managers and enforcement officers, stakeholders, and partner agencies and organizations include meetings held by the Council, the Council's Ecosystem and Social Science Committees, the FMP Plan Teams, and the Bering Sea FEP Team. Workshops are important venues for multi-directional and -level discussions among partners and stakeholders, such as the dedicated ecosystem science workshop held by the Council in conjunction with its February 2018 meeting. However, consistent with the Council process and the Bering Sea FEP, NOAA Fisheries' engagement with partners and stakeholder groups on EBFM should be supported by a framework of guiding principles, tailored to each group. For example:

Engaging partners and stakeholders in local and traditional knowledge

NOAA Fisheries will continue to work with stakeholders and partners to formalize the use and review of local knowledge (LK) and traditional knowledge (TK) in the EBFM process. LK includes observations and experiences of local people based on personal, shared, and inherited experience connected to a specific place. It is acquired over a few generations or less, and bearers of local knowledge may or may not be indigenous to the area. TK refers more specifically to knowledge held by Indigenous people, with intergenerational transmission, and is deeply embedded in those cultures over great periods of time. In the Alaska Region, LK and TK are relevant for commercial, recreational, and subsistence fisheries management. LK and TK can exist in remote rural communities dependent on fishing and harvesting activities as part of a subsistence way of life and from commercial fishing. Commercial fishermen may possess LK and TK from considerable time in a region, possibly as intergenerational participants in the fishery, yet partially reside in ports such as Seattle or Astoria, Washington. NOAA Fisheries also recognizes the value to EBFM of local and traditional ecological knowledge (LEK and TEK) as components of LK and TK, respectively. LEK refers to what people know about particular environments that is acquired through observations and experience. TEK is the compendium of environmental knowledge Indigenous people have accumulated over numerous generations observing and interacting with the local environment.

The Bering Sea FEP includes a detailed strategy for NOAA Fisheries and the Council to implement more comprehensive management of the Bering Sea ecosystem through integrating LK and TK into research and decisions made regarding fisheries management processes. That strategy provides the blueprint for the Alaska EBFM engagement strategy for working with LK and TK partners to integrate LK and TK into the Alaska Region EBFM. This provides an opportunity for local residents to be included in research and management decisions for resources on which their livelihoods depend and to share their knowledge about the biological, physical, cultural, and spiritual worlds in which they inhabit and engage. Actively seeking out LK and TK from local residents, Tribes, fishing vessel captains, crew, processors, and others in structured, systematic ways may prove critical in understanding and reacting to shifting ecosystem characteristics over time (e.g. climate change). Actively seeking LK and TK may also create a dialogue between researchers and communities to answer sometimes complex research questions that are meaningful to residents of the region.

Further, E.O. 13175 requires "executive agencies" to establish regular and meaningful consultation and collaboration with Indian Tribes in the development of Federal policies that

have Tribal implications. The tribal consultation policies of the Department of Commerce (DOC) and NOAA require NOAA Fisheries to consult and work with tribal governments before making decisions or implementing policy, rules, or programs that may affect tribes to ensure that tribal rights and concerns are addressed. In addition to the requirement to consult with the 229 federally recognized tribes in Alaska, Congress also requires NMFS to consult with Alaska Native corporations on the same basis as tribes. More information about tribal consultations with the AKRO may be found at: <https://alaskafisheries.noaa.gov/tribal-consultations>.

Engagement at the milestone level

In addition to the broader partner and stakeholder engagement framework described above, each EBFM milestone should include deliberate and specific engagement strategies with each of our partners and stakeholder groups. In developing the strategies for each milestone, EBFM project leads are encouraged to consider the appropriate flow of information and opportunities for strengthening the project through partner and stakeholder participation. For each milestone, a specific approach to listen, inform, consult, and partner to effectively develop, achieve, and communicate EBFM projects with the appropriate partners and stakeholder groups should be described. Table 2 provides some engagement principles and methods for projects leads to consider in designing the engagement strategy for maximum project effectiveness.

Table 2. Example engagement principles and methods for designing a project-specific engagement strategy for maximum project impact.

Principles of Engagement	Methods of Engagement
<ul style="list-style-type: none"> ○ Build trust and transparency ○ Encourage collaboration ○ Encourage 360° openness, listening, and learning ○ Set clear expectations ○ Be inclusive and reflect diversity ○ Be open to new approaches 	<ul style="list-style-type: none"> ○ Participatory Workshops ○ Community Outreach Meetings ○ Notice and Comment Opportunities ○ Council Meetings ○ Webinars ○ Teleconferences ○ Websites ○ Reports

List of Acronyms

ACLIM Alaska Climate Integrated Modeling
ADFG Alaska Department of Fish and Game
AFSC NOAA Fisheries Alaska Fisheries Science Center
AKRO NOAA Fisheries Alaska Regional Office
BSAI Bering Sea and Aleutian Islands
CDQ Community Development Quota
EBFM Ecosystem-based fisheries management
EEZ Exclusive Economic Zone
ESP Ecosystem-Socioeconomic Profile
ESR Ecosystem status report
FEP Fishery Ecosystem Plan
FMP Fishery management plans
GOA Gulf of Alaska
IEA Integrated Ecosystem Assessment
IERP Integrated Ecosystem Research Programs
IPHC International Pacific Halibut Fishery Commission
LEK Local ecological knowledge
LK Local knowledge
LME Large marine ecosystems
MMPA Marine Mammal Protection Act
MSA Magnuson-Stevens Fishery Conservation and Management Act
NEPA National Environmental Policy Act
NPRB North Pacific Research Board
PSEIS Programmatic Supplemental Environmental Impact Statement
RFA Regulatory Flexibility Act
TAC Total Allowable Catch
TEK Traditional ecological knowledge
TK Traditional knowledge
WACDA Western Alaska Community Development Association

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