FINAL

New England Fishery Management Council

Essential Fish Habitat (EFH)

5-Year Review Summary Report

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1 EXECUTIVE SUMMARY

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; MSA) includes provisions concerning the identification and conservation of Essential Fish Habitat (EFH). The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The regional fishery management councils must describe and identify EFH in their fishery management plans (FMPs), minimize to the extent practicable the adverse effects of fishing on EFH, and identify other actions to encourage the conservation and enhancement of EFH. Federal agencies that authorize, fund, or undertake actions that may adversely affect EFH must consult with the National Marine Fisheries Service (NMFS), and NMFS must provide conservation recommendations to federal and state agencies regarding actions that would adversely affect EFH.

Federal regulations require Fishery Management Councils review and revise EFH components every five years, and amend EFH provisions in the FMPs, as warranted, based on available information. This comprehensive EFH Review is intended to complete these regulatory requirements while developing innovative methods for describing and identifying fish habitat in both state and federal waters to support new EFH designations and mapping approaches for the Council. The updated designations that will result from the approaches developed in this review are expected to improve the EFH consultation process and address management needs. This EFH Review builds on the work conducted in developing the original designations and in Omnibus EFH Amendment 2.

This Summary Report discusses each of the nine EFH components in detail and provides recommendations for possible revisions to the EFH provisions in the FMPs and recommendations for future reviews. The EFH review components include (1) EFH designation, (2) impacts of fishing on EFH, (3) impacts of non-Magnuson Stevens Act fishing on EFH, (4) non-fishing impacts to EFH, (5) cumulative effects of activities on EFH, (6) minimizing the adverse effects of fishing on EFH, (7) prey species, (8) designation of Habitat Areas of Particular Concern, and (9) EFH-related research needs. Additional comprehensive analysis is provided in accompanying working papers that focus on the main EFH components (i.e., 1, 2, 3, 4, 6, 7, and 9). Components 5 and 8 are addressed solely via this report.

On January 28, 2025, the Council considered the review approaches and results and generally endorsed the work of the Plan Development Team on this EFH Review, enabling the findings to be integrated into future management work. Specific recommendations for future Council action were identified for each review component. These range from the core recommendation of the review, which is to update the Council's EFH designations, to recommendations for ongoing coordination and information gathering, to continued refinement of analytical approaches going into the next 5-year EFH Review. The technical information associated with this review (for example, the food habits and non-fishing impacts evaluations) can be incorporated into the Councils FMPs by reference through continued staff and committee work on individual FMPs. Other follow up activities, such as EFH designations, HAPC designations, development of policies on non-fishing activities, and changes to spatial management approaches, would require prioritization and formal action by the Council.

The Council agreed to begin work on a series of three EFH designation frameworks immediately following the completion of this review.

Note: the term "Council", in this report, refers to the New England Fishery Management Council.

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3 EFH 5-YEAR REVIEW PROCESS

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; MSA) includes provisions concerning the identification and conservation of Essential Fish Habitat (EFH). The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The regional fishery management councils and National Marine Fisheries Service (NMFS) must describe and identify EFH in fishery management plans (FMPs), minimize to the extent practicable the adverse effects of fishing on EFH, and identify other actions to encourage the conservation and enhancement of EFH. Federal agencies that authorize, fund, or undertake actions that may adversely affect EFH must consult with NMFS, and NMFS must provide conservation recommendations to federal and state agencies regarding actions that would adversely affect EFH. Fishery management councils also have the authority to comment on federal or state agency actions that would adversely affect the habitat, including EFH, of managed species.

Section 303(a)(7) of the MSA requires that FMPs describe and identify EFH based on the guidelines established by the Secretary of Commerce under section 305(b)(1)(A) of the MSA. NMFS established guidelines in Federal regulations at 50 CFR 600 Subparts J and K. Federal regulations at 50 CFR 600.815 require that each FMP contains the following nine EFH components.

1. EFH descriptions and identification
2. Fishing activities that may adversely affect EFH
3. Non-Magnuson-Stevens Act fishing activities that may adversely affect EFH
4. Non-fishing activities that may adversely affect EFH
5. Cumulative impacts analysis
6. EFH conservation and enhancement recommendations
7. Prey species list and any locations
8. Habitat Areas of Particular Concern (HAPC) identification
9. Research and information needs

Federal regulations at 50 CFR 600.815(a)(10) also state:

> Councils and NMFS should periodically review the EFH provisions of FMPs and revise or amend EFH provisions as warranted based on available information. FMPs should outline the procedures the Council will follow to review and update EFH information. The review of information should include, but not be limited to, evaluating published scientific literature and unpublished scientific reports; soliciting information from interested parties; and searching for previously unavailable or inaccessible data. The Council should report on their review of EFH information as part of the Annual Stock Assessment and Fishery Evaluation (SAFE) report prepared pursuant to §600.315(e). A complete review of all EFH information should be conducted as recommended by the Secretary, but at least once every 5 years.

This document describes the analytical approaches used for this EFH Review, provides information on the findings of the review relative to each of the nine EFH components, and shares the Council's recommendations for improving the EFH information in the FMPs and conducting future EFH related research and EFH Reviews. The review relies on new information available since the completion of the previous review. Staff use information from published or unpublished scientific literature or scientific data that meet acceptable standards of scientific review, as directed in Federal regulations.

The following steps were used to complete and document the EFH 5-year review:

1) Review the Councils' (NEFMC and MAFMC) FMPs for information relating to the nine EFH components, noting areas where changes to the EFH components may be warranted.

2) Develop the Northeast Regional Habitat Assessment (NRHA) to compile fishery-independent

survey and habitat data, develop species distribution models, and summarize species and habitat climate vulnerability.

3) Use the NRHA information and other resources to update information for each review component.

4) Conduct the analytical work to improve the components with new information, and summarize findings in six component specific working papers:

   a) EFH descriptions and identification

   b) Fishing activities that may adversely affect EFH and EFH conservation and enhancement recommendations

   c) Non-Magnuson-Stevens Act fishing activities that may adversely affect EFH

   d) Non-fishing activities that may adversely affect EFH

   e) Prey species information

   f) Research and information needs

5) Prepare EFH 5-Year Review Summary Report (this document) for the Council. Include recommendations of whether changes to the FMPs are warranted. This report also includes information related to cumulative impact analysis and designation of Habitat Areas of Particular Concern.

6) The Council reviews the summary report and endorses the recommendations.

7) The summary report and individual component reports are transmitted to NMFS GARFO for their awareness and posted to the Council's website.

This work was done in collaboration with the Mid-Atlantic Fishery Management Council staff and EFH Fishery Management Action Team (FMAT). Periodic check-ins occurred with the Habitat Committee, Habitat Advisory Panel, and Council during this process. Components of this work were reviewed twice, once during NRHA development (step 2, above), and once during the EFH review (steps 3 and 4).

3.1 EFH in the Fishery Management Plans

Omnibus EFH Amendment 1 (1998) identified and described EFH for all 18 species managed by the Council at that time of its development through amendments to the Northeast Multispecies, Atlantic Sea Scallop, and Atlantic Salmon FMPs. EFH designations not included OHA1 were completed on the following schedule: monkfish (1999), offshore hake (2000) red crab (2002), skate complex (2003), and Atlantic wolffish (2010), EFH designations for all species were updated in 2018 via Omnibus EFH Amendment 2. Additional information about past EFH actions is provided in Volume 1, section 3 of OHA2 (OA2-FEIS_Vol_1_FINAL_161208.pdf (d23h0vhsm26o6d.cloudfront.net).

3.2 Roadmap to the nine EFH components

This summary report provides information to inform future Council decisions to initiate actions to revise the EFH information it its FMPs. The EFH review components include:

1) EFH designations – Section 4,
2) Impacts of fishing on EFH– Section 5,
3) Impacts of non-Magnuson Stevens Act fishing on EFH– Section 6,
4) Non-fishing impacts to EFH – Section 7,
5) Cumulative effects of activities on EFH– Section 8,

6) Minimizing the adverse effects of fishing on EFH– Section 9,
7) Prey species– Section 10,
8) Identification of Habitat Areas of Particular Concern– Section 11, and
9) EFH-related research needs – Section 12.

Additional comprehensive analysis is provided in accompanying working papers that focus on the main EFH components (i.e., 1, 2, 3, 4, 6, 7, and 9). Components 5 and 8 are addressed solely via this report.

3.3 Recommendations for Council action across all review components

The Council's role with respect to the EFH Review is to receive a report on the review and decide whether any of the new information warrants changes to management (i.e., modifications to the FMPs). If, after reviewing the draft summary report, the Council chooses to update any EFH components in its FMPs, fishery management actions will be prepared along with the appropriate NEPA documents. OHA2 made changes to allow EFH designations and measures to minimize the effects of fishing on EFH to be developed through frameworks to the FMPs, vs. requiring amendments.

Dedicated Council staff time and resources, as well as Committee, Advisory Panel, and Council meeting time, will be required to continue progressing this EFH work over the coming years. Advancement of EFH designation work is identified as a 2025 priority. Generally, the Council has identified the possibility of continued Fishing Effects Model updates in its current four-year NOAA Operating Agreement. MAFMC has an Inflation Reduction Act project dedicated to updating EFH source documents. Additional resources will be needed to implement the other recommendations before the next 5-year EFH review, and the Council will need to discuss annual work plans and commitments during its annual priorities setting process.

Table 1. Council-recommended actions based on this EFH 5-Year Review.

EFH component	Recommendations for Council action including any changes to the FMPs
1. EFH descriptions and identification for individual species	1. Evaluate and potentially update text and map components of EFH designations for all NEFMC-managed species. A separate memorandum provides details on how EFH revisions for each species will be prioritized over three years with a roughly equal number of species per year. Timing: near-term, beginning in 2025 and continuing through 2027. 2. Continue to update and advance species / environmental data sources, modeling approaches, and other sources of information to ensure EFH designation updates utilize the best available information and practices. Continue to collaborate and share habitat-related information / resources with regional and federal partners where appropriate. Timing: prior to the next EFH Review.
2. Fishing activities that may adversely affect EFH	1. Update Fishing Effects analysis more routinely (timing dependent on available resources). Timing: planning near term, implement more regular updates between now and next EFH Review. 2. Continue to advance modeling methods. Specifically, continue collaborating with the NPFMC as Fishing Effects modeling work progresses across regions (additional / updated data, literature, adjustments to vulnerability assessment, model calculations, sediment data, energy data, etc.). Timing: near term and until next EFH Review.
3. Non-Magnuson-Stevens Act fishing activities that may adversely affect EFH	1. Continue deploying the questionnaire-based review approach, in partnership with the states. Consider refining the questionnaire to ensure that all state fisheries of interest to the Council in the context of EFH impacts are captured in the responses. Timing: during the next EFH Review. 2. Include other types of non-MSA fishing that may impact habitat in future reviews, as appropriate. This could include fishing that occurs on federal lands (e.g., those managed by USFWS) or outside MSA jurisdiction such as U.S. high seas permitted fisheries under the High Sea Fishing Compliance Act (1994), recreational, subsistence, and traditional indigenous fishing that doesn't meet the definition of commercial or recreational fishing under MSA. Timing: during the next EFH Review.

EFH component	Recommendations for Council action including any changes to the FMPs
4. Non-fishing activities that may adversely affect EFH	1. Schedule routine check-ins between NOAA Fisheries and Council staff to discuss emerging issues of concern. Timing: near term. 2. Conduct periodic literature searches to identify new published research on the habitat impacts from activities and stressors. Timing: near term. 3. Continue to participate in regional habitat management, science, and conservation partnerships. Timing: near term. 4. Consider the development of new joint Council habitat policies such as marine carbon dioxide removal and offshore sand mining, or other emerging topics as appropriate, as more work and research are done. Timing: medium term / next few years.
5. Cumulative Impacts	1. Develop spatial products/maps that show the overlaps between species-specific EFH designations and other marine activities to help inform discussions about impacts to EFH as these activities change/advance. Timing: prior to the next EFH Review. 2. Consider developing quantitative indices/metrics to measure cumulative impacts and their changes over time. Timing: prior to the next EFH Review. 3. Identify and implement improvements to information resources in the cumulative effects analysis sections of FMP documents. Timing: prior to the next EFH Review. 4. Consider the strategic offshore wind compensation program that is under development in the U.K. as a potential application in the cumulative effects context. Timing: prior to the next EFH Review.
6. EFH Conservation and Enhancement Recommendations	1. Consider the need to initiate an action or actions to adjust measures in Council FMPs that minimize the effects of fishing on EFH (e.g., spatial measures). OHA2 recommended this occur on a 10-year time frame from 2018 implementation. Timing: 2027-2028. 2. Consider a more detailed evaluation of Fishing Effects results at finer temporal (monthly) and spatial (sub-regions, management areas) scales to support an evaluation of the Councils' adverse effects minimization measures. Timing: prior to and during the next EFH Review. 3. Consider other factors that could be affecting the offshore marine environment and how these activities may be affecting the prosecution of fisheries in space and time (e.g., offshore wind energy, any new sanctuary designations, etc.). These changes could result in alterations in fishing effort/behavior and could warrant changes in management measures currently in place. Timing: prior to and during the next EFH Review.

EFH component	Recommendations for Council action including any changes to the FMPs
7. Prey species list and any locations	1. Consider how food habits information for Council-managed species can integrate with and/or inform Council and NOAA processes (e.g., NEFMC's new risk policy, NEFSC bottom trawl survey protocols / design, State of the Ecosystem reports, Socio-Economic Profiles, Fishery Management Plans, work of the NEFMC Climate and Ecosystem Steering Committee, work of the MAFMC Ecosystem and Ocean Planning Committee, etc.). Timing: near term, during IRA performance period 2025-2027. 2. Consider roll-out of products (reports, R-Shiny applications) and ensure proper documentation of methods including R-Shiny application development in repositories such as GitHub. Timing: near term. 3. Continue to share resources and information with NOAA Fisheries (NEFSC Food Web Dynamics Program). Timing: near term,
8. Habitat Areas of Particular Concern	1. No recommended action at this time.
9. Research and information needs	1. Consider updating research needs and new and existing inventories of research projects as NEFMC and MAFMC Inflation Reduction Act projects progress. Timing: During IRA performance period, 2025-2027.

3.4 Implementation and Report Audience and Use (in brief)

The primary purpose of this report and the associated review information / component reports is to review and update EFH information and to help support Council members' decision making for any follow-on management actions. Some of this review information will be integrated directly into the FMPs via specific Council actions including recommended revisions to EFH designations (text and maps), and other information will be used as context and background for Council discussion and decision-making. For example, the information can be used in Council comment letters to state and federal agencies and for background to inform discussion on any future management action. This could include using the fishing effects model outputs and other spatial/temporal analyses to evaluate existing or new Habitat Management Areas (HMAs) and/or any new management measures that would then be incorporated into an individual FMP.

The outputs of the review not only support the Council in its ongoing habitat conservation work but also GARFO Habitat and Ecosystem Services Division (HESD) staff work on EFH consultations. The updated designation maps and text descriptions to be developed following this review will directly affect GARFO HESD EFH consultations, but other outputs, recommendations, and considerations from specific EFH components can inform this consultation work.

The results of this EFH Review also have additional applications that warrant further collaboration to support development and improvement of specific model outputs and products, as well as communication about this work with other regional and federal partners. This was the first NEFMC and MAFMC EFH Review developed collectively through coordination with regional partners (both Council and NOAA Fisheries staff) and leveraging both the NEFMC PDT and MAFMC FMAT resources. If the results and

products are useful, the Council should consider how to support future collaborative work between these groups and others for the future EFH Reviews. Table 2 provides a non-exhaustive list of potential applications and end users of these EFH Review results.

Table 2. Examples of applications and end users of EFH Review results, products, and information relative to individual EFH review components.

EFH Review component	Applications and End Users of Results, Products, and Information
1. EFH descriptions and identification for individual species*	• Internal to Council and staff: EAFM/Climate Teams - community-level basis function (CBFM) modeling and Northeast Regional Habitat Assessment (NRHA) work that supported designations can inform the Council's understanding of changes in habitat use and examine which species interaction(s) or environmental variable(s) may be important drivers of change. This would serve as a foundation for further collaboration with MAFMC and as a starting point to maintain and develop improved Northeast designations for the next EFH Review; Generally, this work could support Council actions. • External to Council incl. regional partners: *EAFM/Climate* (East Coast Climate Coordination Group, E3CG) partners could consider this information for State of the Ecosystem (SOE) indicators or other work; *GARFO HESD*: EFH text and maps directly support EFH consultations and could use these supplemental products (i.e., modeling outputs, seasonal maps, and detailed state-federal survey information synthesized and posted on NRHA's website); *MAFMC*: Will inform EFH Source Document IRA-funded work for all NEFMC and MAFMC managed species.
2. Fishing activities that may adversely affect EFH*	• Internal to Council and staff: To identify trends in fishing effort by area/gear type to inform further exploration of adverse effects from fishing on EFH in specific areas with certain gear types and any subsequent work priorities/actions for staff • External to Council incl. regional partners: Improve understanding of fishing impacts across entire region and multiple gear types. Could support cumulative effects considerations in actions GARFO/Council staff develops. Informs cross-Council work on fishing effects analysis work (MAFMC, NEFMC, NPFMC).
3. Non-Magnuson-Stevens Act fishing activities that may adversely affect EFH*	• Internal to Council and staff: Improve understanding of complexity of non-Council managed fishing activities within the region that may impact EFH; may inform tracking of emerging or declining fisheries or other activities in region (cumulative effects). • External to Council incl. regional partners: GARFO HESD can use this information when evaluating other habitat protection measures in place during consultations (e.g., if a state prohibits dredging certain months to protect submerged aquatic vegetation, this could inform conservation recommendations for a project); Inform coordination, collaboration, and resource-sharing with state-water fisheries partners.

4. Non-fishing activities that may adversely affect EFH*	• Internal to Council and staff: Identify emerging activities and activities that are expanding in scope in the region to inform when new non-fishing policies are needed or when existing policies need updates; highlight issues of concern for relevant FMP staff. • External to Council incl. regional partners: Identify new areas for staff coordination with GARFO consultation staff, which may warrant the inclusion of certain activities in cumulative effects analyses developed with GARFO NEPA for any Council action.
5. Cumulative Impacts	• Internal to Council and staff: No specific products and information developed; Could utilize the work from other EFH review components (#1, #2, #3, #4) to inform more structured multi-use considerations for Council-managed fisheries in the long-term. • External to Council incl. regional partners: Coordinate with MAFMC and GARFO to improve cumulative effects analysis (based on information and recommendations in component reports #4 and #9)
6. EFH Conservation and Enhancement Recommendations	• Internal to Council and staff: Multiple review components (including 1, 2, 4) can be used to support re-evaluation and possible adjustments to measures to minimize adverse effects across Council FMPs. • External to Council incl. regional partners: To be determined; review products that are map-based could be shared via regional data portals to communicate Council actions to minimize impacts of fishing, and the need for complementary conservation actions at regional scales.
7. Prey species list and any locations*	• Internal to Council and staff: Can support affected environment sections of Council actions developed by staff; inform Council considerations of ecosystem component species / unmanaged forage in region (e.g., NEFMC IRA project); identify important relationships between managed fish and their prey, which could lead to a change in risk tolerance, future research or actions. • External to Council incl. regional partners: Support development of important prey indicators for species or species complexes in SOE Reports with NOAA partners; Can support other external partners/researchers working on similar topics (i.e., NEFSC Food Habits group).
8. HAPC	• Internal to Council and staff: Inform Council habitat types and/or specific areas of importance to emphasize in federal project comment letters (e.g. identify areas to exclude from offshore wind energy siting); Inform habitat considerations for any Council action that overlaps with an HAPC designation; Enhance ability to highlight important areas relative to other regional activities. • External to Council incl. regional partners: HAPC designation text and maps directly support EFH consultations; provides more specificity and emphasize concern. • This work can be done with respect to existing designated HAPCs, or any new HAPC identified in the future.

9. Research and information needs*	• Internal to Council and staff: Inform development of the Council's 5-year research priorities. • External to Council incl. regional partners: Inform regional research plans and work priorities including those of NEFSC, GARFO, and MAFMC; coordination will be required to advance work on habitat research/needs in the region.

*Denotes a separate component working paper/products are available beyond those in this summary report.

4 COMPONENT 1: EFH DESCRIPTIONS AND IDENTIFICATION

Descriptions and identification of EFH consists of written summaries (text descriptions), tables, and maps in the FMPs. The EFH regulations provide an approach to organize the information necessary to describe and identify EFH (50 CFR 600.815(a)(1)(iii)). When designating EFH, the Council should strive to describe and identify EFH information in the FMPs at the highest level possible (50 CFR 600.815(a)(1)(iii)(B))

- *Level 1:* Distribution data are available for some or all portions of the geographic range of the species.
- *Level 2:* Habitat-related densities or relative abundance of the species are available.
- *Level 3:* Growth, reproduction, or survival rates within habitats are available.
- *Level 4:* Production rates by habitat are available.

Generally, text and maps are developed for individual life history stages (eggs, larvae, juveniles, adults) when sufficient information exists to do so. Northeast regional EFH text and maps rely on level 2 data for most species, although a few species use distribution data only (level 1).

4.1 Previous work to designate EFH

Prior EFH designation approaches for both Councils are similar and described in the Component 1 report and in previous NEFMC and MAFMC documents. For most species, text descriptions were prepared based on NOAA Technical Memoranda (EFH Source Documents) and include information such as the range of the species, appropriate depths and temperatures, and associated habitat types (substrates such as sands and gravels, submerged aquatic vegetation, etc.). Each of the Councils managed species has an original designation, developed around 1998-1999 following the Sustainable Fisheries Act EFH requirements, or whenever the species was added to a fishery management plan, whichever occurred later.

The foundation of the existing EFH maps, for most species in the region, is relative abundance data from spring and fall Northeast Fisheries Science Center's bottom trawl surveys. These data were gridded by ten-minute squares, and the squares were ranked. The top 75% or 90% of ranked squares form the basis of the maps. In most cases, separate adult and juvenile maps were developed. More recently developed map designations, such as those prepared for NEFMC's Omnibus EFH Amendment 2, combine survey data with depth and temperature data. When available, egg and larval plankton data were gridded by ten-minute square and used as the basis for egg and larval EFH maps. Where data were unavailable for a life stage, a single map that is representative of multiple life stages was used. EFH for inshore regions (shallower coastal areas, defined estuaries and embayments) was based on relative abundance in state trawl surveys (gridded by ten-minute squares) or on findings of the Estuarine Living Marine Resource (ELMR) inventory (entire estuary or embayment designated).

4.2 Current review approach

The designation methods for this EFH Review drew inspiration from the model-based approach employed by the North Pacific Fishery Management Council (NPFMC) in its recently completed 2023 EFH 5-year Review (NPFMC 2023). The NPFMC was the first of the eight fishery management councils to utilize model-based approaches to support EFH maps and designations. The Northeast is the second region to apply these model-based methods for EFH purposes. This approach uses species distribution models (SDMs) to combine abundance data primarily from fishery-independent surveys with environmental

covariates and map the extent of EFH for each managed species, which then informs EFH text descriptions.

In March 2017, the MAFMC EFH Fishery Management Action Team (FMAT) met at the James J. Howard Marine Sciences Laboratory with experts from the Northeast Fishery Science Center, GARFO, NEFMC habitat staff, and several state agencies to provide their expertise and assist the FMAT in developing recommendations for improving EFH and HAPC text and map designations. The recommendations from that group were carried forward into the work of the Northeast Regional Marine Fish Habitat Assessment (NRHA) to support EFH and ecosystem initiatives in the Northeast Region. Following the FMAT meeting, MAFMC recommended stepping back from the EFH review to develop foundational information via NRHA. NEFMC and NEFSC signed on as co-leads of the assessment, which was completed between 2017-2022.

NRHA served as the necessary foundation to inform the development of improved EFH designations. This multi-disciplinary, regional endeavor compiled and integrated a variety of data sources (both state and federal fish survey data) allowing them to be utilized for both modeling efforts and to inform inshore fish habitat use.

The updated EFH designation approach uses modeling outputs from SDMs as the basis for revising EFH boundaries. A full description of these methods is available in the Component 1 report. Briefly, life stage-specific SDMs for each managed species are built using abundance data from offshore and select inshore surveys along with environmental covariates. These models predict species density, and we define model-based EFH as the upper 95% quantiles of these density predictions constrained to the species' occupied habitat (as defined in the NPFMC 2023 EFH Review and references therein). These model-based footprints are then joined with occurrence-based footprints from additional inshore surveys to produce draft revised EFH designation footprints. Finally, these footprints are verified by consulting experts and the literature and inform revisions to the EFH text descriptions. Example designations are available in the Component 1 report as well as an EFH Demo R-Shiny Application developed by the MAFMC.

Like prior EFH reviews, for most species, text descriptions are being prepared based on reference peer-reviewed literature, that includes information such as the range of the species, appropriate depths and temperatures, and associated habitat types (substrates such as sands and gravels, submerged aquatic vegetation, etc.). While the NOAA Technical Memoranda (EFH Source Documents) have not been updated since the mid-2000s, a new Inflation Reduction Act (IRA) project will produce updated "climate-ready" EFH Source Documents.

4.3 Summary of findings

Table 3 describes potential updates to EFH text and maps by species and life stage, including whether model-based designations are possible or if alternative approaches will be required. Currently, many species have separate egg and larval maps that were developed by summarizing plankton data for these life stages by ten-minute squares. The PDT generally does not recommend continuing to use maps based on plankton data but instead suggests that either juvenile or adult maps be used as proxies for egg and larval distributions until additional egg and larval life stage data or species distribution models become available. The most appropriate proxy can be determined on a case-by-case basis, based on life history information.

Table 3. Updates to EFH text and maps that are likely to be appropriate in trailing actions to this EFH Review. Unless otherwise specified, map updates will be based on species distribution modeling outputs using fishery-independent survey data, combined with inshore occurrence data.

Species	Update Text?	Update Maps?	Notes	Year
Northeast Multispecies FMP				
1. Acadian redfish	Yes, larvae, juvenile, adult	Yes, juvenile, adult	Consider the most appropriate life stage proxy in lieu of a separate larval map. No distinct egg stage.	2027
2. American plaice	Yes, egg, larvae, juvenile, adult	Yes, juvenile, adult	Consider the most appropriate life stage proxy in lieu of separate egg/larval maps.	2027
3. Atlantic cod	Yes, egg, larvae, juvenile, adult	Yes, juvenile, adult	Consider the most appropriate life stage proxy in lieu of separate egg/larval maps.	2025
4. Atlantic halibut	Yes, egg, larvae, juvenile, adult	Yes, likely one map for species	Not modeled, data poor. Alternative use/processing of survey data is likely required to generate an EFH map.	2027
5. Atlantic wolffish	Yes, egg, larvae, juvenile, adult	Potentially yes, likely one map for species	Not modeled, data poor. Species geographic/depth range approach to EFH mapping is most likely path forward; this is the approach currently taken. Map may not require adjustment.	2027
6. Haddock	Yes, egg, larvae, juvenile, adult	Yes, juvenile, adult	Consider the most appropriate life stage proxy in lieu of separate egg/larval maps.	2026
7. Ocean pout	Yes, egg, juvenile, adult	Yes, juvenile, adult	Consider most appropriate life stage proxy in lieu of a separate egg map. There is no true larval stage for ocean pout.	2027
8. Pollock	Yes, egg, larvae, juvenile, adult	Yes, combined juvenile/adult map	Consider the most appropriate life stage proxy in lieu of separate egg/larval maps.	2027
9. White hake	Yes, egg, larvae, juvenile, adult	Yes, juvenile, adult	Consider most appropriate life stage proxy in lieu of separate egg/larval maps.	2027
10. Windowpane flounder	Yes, egg, larvae, juvenile, adult	Yes, juvenile, adult	Consider most appropriate life stage proxy in lieu of separate egg/larval maps.	2026
11. Winter flounder	Yes, egg, larvae, juvenile, adult	Yes, juvenile, adult	Consider most appropriate life stage proxy in lieu of separate egg/larval maps.	2026
12. Witch flounder	Yes, egg, larvae, juvenile, adult	Yes, juvenile, adult	Consider most appropriate life stage proxy in lieu of separate egg/larval maps.	2027
13. Yellowtail flounder	Yes, egg, larvae, juvenile, adult	Yes, juvenile, adult	Consider most appropriate life stage proxy in lieu of separate egg/larval maps.	2026

Species	Update Text?	Update Maps?	Notes	Year
Small Mesh Multispecies FMP				
14. Offshore hake	Yes, egg, larvae, juvenile, adult	Yes, likely one map for species	Not modeled, data poor. Alternative use/processing of survey data is likely required to generate an EFH map.	2026
15. Red hake	Yes, egg, larvae, juvenile, adult	Yes, juvenile, adult	Consider the most appropriate life stage proxy in lieu of separate egg/larval maps.	2026
16. Silver hake	Yes, egg, larvae, juvenile, adult	Yes, juvenile, adult	Consider the most appropriate lifestage proxy in lieu of separate egg/larval maps.	2026
Monkfish FMP				
17. Monkfish	Yes, egg, larvae, juvenile, adult	Yes, juvenile, adult	Consider the most appropriate life stage proxy in lieu of separate egg/larval maps.	2025
Skate Complex FMP				
18. Barndoor skate	Yes, egg, juvenile, adult	Yes, combined juvenile/adult map	Combined map could be used as proxy for egg EFH. Currently there are no egg EFH maps for skates.	2025
19. Clearnose skate	Yes, egg, juvenile, adult	Yes, juvenile, adult	Adult map could be used as proxy for egg EFH. Currently there are no egg EFH maps for skates.	2025
20. Little skate	Yes, egg, juvenile, adult	Yes, juvenile, adult	Adult map could be used as proxy for egg EFH. Currently there are no egg EFH maps for skates.	2025
21. Rosette skate	Yes, egg, juvenile, adult	Yes, combined juvenile/adult map	Not modeled, data poor. Alternative use/processing of survey data is likely required to generate an EFH map. Combined map could be used as proxy for egg EFH, in lieu of a separate egg map.	2025
22. Smooth skate	Yes, egg, juvenile, adult	Yes, combined juvenile/adult map	Combined map could be used as proxy for egg EFH. Currently there are no egg EFH maps for skates.	2025
23. Thorny skate	Yes, egg, juvenile, adult	Yes, combined juvenile/adult map	Combined map would be used as proxy for egg EFH. Currently there are no egg EFH maps for skates.	2025
24. Winter skate	Yes, egg, juvenile, adult	Yes, juvenile, adult	Adult map could be used as proxy for egg EFH. Currently there are no egg EFH maps for skates.	2025
Atlantic Sea Scallop FMP				
25. Atlantic sea scallop	Yes, egg, larvae, juvenile, adult	Yes, likely one map for species	Separate scallop model planned (for continued development and completion in 2025). Currently there is a single map for the species.	2026

Atlantic Herring FMP				
26. Atlantic herring	Yes, egg, larvae, juvenile, adult	Yes, juvenile, adult	Consider the most appropriate life stage proxy in lieu of separate egg/larval maps. Because egg beds occur in specific locations, a map specific to eggs may be appropriate for this species (there is currently an egg map). Data on egg beds is fairly limited, however.	2025
Deep-Sea Red Crab FMP				
27. Deep-sea red crab	Yes, egg, larvae, juvenile, adult	Potentially yes	Not modeled, data poor. Species geographic/depth range approach to EFH mapping is most likely path forward; this is the approach currently taken. Maps may not require adjustment.	2027
Atlantic Salmon FMP				
28. Atlantic salmon	Potentially yes, all stages.	Potentially yes, likely one map for species	Not modeled, data poor. Map is based on rivers and associated embayments where species occurs now or occurred in the past; literature review would be needed to confirm mapped extent remains appropriate. A subset of these rivers is designated as an HAPC.	2027

4.4 Council recommendations

The Council recommended the following actions:

- **Component 2, Recommendation 1:** Evaluate and potentially update text and map components of EFH designations for all NEFMC-managed species. A separate memorandum provides details on how EFH revisions for each species will be prioritized over three years with a roughly equal number of species per year. **Timing: near-term, beginning in 2025 and continuing through 2027.**

- **Component 2, Recommendation 2:** Continue to update and advance species / environmental data sources, modeling approaches, and other sources of information to ensure EFH designation updates utilize the best available information and practices. Continue to collaborate and share habitat-related information / resources with regional and federal partners where appropriate. **Timing: before the next EFH review.**

5 COMPONENT 2: FISHING EFFECTS ON EFH

The EFH regulations base the evaluation of the adverse effects of fishing on EFH on a 'more than minimal and not temporary' standard (50 CFR 600.815). Gear contact from fishing operations may change the abundance or availability of certain habitat features (e.g., the presence of living or non-living habitat structures) used by managed fish species to accomplish spawning, breeding, feeding, and growth to maturity. These changes can reduce or alter the abundance, distribution, or productivity of that species, which in turn can affect the species' ability to "support a sustainable fishery and the managed species' contribution to a healthy ecosystem" (50 CFR 600.10). The outcome of this chain of effects depends on the characteristics of the fishing activities, the habitat, fish use of the habitat, and fish population dynamics. Conducting an analysis considering all relevant factors required the consolidation of information from a wide range of sources and fields of study to focus on the evaluation of the effects of fishing on EFH.

The assessment of fishing effects on EFH is guided by the EFH regulations at 50 CFR 600.815(a)(2) and **we highlight and summarize two here**:

Fishing activities that may adversely affect EFH

i. *Evaluation.* Each FMP must contain an evaluation of the potential adverse effects of fishing on EFH designated under the FMP, including effects of each fishing activity regulated under the FMP or other Federal FMPs. … In completing this evaluation, Councils should use the best scientific information available, as well as other appropriate information sources. Councils should consider different types of information according to its scientific rigor. (Summarized)

ii. *Minimizing adverse effects.* Each FMP must minimize to the extent practicable adverse effects from fishing on EFH, including EFH designated under other Federal FMPs. Councils must act to prevent, mitigate, or minimize any adverse effects from fishing, to the extent practicable, if there is evidence that a fishing activity adversely affects EFH in a manner that is **more than minimal and not temporary in nature**, based on the evaluation conducted pursuant to paragraph (a)(2)(i) of this section and/or the cumulative impacts analysis conducted pursuant to paragraph (a)(5) of this section. … FMPs must explain the reasons for the Council's conclusions regarding the past and/or new actions that minimize to the extent practicable the adverse effects of fishing on EFH. (Summarized)

5.1 Previous work to describe fishing effects on EFH

Prior to OHA2, evaluations of fishing impacts to EFH were conducted plan by plan, and measures such as gear restricted areas were implemented in individual plans. Through OHA2, the Council sought to consider EFH designations and effects minimization holistically across FMPs. For this reason, following the initial "Phase 1" work of OHA2 to update EFH designations and identify new Habitat Areas of Particular Concern (HAPC), the Habitat PDT developed the Swept Area Seabed Impact Model. The model was developed over a period of several years, reviewed through the Council process, and the outputs were used to develop spatial measures to minimize the effects of fishing on EFH. Fishing effort data used in the model covered the years 1996-2009. These recommendations were finalized by the Council in April and June 2015 and implemented via a final rule in April 2018. This work is documented extensively via the OHA2 FEIS, including Appendix D which details the modeling approach, and the administrative record for the amendment which includes numerous PDT, Committee, Advisory Panel, and Council meetings where the model and development of management measures were discussed.

Following submission of the OHA2 documents for NMFS review, Council habitat staff and the PDT collaborated with Alaska Pacific University to implement the Fishing Effects model for the Northeast

region. Fishing Effects is very similar to the Swept Area Seabed Impact Model and uses the same inputs in many cases, in terms of effort data, substrate maps, and vulnerability parameters. The model formulation is somewhat different. One benefit of Fishing Effects is that the model outputs for each cell are on a 0-1 scale (which can be expressed as percentages), which is more intuitive to interpret than the Swept Area Seabed Impact Model impacts estimates, which were not so constrained. Fishing effort data included in the Fishing Effects work covered the years 1996-2017. The Northeast Region implementation of the Fishing Effects Model is summarized in a 2020 Council report and related appendices, and the North Pacific formulation was published as Smeltz et al., 2019.

5.2 Current review approach

The current review uses the Fishing Effects Model to estimate impacts of fishing at the scale of the Northeast Region for six separate categories of bottom tending-gears (bottom trawl, scallop dredge, clam hydraulic dredge, trap, longline, and gillnet), and across all gears combined. Fishing effort data inputs are for the period from 1996-2023. A major challenge with the current update has been developing the tables of fishing effort inputs as swept area; since the last EFH update completed in 2018, the Northeast region moved from separate data structures to the Catch Accounting and Monitoring System (CAMS) data system, which has required reworking prior scripts. However, this presented an opportunity to make other adjustments to the swept area calculations, namely, to remove outliers. The PDT is not changing other model inputs for this current EFH update; the vulnerability assessment, sediment and energy map, and the model calculations remain the same as what was included for the 2017-2020 update.

5.3 Summary of findings

The realized annual time-series of fishing effects were examined across all six core gear types (bottom trawl, scallop dredge, clam dredge, demersal longline, gillnet, and trap) for the entire Northeast, irrespective of a corresponding FMP. At present, the overall effects of fishing have declined from the beginning of the modeling period (1996). For 2023, averaging across all areas of the model domain, estimated effects for all gears are approximately 10%. However, localized effects can be quite high, as shown in the Component 2 and 6 Report.

Looking more closely at individual gears (mean annual effects for each of the six core gear types), trawl gear is responsible for most of the realized effects in the region. Since 1996, there have been overall declines in effects from bottom trawl, scallop dredge, demersal longline, and gillnet, and increases in the effects from clam dredge and trap. Although, the mean effect for these gears is very small (with a mean effect of approximately 0.2% for both hydraulic dredges and traps in the most recent years), the magnitude of effects has nearly tripled for hydraulic clam dredge and quadrupled for traps.

In addition, effects were examined by region, Mid-Atlantic Bight, Southern New England, Georges Bank, and the Gulf of Maine. Over time in all regions, there has been a general decline in the mean annual effect of these fishing gears on seafloor habitat. Average effects are lowest in the Mid-Atlantic Bight (recently around 5%) and higher in the other three regions (recently around 15-20%).

5.4 Council recommendations

The Council recommended the following actions:

- **Component 2, Recommendation 1:** Update Fishing Effects analysis more routinely (timing dependent on available resources). **Timing: planning work in the near term, begin to implement a more regular update cycle prior to next EFH Review.**

- **Component 2, Recommendation 2:** Continue to advance modeling methods. Specifically, continue collaborating with the NPFMC as Fishing Effects modeling work progresses across regions (additional / update data, literature, adjustments to vulnerability assessment, model calculations, sediment data, energy data, etc.). **Timing: near term and until next EFH Review.**

6 COMPONENT 3: NON-MAGNUSON-STEVENS ACT FISHING ACTIVITIES THAT MAY ADVERSELY AFFECT EFH

Per Essential Fish Habitat (EFH) regulations (50 CFR §600.815), "Fishery Management Plans (FMPs) must identify any fishing activities that are not managed under the Magnuson-Stevens Act that may adversely affect EFH. Such activities may include fishing managed by state agencies or other authorities." Non-MSA fishing includes state-water fisheries that parallel MSA fisheries, state-waters only fisheries, and other fisheries that may occur on federal lands (e.g., those managed by USFWS) or outside MSA jurisdiction such as US high seas permitted fisheries under the High Sea Fishing Compliance Act (1994). Non-MSA fishing also includes recreational, subsistence, and traditional indigenous fishing that doesn't meet the definition of commercial or recreational fishing under MSA.

While Council-managed fishing activities occur in federal waters, EFH can be designated in both federal and state waters, including in estuaries and freshwater, to capture the full geographic range of areas used by a species through all life stages (e.g., egg, larvae, juvenile, adult). Understanding fishing activities in these nearshore areas provides context for evaluating the impacts of a full suite of human activities, both fishing and non-fishing, on EFH, including during EFH consultations on federally-funded or federally-permitted projects (i.e., offshore wind development, aquaculture, dredging, etc.). Geographically specific information is useful since EFH consultations on projects are site-specific. A consultation with NMFS is required whenever a federal agency, including the military, works in an area that will adversely affect EFH. Together, the agency and NMFS determine how best to conduct coastal development while supporting fish habitat and minimizing or avoiding environmental damage.

6.1 Previous work to document non-MSA fishing activities

The previous EFH review (OHA2) focused on estimating the effects of fishing occurring in federal waters, and did not catalog the various fisheries occurring in state waters. The fishing gear effects evaluation conducted for OHA2 using the Swept Area Seabed Impact Model (SASI Model) did include gears managed by the states but used in federal waters, for example shrimp trawls and lobster pots. OHA2 summarized state regulations that would minimize the effects of fishing on habitat (OHA2 Volume 1, Section 4.7).

6.2 Current review approach

This report focused on improving information related to state-water fisheries, which are one type of non-MSA fishing. The focus of this analysis was to understand gears and fisheries that could potentially impact the quality of EFH in state-waters (i.e., state waters within three miles from the coast); which mainly includes state-waters only fisheries or some state water fisheries that parallel MSA fisheries.

First, we developed and distributed a questionnaire. Working with partners at state resource management agencies (New England: ME, NH, MA, RI, CT; Mid-Atlantic: NY, NJ, PA, DE, MD, VA, NC), we developed a list of larger-scale, state-managed fisheries that occur in state waters and contribute higher amounts of landings and/or revenues, considering the period from 2000-present. Specifically, we asked about target species, gear type(s), important geographic areas, and trends. We also asked whether there were other smaller-scale fisheries occurring in state waters, what were considered the most important fisheries in terms of impacts to habitat, if there are specific gear restriction or other measures to protect habitat enacted by the state, and for any other relevant information. While we did not explicitly exclude recreational fisheries, the kinds of fishing gear used recreationally are generally less impactful and are

only noted in a few specific instances in this report.

Next, we summarized the information overall and by state in text and tables. Report authors reviewed and summarized results, researching additional details using the links and resources provided by respondents, and clarifying submissions with respondents where necessary. Species and their common names were checked for consistency between states. The draft report was provided to respondents for their review in October 2024, prior to sharing with the NEFMC Habitat Committee and MAFMC Ecosystems and Ocean Planning Committee December 18, 2024.

6.3 Summary of findings

Diverse fish and invertebrate species are harvested in states from Maine to North Carolina, including many species not managed by the Councils (Table 4, Table 5). For example, Maine has a fishery for rockweed (*Ascophyllum nodosum*) that is not a Council-managed species. The information in this report should be useful as a starting point to NOAA Fisheries EFH consultation staff, state and federal fishery managers, and academic, research, or non-profit professionals working on marine fisheries issues.

Table 4. Harvested fishes (common and scientific names) and states where fish are harvested.

Species common name (other names, if noted)	Scientific name	States where harvested
Alewife	*Alosa pseudoharengus*	Maine (minor)
American eel	*Anguilla rostrata*	Maine (elvers), New Jersey, Maryland, Delaware
Atlantic croaker	*Micropogonias undulatus*	North Carolina
Atlantic cutlassfish	*Trichiurus lepturus*	North Carolina
Atlantic halibut	*Hippoglossus hippoglossus*	Maine
Atlantic herring	*Clupea harengus*	Maine (minor)
Atlantic menhaden	*Brevoortia tyrannus*	Maine, New Hampshire (minor), New Jersey, Maryland, Delaware, North Carolina
Black drum	*Pogonias cromis*	North Carolina (minor)
Black sea bass	*Centropristis striata*	Massachusetts, Virginia
Blueback herring	*Alosa aestivalis*	Maine (minor)
Blue catfish	*Ictalurus furcatus*	Virginia
Bluefish	*Pomatomus saltatrix*	Massachusetts

Species common name (other names, if noted)	**Scientific name**	**States where harvested**
Groundfish (Atlantic cod, American plaice, haddock, pollock, Acadian redfish, winter flounder, witch flounder, yellowtail flounder)	*Gadus morhua, Hippoglossoides platessoides, Melanogrammus aeglefinus, Pollachius virens, Sebastes fasciatus, Pseudopleuronectes americanus, Glyptocephalus cynoglossus, Limanda ferruginea*	Massachusetts
Killifishes	*Fundulus diaphanus*	New Jersey (minor)
Kingfishes	*Menticirrhus spp. (3 species)*	North Carolin
Oyster toadfish	*Opsanus tau*	New Jersey (minor)
Red drum	*Sciaenops ocellatus*	North Carolina (minor)
Scup	*Stenotomus chysops*	Massachusetts
Sheepshead	*Archosargus probatocephalus*	North Carolina (minor)
Southern Flounder	*Paralichthys lethostigma*	North Carolina
Spiny dogfish	*Squalus acanthias*	Massachusetts, Maryland (minor)
Spot	*Leiostomus xanthurus*	New Jersey, North Carolin
Spotted sea trout	*Cynoscion nebulosu*	North Carolina
Striped bass	*Morone saxatalis*	Massachusetts, Delaware, North Carolina (minor)
Striped mullet	*Mugil cephalus*	North Carolina
Summer flounder (fluke)	*Paralichthys dentatus*	Massachusetts, Maryland (minor)
Tautog	*Tautoga onitis*	Massachusetts, New Jersey (minor)
Weakfish	*Cynoscion regalis*	North Carolina
White perch	*Morone americana*	New Jersey

Table 5. Harvested invertebrates (common and scientific names) and states where invertebrates are harvested.

Species common name (other names, if noted)	Scientific name	States where harvested
American lobster	*Homarus americanus*	Maine, New Hampshire, Massachusetts, New York
Atlantic sea scallop	*Placopecten magellanicus*	Maine, Massachusetts
Atlantic surfclam (hen clam)	*Spisula solidissima*	New Hampshire (minor), Massachusetts, New Jersey
Bay scallop (northern bay scallop)	*Argopecten irradians irradians*	Rhode Island, New Jersey (minor), North Carolina (minor)
Blood worm	*Glycera dibranchiata*	Maine (minor)
Blue crab	*Callinectes sapidus*	Rhode Island (minor), New York, New Jersey, Maryland, Delaware, Virginia, North Carolina
Blue mussel	*Mytilus edulis*	Maine (minor), Massachusetts (minor), Rhode Island (minor), Connecticut (minor)
Channeled whelk	*Busycotypus canaliculatus*	Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Virginia
Eastern oyster (American oyster)	*Crassostrea virginica*	Maine, Rhode Island (minor), Connecticut (minor), New Jersey, Maryland, Virginia, North Carolina
Green sea urchin	*Strongylocentrotus droebachiensis*	Maine
Hardshell clam / Northern quahog / Bay quahog	*Mercenaria mercenaria*	Maine, New Hampshire, Massachusetts, Rhode Island, New Jersey, North Carolina
Horseshoe crabs	*Limulus polyphemus*	Massachusetts, New York, Delaware, Maryland, Virginia
Illex (shortfin) squid	*Illex illecebrosu*	Massachusetts
Knobbed whelk	*Busycon carica*	Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware
Longfin squid	*Doryteuthis (Amerigo) pealeii*	Massachusetts

Species common name (other names, if noted)	Scientific name	States where harvested
Mantis shrimp	*Squilla empusa*	Rhode Island
Ocean quahog	*Arctica islandica*	Massachusetts
Sand worm	*Nereis virens*	Maine (minor)
Shrimp (brown)	*Farfantepenaeus aztecus*	Virginia, North Carolina
Shrimp (pink)	*Farfantepenaeus duorarum*	North Carolina
Shrimp (white	*Litopenaeus setiferus*	Virginia, North Carolina
Softshell clam	*Mya arenaria*	Maine, Rhode Island (minor), Connecticut, New Jersey (minor)
Waved whelk (common whelk)	*Buccinum undatum*	Maine

6.4 Council recommendations

The Council recommended the following actions:

- **Component 3, Recommendation 1:** Continue the questionnaire-based review approach, in partnership with the states. Consider refining the questionnaire to ensure that all state fisheries of interest to the Council in the context of EFH impacts are captured in the responses. **Timing: during the next EFH Review.**
- **Component 3, Recommendation 2:** Include other types of non-MSA fishing that may impact habitat, if appropriate. This could include fishing that occurs on federal lands (e.g., those managed by USFWS) or outside MSA jurisdiction such as US high seas permitted fisheries under the High Sea Fishing Compliance Act (1994), recreational, subsistence, and traditional indigenous fishing that doesn't meet the definition of commercial or recreational fishing under MSA. **Timing: during the next EFH Review.**

7 COMPONENT 4: NON-FISHING EFFECTS ON EFH

Federal regulations require FMPs to identify activities other than the act of fishing that may adversely affect EFH at 50 CFR 600.815 (a)(iii)(A)(4). Non-fishing activities that may adversely affect EFH are diverse and highly variable. It is important for NMFS to understand non-fishing activities that occur in marine and estuarine environments and their potential effects on EFH so that they can provide appropriate conservation recommendations via the EFH consultation process.

7.1 Previous work to identify, describe, and mitigate the impacts of non-fishing activities on EFH

NMFS published a Technical Memorandum in 2008 focused on impacts to marine fish habitats from non-fishing activities in the Northeastern U.S. This memorandum estimated the magnitude of impacts associated with various non-fishing activities (from coastal development to marine transportation to aquaculture and global impacts). The Council's Omnibus EFH Amendment 2 Appendix G expanded upon this memorandum in 2014 to include more recent information related to the impacts of climate change, offshore wind development, offshore mineral mining, offshore aquaculture, and liquefied natural gas facilities. The Councils subsequently developed an initial suite of habitat policies which help articulate recommendations regarding how to avoid and/or minimize the impacts of non-fishing activities on fish habitats, fish, and fishing communities. Council policies include oil and gas development, aquaculture, submarine cables, and offshore wind energy. MAFMC has very similar policies on aquaculture and offshore wind development and has policies related to marine transport and coastal development.

7.2 Current review approach

During this EFH review, previous evaluations of the impacts of non-fishing activities on EFH in the Northeast U.S. region were summarized and new and emerging activities and issues that would benefit from additional evaluation were identified. Impact-producing activities evaluated as part of this review include aquaculture, climate change impacts and natural disasters, flood control and shoreline protection, marine debris, offshore wind energy, contaminants that degrade water quality, and offshore mineral and sand mining. Habitat restoration is also an area of ongoing work among NMFS and partner organizations and is also discussed briefly in the working paper.

The report for this review component includes a brief description of each non-fishing activity, a general overview of the potential range of impacts to EFH, and resources and selected literature for further reading. The primary purpose of the report is to summarize the current scope and scale of a given non-fishing activity and provide resources for additional information, effectively serving as a starting point for the Council and staff to provide comments on any federal projects that may adversely impact EFH. The report does not constitute a thorough treatment of all non-fishing activities and does not analyze in detail the impacts to EFH nor recommends measures to avoid, minimize, or offset adverse effects to EFH. The primary audiences for this review report are the Councils and members of the public and organizations interested in promoting fish habitat conservation. Staff at NMFS Habitat and Ecosystem Services Division are considered a secondary audience, as they are generally familiar with these activities and their impacts because of their EFH consultation work. Longer term, it would be ideal to research these activities, impacts to EFH, and suitable conservation recommendations in more detail, similar to the level of information provided in the 2008 Technical Memorandum, but that was not possible for this review, given the time and resources available.

7.3 Summary of findings

The current review focused on activities of increasing concern and emerging activities including aquaculture, climate change, flood control and shoreline protection, marine carbon dioxide removal, marine debris, offshore mining of sand and other mineral resources, offshore wind energy, inshore restoration strategies, and water quality including emerging contaminants. As previously noted, some of these activities are the subject of Council policies, while others are not.

- Aquaculture
    - Potential impacts on EFH range from disease outbreaks and introduction of invasive species to habitat conversion to coastal protection and improved water clarity.
    - Recent NOAA planning efforts include NOAA's Guide to Permitting Marine Aquaculture, NOAA's Aquaculture Strategic Plan 2023-2028, and NOAA's Aquaculture Opportunity Area Process
    - The report compiled literature published since 2020 related to aquaculture impacts to fisheries and EFH.
- Climate Change
    - Nearshore and offshore habitat impacts and potential effects include loss of wetlands, scour/erosion, species distribution changes, water column habitat changes, ocean acidification, etc.
    - The report includes a list of resources for further reading including GARFO's guidance for integrating climate change information during EFH consultation; the NMFS Procedure for addressing climate change in consultations; and selected literature published since 2020.
- Flood control, shoreline protection
    - Activities include nature-based solutions such as beach nourishment, protection and enhancement of sand dunes and submerged aquatic vegetation, and engineered protection methods such as breakwaters, bulkheads, and groins.
    - Potential changes to habitats range from chemical, physical, and biological.
    - The Northeast region has a mix of natural and hardened structures, namely tide gates and storm barriers, which represent one of the largest threats to wetlands.
- Marine carbon dioxide removal
    - There are various carbon capture approaches including ocean alkalinity enhancement, macroalgal cultivation, ocean fertilization, and artificial downwelling and upwelling. There are onshore carbon capture approaches as well.
    - Potential negative impacts and concerns include impacts on and changes to species biology/life cycles, species relationships and behaviors, habitat structures, sea conditions, fishing opportunities, and deep-sea ecosystems. There is also a major concern that this is an unproven industry and that there should not be a rush into deploying technology that could have unintended consequences.
    - Potential positive impacts include a reduction in atmospheric carbon dioxide, habitat creation, elevated alkalinity, enhanced marine production, and co-location with fisheries.

    - In New England, there is a proposed ocean alkalinity enhancement project called "Locking Ocean Carbon in the Northeast Shelf and Slope" (LOC-NESS) with a proposed test site in the Gulf of Maine, located near Wilkinson Basin, Stellwagen Bank, and the new floating offshore wind lease areas.

- Marine debris
    - Marine debris includes any solid waste that persists and is not naturally found in the marine environment (e.g., plastics/microplastics, ghost fishing gear, metals, textiles/microfibers, and so on).
    - Potential impacts include habitat degradation (smothering, shading, physical damage) and the physical trapping of aquatic species.
    - NOAA Fisheries has a Marine Debris Program and each region also has a Regional Marine Debris Action Plan.
- Offshore mining of sand and other mineral resources
    - Offshore mining is the extraction of critical minerals including sand and gravel from the Outer Continental Shelf. This activity is managed by the Bureau of Ocean Energy Management (BOEM) via the Marine Minerals Program, which hosts a sand inventory database.
    - Potential impacts include habitat alteration, changes in sediment composition, and co-location with other ocean users (i.e., offshore renewable energy, fisheries, cabling, and so on).
    - There has been increased demand for offshore sand in the Atlantic Ocean due to infrastructure projects; while MAFMC has written a comment letter on this activity in the past, no letters have been written by either Council since at least 2019.
- Offshore wind energy
    - Recently there has been increased interest in floating offshore wind technology in deeper waters of the Gulf of Maine, New York Bight, and the Central Atlantic.
    - Impacts from both fixed and floating offshore wind infrastructure range from physical habitat conversions, increased turbidity, and sedimentation, noise, and electromagnetic field to changes in hydrodynamics and entrainment concerns.
    - Updated resources include the draft Benthic Habitat Monitoring Guidance, draft NEFSC Fisheries Survey Mitigation Plans, the draft Fisheries Mitigation Guidance, social and economic guidelines, compensatory mitigation, Synthesis of the Science, and the FishFORWRD database developed by the Responsible Offshore Science Alliance (ROSA).
- Inshore restoration strategies
    - Restoration activities are focused on enhancing and restoring low functioning habitats from dam removals to oyster reef seeding, etc. There are local, state, and federal initiatives that entail coordinated planning, the restoration field work, and subsequent monitoring.
    - Potential impacts range from changes in local hydrology and sediment transport to habitat conversion to temporal loss of habitat function.
    - It is worth noting that offshore restoration strategies are in development, but these are early stage and focus off New York and New Jersey.

- Water quality – emerging contaminants
    - Emerging contaminants are of increasing concern due to the range of expected impacts that are ubiquitous in nature and are a public health priority. Examples of emerging contaminants include pharmaceuticals, personal care products, products containing PFAS (water/stain resistant fabrics, paper, metal, lubricants, etc.), microplastics, and so on.
    - Many impacts are likely unknown given many pollutants are unregulated, though known impacts include reduced water quality and bioaccumulation of toxic pollutants in sediments.
    - Resources for additional reading include the Environmental Protection Agency's (EPA) guidance documents and national recommendations on water quality, the National Centers for Coastal Ocean Science Contaminants of Emerging Concern, and many peer-reviewed published articles. It is worth noting that the EPA does not have any regulatory requirements on acceptable PFAS in fish.

7.4 Council recommendations

The Council recommended the following actions:

- **Component 4, Recommendation 1:** Schedule routine check-ins between NMFS and Council staff to discuss emerging issues of concern to help identify and inform any new Council policy development. **Timing: near-term.**
- **Component 4, Recommendation 2:** Conduct periodic literature searches to identify new published research on the habitat impacts from the non-fishing activities and stressors, prioritizing activities that the Councils frequently comment on (offshore wind, transmission and telecommunication cables, and aquaculture). **Timing: near-term.**
- **Component 4, Recommendation 3:** Continue to participate in regional habitat management, science, and conservation partnerships to improve staff expertise and networking opportunities. **Timing: near-term.**
- **Component 4, Recommendation 4:** Consider the development of new joint Council habitat policies as additional information and research are available on the emerging issues identified in the report. Two topics of potential interest are marine carbon dioxide removal and offshore sand mining. In the immediate term, staff do not recommend drafting any new Council policies based on the evaluation of new information in this EFH review, however, over the next couple of years new policy development could be explored. **Timing: medium-term, as appropriate given information available and level of Council engagement in specific topics.**

8 COMPONENT 5: CUMULATIVE IMPACTS ANALYSIS

Cumulative impacts are impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of who undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over time. EFH regulations indicate that to the extent feasible and practicable, FMPs should analyze how the cumulative impacts of fishing and non-fishing activities influence the function of EFH on an ecosystem or watershed scale. An assessment of the cumulative and synergistic effects of multiple threats, including the effects of natural stresses (such as storm damage or climate-based environmental shifts) and an assessment of the ecological risks resulting from the impact of those threats on EFH, also should be included.

Note: This component is included as part of the summary report to each Council given the amount of information for this topic does not indicate a need for a standalone component report.

8.1 Prior evaluation of cumulative impacts

The previous EFH Review (OHA2) included a cumulative effects analysis (OHA2 Volume 6, Section 2). The analysis considered four valued ecosystem components, or VECs: (1) the physical and biological environment focusing on seabed habitats, (2) managed species, (3) human communities and the fishery, and (4) protected resources. This qualitative analysis described past, present, and foreseeable future actions, the baseline status of VECs, the combined direct effects of alternatives in the amendment, and concluded with a cumulative effects summary. Direct effects were separated out for EFH and HAPC designations vs. spatial measures designed to minimize the effects of fishing on EFH and protect groundfish resources.

8.2 Current review approach

The PDT and FMAT evaluated the EFH regulatory requirements for describing cumulative impacts, acknowledging that in theory, a high-quality cumulative impacts evaluation would be valuable to management work, however, in practice, achieving an effective cumulative analysis remains extremely challenging. The PDT and FMAT considered approaches that would provide meaningful insights as to the relationships between fishing and non-fishing activities an EFH. One specific approach considered was the spatial overlap analysis developed by MAFMC staff to support their risk assessment. The PDT and FMAT agreed that this type of approach was promising for considering impacts to essential habitats. The PDT and FMAT discussed the types of activities that seemed most important to evaluate in a cumulative context in the near-term.

Cumulative effects analyses in other contexts were briefly discussed, especially in the offshore wind context and Programmatic Environmental Impact Statement documents, to help understand if/how fishery management cumulative effects could be improved.

Note: The PDT and FMAT did not prepare a standalone report for this component; additional discussion is provided in the October 29-30, 2024 meeting summary.

8.3 Summary of findings

Offshore wind is a major non-fishing activity that will impact EFH in the near term. Habitat conversion estimates due to offshore wind component installation in the seabed (i.e., the amount of area converted over time to artificial structures) would be readily quantifiable and would represent a useful indicator of

benthic disturbance. It is worth noting that there is some information in offshore wind Environmental Impact Statement documents about habitat conversion, though the analysis is based on a project design envelope versus the specific scale of the project that ends up being built, so additional efforts to estimate actual habitat conversion rates would be required.

In a climate change mitigation context, changes in carbon dioxide emissions associated with fishery management actions would also be informative to management discussions and cumulative impacts analysis. The PDT and FMAT agreed these values would be very hard to quantify.

8.4 Council recommendations

The Council recommended the following actions:

- **Component 5, Recommendation 1:** Develop spatial products / maps that show the overlaps between species-specific EFH designations and other marine activities to help inform discussions about impacts to EFH as these activities change / advance. Activities could include both commercial and recreational fishing activities, offshore wind infrastructure (turbines, substations, inter-array cables, export cables, etc.), aquaculture, etc. This type of spatial overlay could be included within individual FMP actions and could use datasets from the Northeast Ocean Data Portal or other sources. **Timing: before the next EFH review, best developed based on final EFH maps.**
- **Component 5, Recommendation 2:** Consider developing quantitative indices / metrics to measure cumulative impacts and their changes over time. For example, estimate acres of habitat conversion due to offshore wind construction. **Timing: before the next EFH review.**
- **Component 5, Recommendation 3:** Identify and implement improvements to information resources in the cumulative effects analysis sections of FMP documents; consider implementing living documents approaches and how to best share resources and keep them up to date. **Timing: before the next EFH review.**
- **Component 5, Recommendation 4:** Consider the strategic offshore wind compensation program that is under development in the United Kingdom as a potential application in the cumulative effects context. **Timing: before the next EFH review.**

9 COMPONENT 6: MINIMIZING THE ADVERSE EFFECTS OF FISHING ON EFH

FMPs must identify actions to encourage the conservation and enhancement of EFH, including recommended options to avoid, minimize, or compensate for adverse impacts. Habitat conservation and enhancement recommendations address fishing and non-fishing threats to EFH and HAPCs. NMFS conducts EFH consultations and makes conservation recommendations for non-fishing activities.

9.1 Prior identification of measures to minimize adverse effects to EFH in Council FMPs

OHA2 FEIS Volume 1 summarizes measures taken to minimize the adverse effects of fishing on EFH prior to OHA2 development, across multiple FMPs. OHA2 updated these measures comprehensively, adding, revising, and removing spatial measures to minimize impacts in specific locations. Most measures restrict mobile, bottom-tending gears. Following OHA2, the Council developed an action to implement exemption areas for clam and mussel dredges within the Great South Channel Habitat Management Area. More recently, the Council considered scallop dredge exemptions from the Closed Area II Habitat Closure Area on the Northern Edge of Georges Bank. This action was discontinued in June 2024. A summary of currently implemented measures is included in the Component 2/6 report.

Note that the Council's Deep-Sea Coral Amendment and associated fishing restriction measures are also intended to minimize the effects of fishing on sensitive habitats, however in large part the areas designated as Coral Protection Areas extend beyond the footprint of designated EFH into deeper waters of the continental slope and canyons. These areas were developed under the MSA discretionary provisions which grant the Councils authority to develop measures to protect corals, independent of EFH designations.

9.2 Review approach

This review catalogs existing measures in Northeast region FMPs that have been developed to minimize the effects of fishing on EFH. Subsequent to this review, the Council can combine this information with results of the Fishing Effects Model evaluation, and knowledge of its fishery management plans, to evaluate the continued suitability of these measures. In OHA2, the Council recommended a comprehensive review of spatial management approaches at ten-year intervals; from OHA2 implementation, this would indicate a Council review of these measures around 2028.

9.3 Summary of findings

The NEFMC Habitat PDT and MAFMC Essential Fish Habitat Fishery Management Action Team (EFH FMAT) updated the Fishing Effects Model and produced model-based estimates of fishing effects from bottom-tending gears at the scale of the Northeast region (to address Component 2 and this Component 6).

At present, the overall effects of fishing have declined from the beginning of the modeling period (1996). For 2023, averaging across all areas of the model domain (coastline to the 2000 m isobath), and across all gears, the mean estimated effect is approximately 10%. However, localized effects can be quite high, as shown in the figures provided. For comparison, in 1996 the mean effect was slightly less than 20%, and the mean effect exceeded 20% in the early 2000s, and around the year 2010. Note that deepwater portions

of the Councils' deep-sea coral conservation areas beyond 2000 m to the edge of the EEZ are not evaluated in the Fishing Effects Model.

If localized avoidance of effects in specific areas is desired by the Councils, they could consider gear restricted areas or habitat management areas to reduce the effects of fishing. Multiple such areas are already in existence, as noted in section 6 of this report. To develop these measures, additional analyses targeting the specific area, gears, and an understanding of specific FMPs involved would be needed to develop an appropriate Council action pathway.

If the Council's goal is to minimize overall or average effects, then further work may not be necessary, as the overall current effects estimate is low (around 10%). Any changes to management measures could impact this overall level of fishing effects over time (i.e., if management measures were modified, or areas reopened to fishing, those effects may change).

The Councils could also consider setting a threshold level or target for fishing effects that could trigger review or consideration of whether an evaluation of measures is needed. This could be reviewed annually, or bi-annually. As noted in the results section, NPFMC has done some work on thresholds for their region that could be considered as a potential model.

Refining model inputs could be a worthwhile investment. Specifically, if swept area estimates for selected trips were based more directly on observed tow locations and waypoints were groundtruthed with VMS data, the magnitude of area swept and thus estimated effects for these trips would be incrementally more accurate. The current swept area inputs rely on assumed fishing time and speed to estimate distance towed and infer fishing location for each subtrip from a single set of coordinates from vessel trip reports. If substrate maps were updated to include additional data, this could improve the accuracy of seafloor characterization, such that vulnerability parameters and thus model outputs would better reflect actual seafloor conditions. Some portions of the model domain are already well-sampled, but others (e.g., Southern New England) are not. In addition, there may be other uses beyond fishing effects estimation for model inputs such as swept area estimates or substrate maps.

9.4 Council recommendations

The Council recommended the following actions:

- **Component 6, Recommendation 1:** Consider the need to initiate an action or actions to adjust measures in Council FMPs that minimize the effects of fishing on EFH (e.g., spatial measures). OHA2 recommended this occur on a 10-year time frame from 2018 implementation. **Timing: 2027-2028.**
- **Component 6, Recommendation 2:** Consider a more detailed evaluation of Fishing Effects results at finer temporal (monthly) and spatial (sub-regions, management areas) scales to support an evaluation of the Councils' adverse effects minimization measures. **Timing: prior to and during the next EFH Review.**
- **Component 6, Recommendation 3:** Consider other factors that could be affecting the offshore marine environment and how these activities may be affecting the prosecution of fisheries in space and time (i.e., offshore wind energy, any new sanctuary designations, etc.). These changes could result in alterations in fishing effort/behavior and could warrant changes in management measures currently in place. **Timing: prior to and during the next EFH Review.**

10 COMPONENT 7: PREY SPECIES

The definition of EFH includes waters and substrate necessary to fish for feeding. A loss of prey may have an adverse effect on EFH and managed species because the presence of prey makes waters and substrate function as feeding habitat. Actions that reduce the availability of a major prey species or their habitat may be considered adverse effects on EFH. Therefore, it is necessary to know what habitats the prey of EFH species are utilizing. FMPs should list the major prey species for the species in the fishery management unit and discuss the location of prey species habitat (EFH component 7; 50 CFR 600.815(a)(7)). Adverse effects on prey species and their habitats may result from fishing and non-fishing activities.

10.1 Existing prey species information in FMPs

To address these EFH review requirements, the prior EFH Review (OHA2) included descriptions of the major prey types for each managed species. This work included quantitative information on the relative contribution of different prey types when available. Summaries based on literature review and an evaluation of Northeast Fisheries Science Center (NEFSC) Food Web Dynamics Program data through 2005 are included in OHA2 Appendix B.

10.2 Current review approach

Food habits data from the NEFSC Food Web Dynamics Program (FWDP) database were used as the foundation for this evaluation, where available. Data were provided directly by FWDP staff, and Council staff consulted with them directly to ensure appropriate use of data. Of the 42 species managed between the New England and Mid-Atlantic Fishery Management Councils (NEFMC and MAFMC), all but nine have sufficient data to provide a quantitative evaluation using the food habits database. Feeding habits for the remainder are summarized based on a literature review, in most cases drawn from the EFH Source Documents, which were published in the late 1990s through the mid-2000s as NOAA Technical Memoranda.

When summarizing FWDP data, grouping variables were used to understand whether patterns of consumption vary across factors routinely considered in management contexts. These grouping variables included sub-region (Scotian Shelf, Gulf of Maine, Georges Bank, Southern New England, Mid-Atlantic Bight), season (spring, summer, fall, winter), time period (1980-1999 vs. 2000-2022), and predator size. Results are presented across all managed species, by sub-region, and for individual managed species in tables and figures. The report presents what we believe will be the data summaries of greatest general interest to fishery managers, but a companion R-Shiny application developed for this EFH review is available at https://fishmaps.shinyapps.io/prey/ and can be used to investigate alternative combinations of data not provided in the report.

10.3 Summary of findings

Several broad taxa emerged as important prey items across all managed species (Table 1). These taxa have remained similar through time (i.e., 1980-1999 vs 2000-2022), despite substantial changes in both predator and prey assemblages commonly attributed to a combination of fishing pressure and climate shifts (e.g., Garrison and Link 2000b; Link et al. 2012; Shackell et al. 2012), and may be illustrative of functional redundancy of predators within the feeding guilds of the Northeast U.S. shelf ecosystem (Garrison and Link 2000a,b; Auster and Link 2009; Smith and Link 2010). We also note the following species as important prey items across all managed predators: silver hake (*Merluccius bilinearis*), sand lance (*Ammodytes* sp.), longfin squid (*Doryteuthis* sp.), and Atlantic herring (*Clupea harengus*).

For species currently under management, fisheries management plans should consider the value of these species both directly to their respective fisheries and indirectly as important prey items of other managed species. For species not currently managed via a fishery management plan, i.e., sand lance, status as designated ecosystem component species may be appropriate.

In 2016, the MAFMC approved an Unmanaged Forage Amendment, which designated sand lances as well as dozens of other fish and invertebrate species that are not managed under fishery management plans as ecosystem component species. Most of the species identified in MAFMC's Unmanaged Forage Amendment are represented in this report. This review may provide a starting point for further work on unmanaged forage and identification of ecosystem component species, including in the New England region.

Managers should also consider the effects of managed predator species on ecosystems. For example, several studies have noted that silver hake and red hake (*Urophycis chuss*) play key roles in regulating prey population dynamics and are one of the primary sources of non-fishing mortality for commercially important species (Bowman 1984; Garrison and Link 2000). Similarly, spiny dogfish (*Squalus acanthias*) consume a variety of prey taxa, including other managed species such as Atlantic herring and Atlantic mackerel.

Many of the managed species exhibited shifts in diet with size / life history stage, geographic area, and season. These considerations are particularly relevant in the context of gears that target specific size classes of fish, area-based and time-based closures, and distributional shifts due to climate change.

As noted in the methods section, food habits data collection and resolution have changed over time, and the results presented here should be taken as a starting point for deeper investigation. For example, differences in taxonomic resolution of prey categorization over time may influence the time comparisons. In addition, a relatively large proportion of prey by weight overall (about 25%) is unclassified animals or unclassified fish. This proportion is higher for certain individual species, for example Atlantic mackerel. In the future, approaches such stable isotope and genetic analysis may provide new insights into the feeding behaviors of certain species.

10.4 Council recommendations

The Council recommended the following actions:

- **Component 7, Recommendation 1:** Consider how food habits information of Council-managed species can integrate with and/or inform Council and NMFS processes (e.g., NEFMC's new risk policy, NEFSC bottom trawl survey protocols / design, State of the Ecosystem reports, Socio-Economic Profiles, Fishery Management Plans, Climate and Ecosystem Steering Committee, Ecosystem and Ocean Planning Committee, etc.). **Timing: near term, during IRA performance period 2025-2027.**
- **Component 7, Recommendation 2:** Consider roll-out of products (reports, R-Shiny applications) and ensure proper documentation of methods including R-Shiny application development in repositories such as GitHub. **Timing: near term.**
- **Component 7, Recommendation 3:** Continue to share resources and information with NMFS (NEFSC Food Web Dynamics Program). **Timing: near term.**

11 COMPONENT 8: IDENTIFICATION OF HAPCS

EFH provisions provide a means for the Council to identify Habitat Areas of Particular Concern, or HAPCs (50 C.F.R. 600.815(a)(8)) within FMPs. FMPs should identify specific types or areas of habitat within EFH as HAPC based on one or more of the following considerations: importance of ecological function, habitat sensitivity to human-induced degradation, whether development activities are or will be stressing the habitat, and rarity of the habitat.

Note: This component is included as part of the summary report to each Council given the amount of information for this topic does not indicate a need for a standalone component report.

11.1 Previous work to designate Habitat Areas of Particular Concern

HAPC are important tools for fishery managers and have been designated in the New England and Mid-Atlantic regions since 1999, using various criteria, methods, and processes. The EFH regulations do not outline a specific approach that councils should take when identifying HAPCs. Collectively, the regional fishery management councils have adopted a diverse range of HAPC designations via a range of procedures. The 2016 report "Regional Use of the HAPC Designation" summarizes HAPC designations at all eight regional councils, including the methods used. While additional HAPCs have been designated since this report was published, the general information about the designation process and the use of HAPCs presented in this report remains relevant.

Generally, the HAPC designation process involves (1) identifying an issue of habitat conservation concern, within a particular location or habitat type, (2) developing a draft proposal, including boundaries and rationale, (3) Council debate of the proposal, (4) Council action to adopt the proposal through one or more of its fishery management plans, and (5) NOAA Fisheries review and approval. Beyond the typical, required processes that Councils and NOAA Fisheries follow when developing fisheries regulations and policy, the specific details of each step in the HAPC designation process are not overly prescriptive. This allows Councils flexibility to develop HAPC designations in a way that works for them, based on criteria that they agree are important.

Existing HAPC designations

In New England, Omnibus EFH Amendment 1 (1999) designated Habitat Areas of Particular Concern (HAPCs) for Atlantic salmon and Atlantic cod. Omnibus EFH Amendment 2 (2018) retained those HAPCs and designated additional HAPCs in the Gulf of Maine, on Georges Bank, in various major submarine canyons to a maximum depth of 1500 meters, and on seamounts within the EEZ in waters shallower than 2000 meters (the maximum depth of red crab EFH). The OHA2 HAPC designations are available as part of the FEIS (Volume 2, Section 2.2.1). A subsequent action implemented in 2024 designated an HAPC in Southern New England where offshore wind energy development is ongoing.

Two types of HAPCs are designated by the Mid-Atlantic Council. The first is a habitat-type HAPC which identifies any seagrass habitats within the footprint of summer flounder EFH as HAPC for summer flounder. The second designates the heads of Lydonia, Oceanographer, Veatch, and Norfolk Canyons as HAPC for golden tilefish. The species creates burrows in the cohesive sediments of the canyon heads.

Existing New England and Mid-Atlantic HAPCs are listed in Table 6 and Table 7.

Use of HAPCs for EFH Consultations and fishery management

HAPCs support the development of conservation measures through the EFH consultation process by providing focal locations and habitat types where the Council recommends an especially hard look at the

impacts of federally permitted activities. HAPCs do not directly restrict fishing or non-fishing ocean activities. Rather, they strongly encourage actions to avoid, minimize, or mitigate impacts on habitats within HAPCs. HAPCs provide a clear indication of the value the Council places on specific habitat types and functions and underscore recommendations to protect such habitats from impacts. In some instances, areas that are designated as HAPCs are co-designated as habitat management areas, gear restricted areas, or have other types of overlapping fishing restrictions. Fishery management discussions related to these locations can become somewhat complex given the overlapping nature of HAPCs with designations that include fishing restrictions.

In New England, many HAPCs spatially overlap with year-round management areas developed for groundfish, habitat, or deep-sea coral conservation. The Northern Edge Juvenile Cod HAPC was designated in 1999 in the northern part of Closed Area II, closed year-round in 1994 to reduce groundfish mortality. HAPCs were established in two other groundfish closures, the Western Gulf of Maine Closure Area and the Cashes Ledge Closure Area, via OHA2. Habitat Management Areas (referred to as Habitat Closure Areas prior to OHA2) were designated in all three of these locations in 2003 and 2004 via the Northeast Multispecies FMP and Atlantic Sea Scallop FMP.

In deep-water areas along the edge of the continental shelf, NEFMC designated HAPCs in multiple submarine canyons intersecting the shelf to highlight the complex and vulnerable deep-sea coral habitat types therein. Two of the largest canyons, Lydonia Canyon and Oceanographer Canyon, were previously closed to fishing while on a monkfish day at sea. MAFMC identified the heads of four canyons as HAPC for golden tilefish, which build burrows in clay sediments. The canyon HAPCs were identified and recommended for designation by the MAFMC prior to development of deep-sea coral gear restricted areas, and their boundaries served as starting points for alternatives in NEFMC's Deep-Sea Coral Amendment. The Mid-Atlantic canyons identified by NEFMC as HAPC were considered as discrete coral zone management areas via MAFMC's Deep-Sea Coral Amendment. The tilefish HAPCs are paired with gear restricted areas, which were developed via the same amendment to the Golden Tilefish FMP.

In some instances, HAPCs have prompted a harder evaluation of the potential fishery management measures on habitat impacts. An example of this is recent NEFMC work to consider sea scallop fishery access to the Northern Edge of Georges Bank. The area's status as an HAPC was referred to frequently in Council discussions about the area (whereby the Council ultimately chose to discontinue work on this action).

Table 6. Current NEFMC HAPCs.

HAPC	Location and size	Management Action and Implementation year	Description and purpose	HAPC Criteria	Overlapping federal fishery mgmt. areas
Atlantic Salmon	Eleven rivers, streams, and embayments in Maine (east to west, lengths in km): St. Croix R. (119), Dennys R. (33), East Machias R. (52), Machias R. (118), Pleasant R. (67), Narraguagus Bay/W. Branch Narraguagas R. (110), Tunk Stream (27), Penobscot R.(466), Ducktrap R., Sheepscot R. (126), Kennebec R. (194)	Omnibus EFH Amendment 1, 1999	Identify rivers that support remaining U.S. populations of naturally spawning Atlantic salmon.	Important ecological function, sensitive to anthropogenic stress, extensive stresses present	None
Northern Edge Juvenile Cod	Northeastern margin of Georges Bank, along the EEZ boundary, ~ 640 km2	Omnibus EFH Amendment 1, 1999	Identifies an area that provides important ecological function related to post-settlement survival of juvenile cod	Important ecological function, sensitive to anthropogenic stress, extensive stresses present	Yes, Closed Area II Groundfish Closure, Closed Area II Habitat Closure
Inshore Juvenile Cod	Coastal of ME, NH, MA, RI from 0-20 m depth (relative to mean high water), length	Omnibus EFH Amendment 2, 2018	Recognize the importance of inshore areas to juvenile cod; areas contain structurally complex rocky-bottom habitat that supports a wide variety of emergent epifauna and benthic invertebrates	Important ecological function, sensitive to anthropogenic stress, extensive stresses present	Seasonal cod protection closures off ME, NH, MA

HAPC	Location and size	Management Action and Implementation year	Description and purpose	HAPC Criteria	Overlapping federal fishery mgmt. areas
Great South Channel Juvenile Cod	Areas East of Cape Cod and Nantucket Island, MA to depths of 120 m, area	Omnibus EFH Amendment 2, 2018	Recognize the importance of the area for its high benthic productivity and hard bottom habitats, which provide structured benthic habitat and food resources for cod and other demersal managed species	Important ecological function, sensitive to anthropogenic stress, extensive stresses present	Great South Channel Habitat Management Area
Cashes Ledge	Overlaps most of Cashes Ledge, which is an offshore pinnacle in the center of the Gulf of Maine, 50+ mi due east of NH and northern MA coasts, area	Omnibus EFH Amendment 2, 2018	Highlight the unique characteristics of Cashes Ledge and to recognize the importance of the area as habitat for a variety of managed species	Important ecological function, sensitive to anthropogenic stress, extensive stresses present, rarity	Cashes Ledge Closure Area, Cashes Ledge Habitat Management Area

HAPC	Location and size	Management Action and Implementation year	Description and purpose	HAPC Criteria	Overlapping federal fishery mgmt. areas
Jeffreys Ledge / Stellwagen Bank	Eastern portion of Stellwagen Bank and Jeffreys Ledge, relatively shallow features in the Western Gulf of Maine, 15+ miles off the northern MA, NH, and southern ME coasts, area	Omnibus EFH Amendment 2, 2018	Recognize the importance of the area as habitat for a variety of managed species; Jeffreys Ledge and Stellwagen Bank have been recognized as key fishing grounds for hundreds of years	Important ecological function, sensitive to anthropogenic stress, extensive stresses present	Western Gulf of Maine Closure Area, Western Gulf of Maine Habitat Management Area, seasonal cod protection closures off ME, NH, MA
Bear and Retriever Seamounts	Shallowest (< 2000 m) portions of two of the four seamounts in the US EEZ south of Georges Bank, area	Omnibus EFH Amendment 2, 2018	Recognize a rare, sensitive, and ecologically valuable habitat type. The shallower parts of the seamounts are EFH for deep-sea red crab.	Important ecological function, sensitive to anthropogenic stress, rarity	Georges Bank Coral Protection Area

HAPC	Location and size	Management Action and Implementation year	Description and purpose	HAPC Criteria	Overlapping federal fishery mgmt. areas
Individual canyon HAPCs: Heezen, Lydonia / Gilbert / Oceanographer, Hydrographer, Veatch, Alvin / Atlantis, Toms / Middle Toms / Hendrickson, Wilmington, Baltimore, Washington, Norfolk	Major submarine canyons of the U.S. east coast north of Cape Hatteras, extending from the EEZ boundary (Heezen) to southern VA (Norfolk), area	Omnibus EFH Amendment 2, 2018	Identify canyons that contain or are believed to contain habitat-forming organisms including, but not limited to, stony corals, black corals, cerianthid anemones, soft corals and gorgonians, sea pens, and sponges	Important ecological function, sensitive to anthropogenic stress, extensive stresses present	Georges Bank Coral Protection Area; monkfish and mackerel/squid/butterfish closures in Lydonia and Oceanographer Canyons, Lautenberg Coral Protection Area and overlapping discrete coral zones
Southern New England	Large area off the MA / RI coast in Southern New England, area	Southern New England Habitat Area of Particular Concern Framework, 2024	Identifies areas that are cod spawning grounds and that potentially have complex seafloor habitats that overlap areas actively undergoing offshore wind development	Important ecological function, sensitive to anthropogenic stress, extensive stresses present	None

Table 7. Current MAFMC HAPCs.

HAPC	Location and size	Management Action and Implementation year	Description and purpose	HAPC Criteria	Overlapping federal fishery management areas
Summer Flounder	Coastal seagrass habitats within the geographic range of summer flounder essential fish habitat, which ranges from MA to FL	Summer Flounder, Scup, and Black Seabass Amendment 12 (1998)	Identifies all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH as HAPC	Important ecological function, sensitive to anthropogenic stress, extensive stresses present	None
Golden Tilefish	Shallow depths of Lydonia, Oceanographer, Veatch, and Norfolk Canyons, area	Golden Tilefish Amendment 1 (2009); a less geographically specific habitat-type designation was implemented via the Golden Tilefish FMP in 1999	Identifies semi-lithified clay substrates in four canyons between depths of 100 and 300 m as important habitat for tilefish, which develop burrows in these substrates. These substrates occur in other canyons but were most clearly documented in these four locations.	Important ecological function, sensitive to anthropogenic stress, rarity	Georges Bank Coral Protection Area; monkfish and mackerel/squid/butterfish closures in Lydonia and Oceanographer Canyons, Lautenberg Coral Protection Area and overlapping discrete coral zones

11.2 Considerations for identifying new HAPCs

The HAPC designation process could potentially benefit from additional structure and clarity, for example use of terminology in the designation criteria, sources of designation concepts, and expectations for use of HAPCs after they are designated.

The PDT and FMAT discussed potential pathways for identifying HAPCs, namely based on habitat type, place-based, and/or species-based. In the Northeast, there are examples of specific and relatively discrete boundary HAPCs (e.g., around offshore wind lease areas, or within specific submarine canyons) and also conceptual, habitat-type HAPCs (e.g., submerged aquatic vegetation overlapping summer flounder EFH). There are also HAPCs focused on particular species (Atlantic cod, Atlantic salmon, tilefish, and summer flounder).

As outlined above, HAPC designation is a straightforward process, but one that requires resources and time which could be used for alternative work. Thus, there should be a consideration of the value of designating HAPC versus the amount of time and effort involved. Generally, HAPCs are a flexible vehicle for raising conservation concerns, which is valuable when making conservation recommendations during an EFH consultation for a federally permitted project, but these recommendations can be provided absent an HAPC designation. One benefit of designating HAPC is an improved understanding of a focal issue. For example, the Council gained a better understanding of cod spawning activity and spawning habitat in Southern New England when developing an HAPC for that region.

Based on recent experience with HAPC designation in Southern New England, Council staff should explain when and how HAPCs should be considered. This will be important to help inform any future Council discussion on new HAPC designation.

Examples of how HAPCs have been used during the EFH consultation by the Habitat and Ecosystems Services Division include an analysis for how an area would be impacted from a proposed federal project and development of any conservation recommendations to avoid and/or minimize impacts to the HAPC. More specifically, during NOAA Fisheries EFH consultation for SouthCoast Wind, the consultation noted that the proposed project "would result in significant alterations of sensitive benthic habitats associated with estuarine habitats and juvenile Atlantic cod Habitat Area of Particular Concern (HAPC) in the Sakonnet River and Mount Hope Bay" and later referenced that "The lease area also overlaps with the Southern New England HAPC which was designated in part due to emerging information demonstrating the importance of this area as cod spawning habitat." NOAA Fisheries made several conservation recommendations based on the designation of the HAPC ranging from "increase coverage of passive acoustic receivers within the Southern New England HAPC and analyze for Atlantic cod spawning activity" to "mitigate for permanent loss of rocky habitats…within juvenile Atlantic cod and summer flounder HAPC in the Sakonnet River and Mount Hope Bay resulting from the installation of the Brayton Point ECC and the use of cable protection…" There are other similar types of evaluations of HAPC designations during EFH consultations for other offshore wind projects and other federally permitted projects.

11.3 Council recommendations

The Council does not recommend any new HAPCs for consideration at this time. In the future, if there are any changes to the understanding of the ecological function of certain EFH, EFH that is particularly sensitive to degradation, if there is any new or cumulative development stress on EFH, and/or if certain EFH becomes rare, all of which are criteria for designating a HAPC, then the NEFMC could consider additional HAPC designations. As part of any new designation, explaining when and how HAPCs should be considered would be valuable.

12 COMPONENT 9: RESEARCH AND INFORMATION NEEDS

FMPs should identify recommendations for research efforts that the Council views as necessary to improve descriptions and identification of EFH, identification of threats to EFH, and development of EFH conservation and enhancement measures.

In 2008, the NMFS Science Board recognized the need to improve habitat science. They identified goals, including supplementing stock assessments with ecosystem considerations, improving the descriptions of EFH, and reducing habitat uncertainty. To address these goals scientists and fishery managers developed the Habitat Assessment Improvement Plan (HAIP) in 2010. Progress towards these HAIP 2010 goals, as well as updated recommendations for how to integrate EFH and EBFM were later published by a national team (Peters et al. 2018).

Additionally, National Standard 1 guidelines of the Magnuson-Stevens Act contain several provisions to facilitate the incorporation of ecosystem-based fisheries management (EBFM) into federal fisheries management. National Standard 2 of the Magnuson-Stevens Act requires NMFS to conserve and manage fishery resources based upon the best available scientific information.

To meet these mandates, NMFS research must identify habitats that contribute most to the survival, growth and productivity of managed fish species and determine science-based measures to best manage and conserve these habitats from adverse effects of human activities.

This section describes the review of research and information needs for EFH, as well as providing research recommendations for many of the individual FMP species.

12.1 Prior work to document EFH research needs

Previous work to document EFH research needs has been done within the 5-year research priority setting process. This is done holistically across all FMPs and in conjunction with the SSC and other Council bodies.

12.2 Review Approach

The purpose of the EFH-related research needs report is to document ideas for research topics important for EFH conservation that were identified during the EFH review process. This does not represent a comprehensive gaps analysis to identify all missing research and information pertinent to EFH. Instead, the report should be viewed as a list of ideas that build on analyses developed for this review and are expected to improve future EFH reviews and support other Council habitat work. Specifically, the report briefly describes existing research planning documents and research inventories for the Northeast region and lists new ideas developed during this EFH review.

Inventories of current research needs includes: science-related (NEFSC 5-year strategic priorities and ASMFC partnership with USGS), management-related (NEFMC and MAFMC research priorities for research set-aside projects, NEFSC research track assessment research recommendations); Council management-related (NEFMC annual work priorities and MAFMC strategic and implementation plans); offshore wind-related (Regional Wildlife Science Collaboration, Responsible Offshore Science Alliance, State of Maine's Research Consortium and Maine Offshore Wind Roadmap); and Inflation Reduction Act project-related (NEFMC has projects that are informed by species distribution models and MAFMC includes a project focused on EFH: "Climate-ready updates to EFH source documents: life history and habitat characteristics for federally managed fish in the Northeast."

12.3 Research needs identified during this EFH Review

A list of research needs was identified during this EFH Review. This list is applicable to the Northeastern U.S., i.e., to both Councils. A purpose for each need is described in the component 9 report.

1. Updated and comprehensive data layers depicting estuarine salinity zones for the Northeast U.S.
2. Locations of structured offshore habitat, identified through local ecological knowledge.
3. Fish food habits/diet data for selected locations and seasons to augment existing sampling efforts, namely data: 1) from the state waters of Maine, New Hampshire, and Massachusetts; 2) collected during summer and winter; 3) from the shelf break / heads of canyons, 4) within fishery closed areas, and 5) within wind energy areas.
4. Updates to the benthic macroinvertebrate fauna data.
5. Additional macroscopic sampling for squids (shortfin and longfin), though it is worth noting that there are ongoing projects using genetics.
6. Better understanding of the relationship between environmental energy / flow regime and fishing gear effects on habitat features.
7. Update the high / low energy input layer for the Fishing Effects Model.
8. Consider updates to the Fishing Effects Model vulnerability assessment, including revised susceptibility and recovery model parameters based on recent literature
9. Consider updates to the Fishing Effects Model sediment map to reflect recent data updates.
10. Consider updates to the Fishing Effects Model swept area calculations. For example, combining observer data with vessel monitoring system data to estimate tow distances on observed trips and tow speed by gear and vessel for estimation of tow distance (ntows x tow speed) on unobserved trips. Also, use substitute observed gear data for VTR reported data and effective swept area procedure assumptions on observed trips.
11. Consider updates to the Fishing Effects Model impact methods / calculations.
12. Research to evaluate the mechanistic impact of fishing on habitat productivity.
13. Develop an inventory of recreational marine fisheries activities by state.
14. Enhance the report on non-fishing impacts with additional detail, similar to the 2008 Tech Memo.
15. Consider alternative sources for oceanographic predictor variables in species distribution models.
16. Use Community Basis Function Modeling to identify length-based ontogenetic shifts in habitat use, using clustering algorithms as an alternative to parsing juveniles vs. adults based on length at 50% maturity.
17. Integrate fishery independent data from diverse survey types, e.g., longline surveys, into Species Distribution Models, including Community Basis Function Models.
18. Develop egg (if possible given available data) and larval species distribution models.
19. Consider the use of environmental DNA to understand species distributions and food habits.
20. Consider the use of living online documents to provide background information during fishery management plan development.
21. Add EFH designations, when developed, to the Northeast and Mid-Atlantic Ocean Data Portals.
22. Integrate research priority inventories across GARFO, NEFSC, and the Councils to better integrate habitat research priorities with a plan/framework to ensure tools, methods, data, etc. are regularly updated.

12.4 Council recommendations

The Council recommended the following action:

- **Component 9, Recommendation 1:** The Council could consider updating research needs and new and existing inventories of research projects as NEFMC and MAFMC Inflation Reduction Act projects progress. **Timing: During IRA performance period, 2025-2027.**

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