

Proposed approach to reviewing Essential Fish Habitat for the 2022 EFH 5-Year Review

March 2020¹

1	Introduction	1
2	Brief History	2
3	Approach.....	3
3.1	Model-based Essential Fish Habitat definitions	3
3.2	EFH Review Steps.....	5
4	Review and Revision to EFH FMP Components.....	6
4.1	EFH Descriptions and Identification.....	6
4.2	Fishing Activities that may affect EFH.....	6
4.3	Non-MSA Fishing Activities that may affect EFH	7
4.4	Non-fishing activities that may affect EFH	7
4.5	Cumulative impacts analysis.....	7
4.6	EFH Conservation and Enhancement recommendations	7
4.7	Prey species	7
4.8	Habitat Areas of Particular Concern (HAPC)	8
4.9	Research and Information needs.....	8
4.10	Review EFH components every 5 years.....	9
5	Protocols and Timeline	9
6	Conclusions	11
7	References.....	11

1 Introduction

The 1996 provisions to the Sustainable Fisheries Act require regional Fishery Management Councils (Councils) to describe and identify Essential Fish Habitat (EFH) for all fisheries, and to minimize to the extent practicable the adverse effects of fishing on EFH. The Magnuson-Stevens Fishery Conservation and Management Act (MSA) defines EFH as “those waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity”. 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. Councils also have the authority to comment on Federal or state agency actions that would adversely affect the habitat, including EFH, of managed species.

Each FMP contains the following EFH components:

1. EFH descriptions and identification
2. Fishing activities that may adversely affect EFH
3. Non-MSA 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 locations
8. Habitat Areas of Particular Concern identification
9. Research and information needs

¹ Prepared by Steve Mac Lean, Council staff, with contributions from Jodie Pirtl, John Olson, and Matt Eagleton.

10. Review EFH every 5 years.

The EFH final rule at 50 CFR 600.815(a)(10) states:

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. 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.

The EFH final rule establishes that Council should identify the level (1-4) of information that is available to describe EFH. As more information becomes available to describe EFH, the EFH description is noted at a higher level. The EFH levels are described below:

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

This document identifies the proposed approach for the scheduled 2022 EFH review. The objective of the review is to evaluate new information on habitat, consider potential new approaches to describe EFH, and determine whether changes to the FMPs are warranted. This information will be presented to the Council in a summary report at the conclusion of the review. If the Council chooses to update its FMPs based on the report, FMP amendments will be prepared along with the appropriate analytical documents.

2 Brief History

The North Pacific Fishery Management Council (Council) described EFH for its FMPs in 1999 in an environmental assessment that also outlined human-induced effects on EFH. In 2000, a legal challenge of the EFH provisions resulted in a reevaluation of EFH information by all Councils. The Alaska Region and Council completed a more comprehensive EFH description and effects analysis in 2005.

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. The HAIP was updated in 2018 (Peters et al. 2018).

The Council updated its EFH information for all six FMPs in 2010, and again for five FMPs in 2017. Updates included several species descriptions, changed the HAPC process to coincide with each 5-year review, and revised EFH priorities. The EFH review completed in 2017 (2017 review) introduced new species distribution models (SDMs) to describe EFH, developed a new Fishing Effects model, and significantly updated the evaluation of non-fishing effects on EFH. The SDMs developed for the 2017 review allowed Level 2 descriptions for some life stages of some species in the BSAI and GOA Groundfish FMPs. Most descriptions, however, remain Level 1 descriptions.

3 Approach

As with the previous reviews, the 2022 EFH review will evaluate EFH components in the six Council FMPs, with respect to new information. In general, the Council initiates an EFH review and relies on analyses and evaluation from stock assessment authors to indicate whether updates to EFH descriptions or other components is necessary. For the 2010 and 2017 EFH review, each stock assessment author was asked to review current FMP text describing EFH for each species or species complex for which they have responsibility. Authors were asked to review EFH text descriptions, level of EFH information, habitat information, and the list of literature. Authors suggested necessary changes and updates, if appropriate, for each life history stage and any new information or literature that should be included in the EFH description. Authors were also asked to review and update, if appropriate, the habitat association tables from the FMP. Finally, authors were asked to review current maps of EFH and determine whether updates to the maps were necessary. For the 2017 review, authors were provided with new maps that resulted from application of SDMs developed for the review, and compared the new maps to the old maps from the 2010 review. Finally, stock authors were provided output from the Fishing Effects model and asked to evaluate the effects of fishing on their stocks following a method developed during the 2017 review. This information was presented to the Plan Teams and the Council. For the 2022 review, the Council may select to review and update all EFH components, or select specific components for review if the Council feels some components are satisfactory and updates may not improve EFH management.

The six Council FMPs are:

- Groundfish of the Bering Sea and Aleutian Islands Management Area (BSAI Groundfish)
- Groundfish of the Gulf of Alaska (GOA Groundfish)
- Bering Sea/Aleutian Islands King and Tanner Crab (BSAI Crab)
- Scallop Fishery off Alaska (Scallop)
- Salmon Fisheries in the EEZ off Alaska (Salmon)
- Fish Resources of the Arctic (Arctic).

Because of the major revisions that took place in 2017, staff have not initially identified any components in need of a major revision or update. NMFS Alaska Region and AFSC staff have continued to update SDMs for some species and life stages. These updated models may have potential to modify EFH descriptions or maps and may allow for Level 3 information for some life stages of some species. Use of Level 3 information may change the EFH footprint for some species, which may result in less precautionary management in some cases. The Council should consider management objectives (smaller EFH footprint vs. more precautionary management) as part of their EFH decisions.

3.1 Model-based Essential Fish Habitat definitions

Essential Fish Habitat descriptions consist of maps and text descriptions. Earlier descriptions of EFH in Alaska were identified by the Council as the distribution of species life stages, and maps based on survey results and observed catch. Since completion of the 2010 EFH review, substantial new data have been made available to describe habitat in the Large Marine Ecosystems around Alaska, and in some cases, the effects of habitat on the abundance of species of interest.

For the 2017 review, scientists at NMFS Alaska Region, the Alaska Fisheries Science Center, and academic researchers produced SDMs of EFH for all major species of groundfish and crabs in the eastern Bering Sea, Aleutian Islands, and Gulf of Alaska. Models and text descriptions of EFH were generated for each species where data exist for egg, larval, juvenile, and adult life history stages in four seasons. Maps were generated that showed the location of EFH. The types of data, and their limitations, are discussed in detail in the 2017 EFH Summary Report (Simpson et al. 2017).

As an outcome of the 2017 review, the Council adopted species distribution models to describe EFH (Laman et al. 2017, Turner et al. 2017, Rooney et al. 2018, Laman et al. 2018) that resulted in updated EFH information levels and maps for some species life history stages (Simpson et al. 2017). The new EFH maps are available on the [Alaska EFH Mapper](#), an ArcGIS web application with EFH maps and spatial data for species in the Councils' FMPs. The new models and maps that were created during the 2017 review allowed more quantitative, precise descriptions of EFH in the Council's FMPs, and met the recommendations in the MSA to use the best available information to define EFH.

The 2017 Alaska EFH Research Plan (Sigler et al. 2017), developed following the review, identifies research recommended to provide information for the next EFH review. The recommendations are: 1) characterize habitat utilization and productivity, 2) assess habitat sensitivity and recovery, 3) validate and improve fishing impacts model, 4) map the seafloor, and 5) assess coastal habitats facing development. The Research Plan retains the five original research themes (above) and also identifies two research objectives:

1. Develop EFH Level 1 information (distribution) for life history stages and areas where missing;
2. Raise EFH information from Level 1 or 2 (habitat related densities) to Level 3 (habitat related growth, reproduction or survival rates).

Objective 2 also calls for fishery researchers to collaborate with model developers to incorporate new and existing data into regional models. New data continue to be collected and new modeling techniques may make use of those new data to produce more precise descriptions of EFH. Several projects funded since the 2017 review address these objectives and may result in updates to EFH information levels for some life stages of some species. Table 1 lists the EFH research projects NMFS has funded since the 2017 review.

Table 1 EFH Research Fund projects funded in 2017, 2018, and 2019

Year	Project Title	Principal Investigators	Research Priority
2017/18/19	Optimal overwintering thermal habitat of juvenile walleye pollock (<i>Gadus chalcogrammus</i>) from the Bering Sea and Gulf of Alaska	Laurel, Heintz, Copeman, Hurst, Pirtle	Characterize habitat utilization and productivity
2017	A pilot study for assessing deep-sea corals and sponges as nurseries for fish larvae in the western Gulf of Alaska	Rooper, Wilborn, Goddard	Characterize habitat utilization and productivity
2017	Using habitat characteristics and prey abundance to predict distribution, abundance, and condition of groundfish in the Gulf of Alaska	Ressler, Simonson, Rooper, Punt	Validate and improve Habitat Impacts Model
2017/18/19	Essential fish habitat of flatfish early life stages in the Chukchi Sea	Cooper, Logerwell, Heintz, Ianelli	Characterize habitat utilization and productivity
2017	Juvenile flatfish habitat in the northern Bering Sea	Yeung, Cooper, Copeman, Matta, Yang	Characterize habitat utilization and productivity
2018/19	Developing a novel approach to estimate habitat-related survival rates for early life history stages using individual-based models	Shotwell, Stockhausen, Gibson, Deary, Pirtle, Rooper	Characterize habitat utilization and productivity
2018/19	A unified nearshore catch database to refine juvenile EFH models and maps for Alaska	Lindeberg, Pirtle, Neff	Characterize habitat utilization and productivity
2018	Is nearshore habitat essential to overwintering YOY Pacific cod?	Kastelle, Helser, Litzow, Laurel	Characterize habitat utilization and productivity
2018	Spatial variation in early juvenile flatfish growth and condition in relation to thermal phases in the eastern Bering Sea Shelf	Yeung, Copeman, Matta, Rooper, Yang	Characterize habitat utilization and productivity
2018	Age effects on thermal habitat requirements on commercial flatfishes	Hurst, Copeman	Characterize habitat utilization and productivity
2019	Advancing EFH species distribution modeling descriptions and methods for the North Pacific Fishery Management Plan species	Laman, Pirtle, Rooper, Hurst, Conrath	Characterize habitat utilization and productivity
2019	Spatial variation in early juvenile flatfish growth and condition in relation to habitat quality the Bering Sea	Yeung, Copeman, Matta, Pirtle, Yang	Characterize habitat utilization and productivity

The NMFS has also funded projects to refine nearshore EFH to improve non-fishing effects consultations for Alaska, develop dynamic SDM to identify and describe EFH under a changing environment, and worked with BOEM to fund and develop new Arctic SDMs.

3.2 EFH Review Steps

Because a major update to EFH was completed in 2017, the approach to the 2022 EFH review is to broadly evaluate all EFH components in the Council’s FMPs and solicit input from the Council on which, if any, of the components warrant updates or a more detailed review. Staff have made recommendations, below, for which EFH components may warrant review. The Council may, of course, select any or all of the components for review. In general, if the Council chooses to review EFH definitions in any or all of its FMPs, the process would be as follows:

1. Compile and evaluate new information available to describe EFH in the Council’s FMPs.
2. Model potential EFH with existing or new SDMs.

3. Review model output and EFH descriptions by stock assessment authors, plan teams, Ecosystem Committee, SSC, and Council.
4. Present summary report to the Council.
5. If updates are determined to be warranted by the Council, prepare updates to the Council's FMPs with the attendant analyses.

Once the summary report is prepared, the Council will be able to determine what action, if any, is warranted based on the information in the report. If the Council chooses to initiate FMP amendments to update any EFH components or consider additional EFH measures (e.g., HAPC), the amendments and associated analysis will proceed through the normal Council process.

4 Review and Revision to EFH FMP Components

4.1 EFH Descriptions and Identification

Descriptions of EFH consist of written summaries in the FMPs (or appendices) and maps. When designating EFH, the Council should strive to identify EFH information at the highest level possible (50 CFR 600.815(a)(1)(iii)(B)), and consider habitat necessary for species throughout their range (50 CFR 600.815(a)(1)(iv)(A)). For the 2017 review a major update to EFH methods was implemented. Scientists at NMFS Alaska Region, the Alaska Fisheries Science Center, and academic researchers produced SDMs to develop descriptions of EFH for all major species of groundfish and crabs in the eastern Bering Sea, Aleutian Islands, and Gulf of Alaska. Models and text descriptions of EFH were generated for each species where data existed for egg, larval, juvenile, and adult life history stages in four seasons. From these, complementary distribution maps were generated that showed the location of EFH for each species and life history stage, where possible. Since the completion of the last review, additional survey and other data have been collected, and SDM modeling techniques have advanced, and SDMs may be available for more species (e.g. Arctic FMP).

In February 2019, NMFS held a workshop in Seattle to discuss the current EFH modeling efforts and research development goals to ensure long-term progress to improve SDMs for Alaska. Attendees discussed opportunities to use the habitat information developed from the SDMs to support stock assessments, climate reporting, and other ecosystem-based fisheries management information needs. Based on this workshop, AFSC, AKR, and academic researchers continue to revise existing SDMs and develop new SDMs to describe EFH for the Council's managed species. Appendix A provides detailed descriptions of the models and summarizes potential changes to EFH descriptions and information levels based on case studies. Potential benefits to applying these updated and new models include:

- Potentially updated EFH descriptions
- Potentially updated EFH information levels
- Potentially updated maps for some life stages

Developing new and updated SDMs will require additional time for the Council and the SSC to review and revise models, similar to the process to review and revise models for the 2017 review. As in the 2017 review, new model output would be presented to the stock assessment authors for review and their recommendations about whether updates to EFH are necessary, based on that new information.

4.2 Fishing Activities that may affect EFH

In 2017 the Council employed the Fishing Effects model to describe and evaluate the potential impacts of fishing activities on EFH. Potential actions for the 2022 review include rerunning the Fishing Effects model with updated fishing data. No new models are proposed to evaluate the effects of fishing activities

on EFH, and limited new data are available since the last review. A 3-year Deep-Sea Coral research initiative is taking place in Alaska from 2020 – 2022 which may provide new information on coral susceptibility to fishing impacts and potential for recovery from impacts are likely to be available after that initiative, before the next schedule EFH review. Because limited new data are available since the 2017 review, the Council may wish to postpone updates to the Fishing Activities component.

4.3 Non-MSA Fishing Activities that may affect EFH

The EFH review must consider any fishing activities that are not managed under the MSA that may affect EFH. Non-MSA fishing activities include State-waters parallel fisheries, State-waters fisheries, recreational fisheries, and halibut fisheries managed under the Northern Pacific Halibut Act of 1982. Although new data may exist to evaluate other non-MSA impacts, resources to complete this analysis are not available at this time. The Council may wish to postpone updates to the non-MSA fishing activities component.

4.4 Non-fishing activities that may affect EFH

The 2017 EFH review included a major review and revision to the description and evaluation of non-fishing activities that may affect EFH (Limpensel et al. 2017²). This analysis included new sources of information to evaluate non-fishing impacts to EFH, updated conservation recommendations for some activities, and added sections to address climate change impacts, ocean acidification, and marine traffic. Potential updates for 2022 include updating conservation recommendations and updates based on the CCC Habitat Work Group (HWG) recommendations from the August 2019 workshop. The Council's Ecosystem Committee is reviewing recommendations from the CCC HWG workshop and will make recommendations to the Council for potential adoption. The Council may wish to postpone decisions on non-fishing activities until input from the Ecosystem Committee is submitted and reviewed.

4.5 Cumulative impacts analysis

To the extent practicable, FMPs should analyze how cumulative impacts of fishing and non-fishing activities influence the function of EFH on an ecosystem or watershed scale. The cumulative impacts of fishing activities were evaluated in the Supplemental Information Report (SIR) to the Alaska Groundfish Fisheries Programmatic Environmental Impact Statement completed in 2015. There is little information with which to update information presented in the SIR. The Council may wish to postpone updates to the cumulative impacts analysis.

4.6 EFH Conservation and Enhancement recommendations

FMPs must identify actions to encourage the conservation and enhancement of EFH, including recommended options to avoid, minimize, or compensate for adverse impacts. Conservation and enhancement recommendations or fishing and non-fishing activities have been evaluated against new information to determine whether updates are warranted during each EFH review. No major revisions have been determined to be necessary. The Council may wish to postpone updates to the EFH conservation and enhancement recommendations.

4.7 Prey species

Actions that reduce the availability of a major prey species or their habitat may be considered adverse effects on EFH if such actions reduce the quality of EFH. FMPs should list the major prey species for the species in the FMP and discuss locations of prey species habitats. Each FMP includes a list of prey

² Limpensel et al. 2017. NOAA Tech. Memo. NMFS-F/AKR-14

species for each managed species for which EFH has been identified. Stock assessment authors review and revise prey species lists and information during each EFH review cycle. For the 2022 review, stock assessment authors will again review and suggest revisions to prey species lists and information about prey species as part of their EFH review.

4.8 Habitat Areas of Particular Concern (HAPC)

FMPs should identify specific types or areas of habitat within EFH as Habitat Areas of Particular Concern (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. In 2010, the Council outlined its HAPC evaluation criteria³ and determined that as part of its HAPC process, areas nominated for inclusion must meet at least two of the four considerations, one of which must be the rarity consideration. Recently, the Council identified six known areas of skate egg concentration in the Bering Sea as HAPC. In February 2020, the Council's Ecosystem Committee received a report from AFSC researchers of the research conducted on skate nursery areas over the last 17 years and concluded, based on the information provided, that updates to the skate egg concentration HAPCs are not warranted at this time.

The Council linked its nomination process for HAPC with the EFH review schedule. For this review, the Council may wish to identify areas of priority for HAPC and request proposals for specific sites for HAPC inclusion.

4.9 Research and Information needs

FMPs should identify recommendations for research efforts that the Council and NMFS view as necessary to improving descriptions and identification of EFH, identification of threats to EFH, and development of EFH conservation and enhancement measures. During each EFH review, stock assessment authors identify gaps in knowledge and recommend research activities to fill those gaps. These become EFH research priorities identified in the FMPs. Table 1 lists the EFH research projects NMFS has funded since the 2017 review, and Figure 4-1 shows the objectives of the research projects funded from 2005 through 2020. Appendix B includes a summary of the research priorities, and the research projects funded to address those priorities. Stock assessment authors will again review and suggest research priorities to improve descriptions of EFH, identification of threats to EFH, and conservation and enhancement recommendations.

³ https://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/HAPC/HAPC_eval_210.pdf

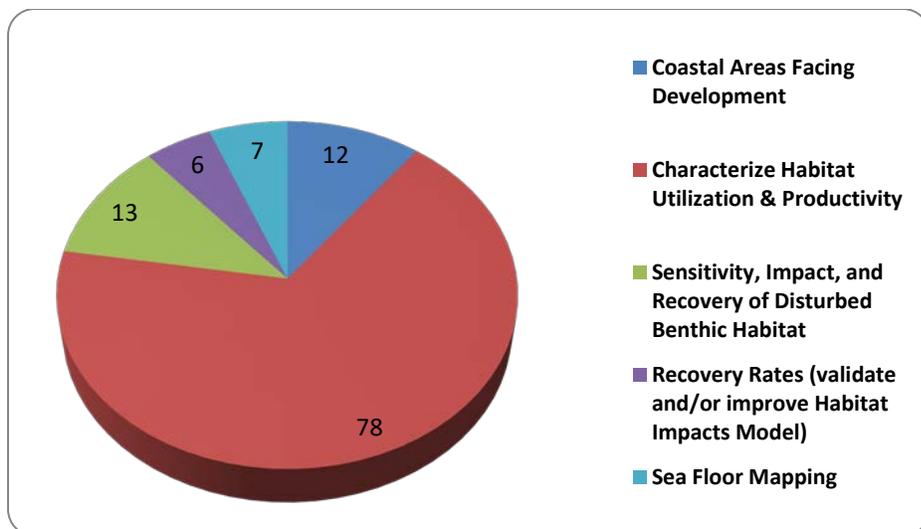


Figure 4-1. Summary of EFH research projects funded, 2005 – current.

4.10 Review EFH components every 5 years

Councils and NMFS should *periodically review the EFH provisions of FMPs and revise or amend EFH provisions as warranted based on available 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. At the conclusion of the EFH review, a summary report is prepared that describes the review process and the results of review for all EFH components the Council elects to review and potentially revise. The summary report represents the EFH review and meets the requirements for review outlined in MSA. If, after reviewing the summary report, the Council chooses to update any EFH components in its FMPs, FMP amendments will be prepared along with the appropriate analytical documents.

5 Protocols and Timeline

In previous reviews, the Council has used a protocol that includes the expertise of the stock assessment authors, plan teams, SSC and Ecosystem Committee. Stock assessment authors are asked to review existing definitions and maps of EFH at the beginning of the process, and are also informed of new habitat data, new habitat or species distribution modeling methods, etc., that might have an effect on EFH definitions. Assessment authors provide their review to the Plan Teams for review and for recommendation for which species updates would be appropriate. Recommendations from the Plan Teams are presented to the Council in an update. If no changes to the work plan are made by the Council, review of all EFH components commences and is summarized in a draft summary report that is presented to the Council at a subsequent meeting. Based on the information in the summary report, the Council may choose to amend the Council’s FMPs to reflect the changes to EFH definitions or maps. If updates to EFH are recommended, the definitions and maps are again reviewed by the stock assessment authors who also identify research needs to fill gaps in habitat knowledge for their particular species of expertise. After assessment author review, the initial draft and final draft NEPA documents are prepared for regular Council review and FMP amendments are prepared.

To complete any FMP amendments and their attendant analyses by 2022, the following general timeline is proposed:

April 2020	Council	Review proposed approach and identify EFH components for potential revision
April – Dec 2021	HCD, NPFMC staff, AFSC	Develop species distribution models, review other components, as recommended by the Council
Jan – Mar 2021	Assessment authors	Review information available for their species, provide recommendations whether changes to EFH descriptions are necessary
Apr 2021	Council	Assessment authors' recommendations presented to the Council, SSC, AP, and ECO.
Mar – Nov 2021	HCD, NPFMC staff, AFSC	Develop summary report with draft updates to EFH descriptions and other EFH components
Dec 2021	Council	Review summary report with draft updates to EFH descriptions and other EFH components. Make recommendations to update EFH or not.
Jan – Feb 2022	Assessment authors	Review updated EFH descriptions and identify research needs
Mar -May 2022	NPFMC staff, HCD, AFSC	NEPA analyses for potential FMP amendments
June 2022	Council	Review Initial Review Draft of EFH FMP amendment analysis
October 2022	Council	Review Final Review Draft of EFH FMP amendment analysis

Alternately, the Council could choose to revise the regular protocols. An alternative schedule is also presented that requires less review and time from the assessment authors and the Council and its advisory bodies. With this schedule, the Council would identify EFH components for review and potential revision in April 2020, the Council would next see the proposed EFH descriptions and maps in April 2022 and choose whether to initiate FMP amendments or not at that time.

April 2020	Council	Review proposed approach and identify EFH components for potential revision
April – Dec 2021	HCD, NPFMC staff, AFSC	Develop species distribution models, review other components, as recommended by the Council
Jan-Mar 2022	Assessment authors	Review information from models, recommend changes to EFH descriptions, if necessary, and identify research needs
Mar 2022	HCD, NPFMC staff, AFSC	Develop summary report with draft updates to EFH descriptions and other EFH components
Apr 2022	Council	Review summary report with draft updates to EFH descriptions and other EFH components. Make recommendation to update EFH or not.
Apr – Sep 2022	NPFMC staff, HCD, AFSC	NEPA analysis for potential FMP amendments
Oct 2022	Council	Review Initial Review Draft of EFH FMP amendment analysis
Dec 2022	Council	Review Final Review Draft of EFH FMP amendment analysis

6 Conclusions

The proposed approach for the 2022 EFH review is based on the approaches approved and used by the Council in the 2017 and 2010 review. Here, we have broadly identified which of the EFH components the Council may wish to update. Staff are seeking input from the Council and its advisory bodies on specific components that should be considered for review and revision, or whether each of the EFH components should be reviewed for potential revision, and which protocols and timeline the Council would prefer for the review. If the Council selects a subset of the EFH components for review now, the summary report and any following action may be less complex than the report received in 2017, and the omnibus amendment package to modify the Council's FMPs may also be less complex. The Council may consider updating the following components and actions for this review:

- Develop and present new or revisions to existing species distribution models and habitat information to stock assessment authors and Plan Teams for review;
 - The Council may wish to consider SSC review of the new and revised species distribution models outlined in Appendix A.
- Run Fishing Effects model with updated fishing data;
- Update research priorities and information needs.

Additionally, the Council may wish to identify priorities for HAPC consideration and request proposals for specific sites for HAPC inclusion, and updating non-fishing impacts analysis and conservation recommendations pending review of the CCC Habitat Workgroup recommendations by the Ecosystem Committee.

7 References

- Laman, E.A., Rooper, C.N., Rooney, S., Cooper, D.W., and Zimmerman, M. 2017. Model-based essential fish habitat definitions for Bering Sea groundfish species. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-AFSC-357, 265p.
- Laman, E.A., Rooper, C.N., Turner, K., Rooney, S., Cooper, D.W., and Zimmermann, M. 2018. Using species distribution models to describe essential fish habitat in Alaska. *Can. J. Fish. Aquat. Sci.* <https://doi.org/10.1139/cjfas-2017-0181>.
- Limpinsel, D.E., M.P. Eagleton, and J.L. Hanson. 2017. Impacts to Essential Fish Habitat from Non-Fishing Activities in Alaska. EFH 5 Year Review: 2010 through 2015. U.D. Dep. Commer., NOAA Tech. Memo. NMFS-F/AKR-14, 229p.
- Peters, R., A.R. Marshak, M.M. Brady, S.K. Brown, K. Osgood, C. Greene, V. Guida, M. Johnson, T. Kellison, R. McConnaughey, T. Noji, M. Parke, C. Rooper, W. Wakefield, and M. Yoklavich. 2018. Habitat Science is a Fundamental in an Ecosystem-Based Fisheries Management Framework: An Update to the Marine Fisheries Habitat Assessment Improvement Plan. U.S. Dept. of Commerce, NOAA Tech. Memo. NMFS-F/SPO-181, 29p.
- Rooney, S., Laman, E.A., Rooper, C.N., Turner, K., Cooper, D.W., and Zimmermann, M. 2018. Model-based essential fish habitat definitions for Gulf of Alaska groundfish species. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-373, 370p.
- Sigler, M.F., M.P. Eagleton, T.E. Helser, J.V. Olson, J.L. Pirtle, C.N. Rooper, S.C. Simpson, and R.P. Stone. 2017. Alaska Essential Fish Habitat Research Plan: A Research Plan for the National Marine Fisheries Service's Alaska Fisheries Science Center and Alaska Regional Office. AFSC Processed Rep. 2015-05, 22 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

- Simpson, S.C., Eagleton, M.P., Olson, J.V., Harrington, G.A., and Kelly, S.R. 2017. Final Essential Fish Habitat (EFH) 5-year Review, Summary Report: 2010 through 2015. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/AKR-15, 115p.
- Turner, K., Rooper, C.N., Laman, E.A., Rooney, S., Cooper, D.W., and Zimmermann, M. 2017. Model-based essential fish habitat definitions for Aleutian Islands groundfish species. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-360, 239p.