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Alaska Essential Fish Habitat Research Plan:

A Research Plan for the National Marine Fisheries Service's Alaska Fisheries Science Center and Alaska Regional Office

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Cover photo: Rockfish, coral, and sponge in the central Aleutian Islands (NOAA-AFSC).

Alaska Essential Fish Habitat Research Plan

A Research Plan for the National Marine Fisheries Service's Alaska Fisheries Science Center and Alaska Regional Office

By

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Preface

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) mandates NOAA to identify habitats essential for managed species and conserve habitats from adverse effects on those habitats. To meet these mandates, NOAA's 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. The NOAA Essential Fish Habitat Research Implementation Plan (AFSC 2006) for Alaska guided research to meet EFH mandates in Alaska during the last several years. This document revises and supersedes the initial Implementation Plan (AFSC 2006), and similar to the first plan is expected to guide the next several years of EFH research. The revision process began with a coordination meeting between Alaska Region habitat managers and Alaska Fisheries Science Center (AFSC) habitat scientists to determine the scope of the revised EFH research plan with a smaller group of 11 AFSC and Alaska Region staff subsequently completing the revision.

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Introduction

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) mandates NOAA to identify habitats essential for managed species and conserve habitats from adverse effects on those habitats (NMFS 2010). These habitats are termed "Essential Fish Habitat" or EFH, and are defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (NMFS 2010). Further, the MSFCMA requires federal agencies to consult with the National Marine Fisheries Service when their actions may adversely affect EFH. These consultations occur for both fishing and non-fishing activities.[1] National Standard 2 of the MSFCMA requires NOAA Fisheries to conserve and manage fishery resources based upon the best available scientific information. To meet these mandates, NOAA's 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. The NOAA Essential Fish Habitat Research Implementation Plan for Alaska (AFSC 2006) guided research to meet EFH mandates in Alaska during the last several years. This document revises and supersedes the initial Implementation Plan (AFSC 2006) and similar to the first plan is expected to guide the next several years of EFH research.

The revision process began with a coordination meeting between Alaska Region habitat managers and AFSC habitat scientists in September 2010, which included a goal to determine the scope of the revised EFH research plan. The previous plan had focused on allocation of EFH funds, which while a major component, does not cover all EFH research conducted by the AFSC. The group recommended that the revised plan set priorities for all EFH research, which this plan does.

A smaller group of 11 AFSC and Alaska Region staff subsequently met during 2011 to revise the first EFH research plan. The group consisted of experienced habitat scientists and managers, as well as members of the AFSC's Habitat and Ecological Processes Research (HEPR) Team. The HEPR Program was established in 2005, consists of a Program leader and a HEPR Team with team members from each division of the AFSC and is tasked with facilitating EFH research.

The review was based on the group's EFH research and stock assessment experience, the 2006 EFH research plan and four recent documents: 1) the NOAA Fisheries Habitat Assessment Improvement Plan, which identified approaches for improving habitat science (NMFS 2010); 2) the AFSC science plan, which identified habitat research priorities (AFSC 2010); 3) the North Pacific Fishery Management Council and NOAA Fisheries Alaska Region 5-year EFH review, which identified habitat research priorities and also summarized recent EFH research (NPFMC 2010); and 4) the proceedings of the 1st National Habitat Assessment Workshop (Blackhart 2010). As of 2009, 17 AFSC scientists within several different research programs were conducting EFH research (NMFS, 2010). During 2005-2009, NOAA Fisheries spent $2.28 M on 49 EFH projects in Alaska (NPFMC 2010). Data from these and other projects were subsequently

[1] NOAA Fisheries recommends measures to conserve EFH resulting from fishing and non-fishing activities. EFH measures conserve sensitive habitats and features necessary to fish for spawning, breeding, feeding, or growth to maturity. For fishing activities (such as trawling and line gears), recommendations may include gear restrictions, time and area closures, and gear modifications. For non-fishing activities (such as oil and gas exploration and development, port and harbor expansions, mining, and roadway construction), recommendations may include measures such as in-water work timing windows, alternative site selection, onshore disposal of dredge spoils, and methods to avoid, remove and remediate impacts from accidental discharge of oil.

listed in a 2009 EFH inventory document for Alaska (McConnaughey et al. 2009). This research effort (number of habitat scientists, annual spending) has remained approximately level since then. In addition, during our review, the NOAA Fisheries Habitat Blueprint was advanced by NOAA Fisheries Assistant Administrator for Fisheries Eric Schwaab (Schwaab 2011).

This document is organized into three major sections: 1) research priorities for the first plan; 2) rationale for their revision; and 3) research priorities for the revised plan. In addition, an appendix describes the request for proposals for studies supported by EFH funding. In revising the research priorities, the existing research priorities mostly were kept but also were revised in several areas. Briefly, those revisions were to increase the level of EFH information, apply information from EFH studies at regional scales, emphasize measurement of habitat recovery rate, develop a geographic-based database for offshore habitat information.

Summary of habitat-related research priorities

2006 EFH Research Plan (AFSC 2006)

1) Characterize habitat utilization and productivity;
2) Assess sensitivity, impact and recovery of disturbed benthic habitat;
3) Improve the habitat impacts model;
4) Map the seafloor; and
5) Assess coastal areas facing development.

Habitat Assessment Improvement Plan (NMFS 2010)

1) Meet Magnuson-Stevens Act mandates;
2) Improve identification and impact assessments of EFH;
3) Reduce habitat-related uncertainty in stock assessments and facilitate a greater number of advanced stock assessments.

2010 AFSC Science Plan (AFSC 2010)

Describe and assess the role of habitats in supporting healthy marine ecosystems and populations of fish, crab and marine mammals:

1) Assess and evaluate the importance of specific habitat types for fish, crab, and marine mammal populations;
2) Evaluate and forecast ecosystem impacts of fishing and develop mitigation tools;
3) Evaluate and forecast impacts of human activities (other than fishing) on fish, crab, and marine mammals and their habitats.

5-year EFH review (NPFMC 2010)

Immediate Concerns

1) Assess whether Bering Sea canyons are habitats of particular concern;
2) Assess Bering Sea skate nursery areas and evaluate the need for designation of new HAPCs;
3) Assess baseline conditions in the northern Bering Sea and Arctic.

Ongoing Needs

4) Improve habitat maps (especially, benthic habitats);
5) Begin to develop a GIS relational database for habitat including spatial intensity of commercial fisheries;
6) Assess the extent of the distribution of *Primnoa* spp. corals in the GOA;
7) Evaluate importance of habitat-forming living substrates to commercially important species, including juveniles;
8) Develop a time series of the impact of fishing on Gulf of Alaska, Aleutian Island and Bering Sea habitats;
9) Evaluate effects of fishing closures on benthic habitats and fish production.
10) Develop new analytical approaches and/or models to refine EFH descriptions at higher levels.

Habitat Blueprint (Schwaab 2011)

1) Preserve or improve the habitat condition within a defined geographic area and on a scale greater than an individual restoration project;
2) The science component should contribute to the initiative through integration of information, modeling, decision support, and/or monitoring.

Research Priorities for the First Plan

The overarching priority for the first plan was research on habitats most affected by human activities, including habitats with frequent human activity as well as habitats sensitive to disturbance where human activity is infrequent. Priority habitats included offshore habitats susceptible to disturbance from fishing gear and coastal habitats susceptible to disturbance from non-fishing activities.

Coastal areas facing development - Characterization of coastal habitats susceptible to disturbance from non-fishing activities is a priority. These activities include oil and gas development, tidal energy, logging, mining, urbanization, and contaminants. The research approach includes coastal habitat mapping (ShoreZone) as well as field surveys of a representative subset of the mapped habitats to measure fish and shellfish utilization. Priority coastal habitats for study are those utilized by managed fish and shellfish species and facing development pressure.

Characterize habitat utilization and productivity – This priority focuses on understanding the relationship between habitat type, patterns of use by species, and differences between habitats in productivity of managed species. The research approach supports integrating projects that combine measurements of habitat characteristics, habitat utilization, and habitat productivity in one study, and also combine laboratory experiments, controlled field manipulations, and field observations. This approach also includes conducting studies that would support refining the description and identification of EFH in Fishery Management Plans (FMPs).

Sensitivity, impact and recovery of disturbed benthic habitat– Habitat-forming biota such as corals and sponges often are sensitive to human activity and may take many years to recover from disturbance. Some managed fish and shellfish species use this habitat for protection and camouflage. Estimates of habitat impacts, sensitivity, and recovery rates are necessary to understand the effects of human activities. Recovery rates are defined as the rate of change of impacted habitat back to un-impacted habitat following disturbance. Sensitivity is defined as the susceptibility of habitat to degradation. Habitat may be affected by fishing. In addition, coastal areas often are affected by non-fishing impacts. Recovery and monitoring studies of impacted coastal areas, such as log transfer facility (LTF) sites, offshore marine mining areas, and dredge spoil discharge areas associated with marine ports, are needed to determine if these sites have returned to their pre-utilization state following facility closure or development.

Validate and improve habitat impacts model – A habitat impacts model has been used to estimate effects of fishing in Alaska, but the parameter estimates were not well resolved and had a high degree of uncertainty. Model validation is a priority because the habitat impacts model has played a key role in evaluating the effects of fishing and deciding on measures to conserve and protect habitat areas from fishing gear impacts (i.e., closure areas).

Seafloor mapping – Information characterizing fish habitat and utilization in Alaska mostly is limited to coarse depth and habitat information (e.g., nautical charts) and utilization information from AFSC surveys for the adult stage of commercially important species. Missing are fine-scale depth and habitat information, as well as juvenile stage information, especially nearshore. Seafloor mapping is costly and time-consuming. The research approach is to support low-cost mapping efforts with existing sampling platforms (e.g., trawl survey vessels, NOAA vessels) to reduce costs.

Rationale for Revision

In revising the research priorities, the existing research priorities mostly were kept but also were revised in several areas. Briefly, those revisions were to increase the level of EFH information, apply information from EFH studies at regional scales, emphasize measurement of habitat recovery rate, develop a geographic-based database for offshore habitat information and emphasize Habitat Focus areas as defined by the Habitat Blueprint Initiative. These revisions are specifically described in the following subsections. The research priorities and the rationales for revision are not prioritized and their order has no significance.

Increase the Level of EFH Information

Information necessary to describe and identify EFH in FMPs is categorized into four levels based on the type of information available: 1) distribution (presence-absence) data; 2) habitat-specific densities; 3) habitat-specific growth, reproduction or survival rates; and 4) habitat-specific production rates (EFH Final Rule, 50 CFR 600.815(a)(1)(iii)(A)(1)-(4)). In addition, FMPs should explain the physical, biological, and chemical characteristics of EFH and, if known, how these characteristics influence the use of EFH by the species/life stage (EFH Final Rule 50 CFR Part 600.815(a)(1)(i)). The level of information available for each managed species in Alaska is listed in Table 1.

Currently the level of EFH information for all managed Alaska species is classified as either Level 1 or no information is available. Where information exists, FMPs use species general distribution (EFH Level 1) to describe EFH in text for each life history stage, including general habitat associations, and in a map. Level 1 - General Distribution is defined as 95% of the population from research survey and commercial catch data. The Level 1 information does not incorporate specific habitat data. Another limitation is that this approach only provides descriptions of EFH for adult fish because only small parts of nearshore areas that juvenile fish commonly inhabit are sampled by AFSC surveys.

The EFH regulations encourage Fishery Management Councils to identify EFH using the highest level of information available, yet currently, General Distribution (EFH Level 1) is used to describe EFH even when higher levels of information exist and are provided under all stock conditions. This approach was decided upon by NOAA Fisheries and the North Pacific Fishery Management Council in 1999 and has carried forward to date. In Alaska, the General Distribution (EFH Level 1) is defined as 95% of the population for each particular life history stage. This approach was deemed risk-averse, supported by scientific rationale, and allows for changing oceanographic conditions, regime shifts, and the seasonality of migrating fish stocks (NPFMC 2010). Sufficient higher level information now is available to refine EFH descriptions for some species.

The level of EFH information could be elevated to Level 2 for the adult stages of most federally managed species and the juvenile stage of a subset of these species through analysis of existing data. Research survey and commercial catch data could be analyzed together with existing habitat data to identify areas of highest relative abundance (Level 2) or vital rates within habitats (Level 3) for some species and thereby refine EFH definitions. This approach would combine existing seafloor and oceanographic data with species abundance data to predict preferred habitats for each species by life stage. An example of this approach is an analysis aimed at refining EFH descriptions for marine life stages of salmon (Echave et al. 2011). In addition, growth, reproduction, and mortality information is available for portions of the range of some species and life stages that may be sufficient to describe EFH based on Level 3 data.

Another example could be combining density data from trawl surveys (Lauth 2011) with Bering Sea habitat information (McConnaughey and Syrjala 2009; Yeung and McConnaughey 2008) to elevate the EFH level of Bering Sea flatfish.

The level of EFH information could be elevated to Level 3 through collection of new data during field studies that address the habitat utilization and productivity research priority. These types of studies constitute the majority of EFH studies conducted by the AFSC. To reach this goal, future EFH studies should incorporate collection of habitat-specific density, growth, condition, reproduction, and survival information. The research priority for habitat utilization and productivity was revised by adding "increase the level of EFH information."

Collecting higher level EFH information in habitat utilization and productivity studies often limits the size and number of study areas due to cost and logistics thus limiting applicability of results at regional scales. The need to apply these results at regional scales is addressed in the next section.

Apply Information from EFH Studies at Regional Scales

EFH studies are most useful if results are applicable at regional scales. Process-related EFH studies often are conducted in small areas over multiple years which are typically well-suited for understanding the complex biological and physical variables that determine fish density and survival. Generalizing these small-scale studies to a regional scale is challenging as these small areas may represent only a small part of a species range and thus limit regional scale inference. This challenge is not limited to small-scale studies as even large-scale studies can have limited application to a regional scale if not well-designed.

EFH studies should follow a scientifically sound pathway to scale EFH information to apply more broadly and eventually at the population level. In particular, proposals should build upon previous research and emphasize statistical principles such as replication, representative sampling, validation and prediction, and inference. These study design principles determine the limits of inference for study results. The choice of study sites should be justified in this context, regardless of the size of the study area(s). An example of a well-designed study is the central Aleutian Islands coral study used for predictive modeling of coral distributions in that region (Woodby et al. 2009). Validation and prediction explicitly test whether an expected outcome (e.g., animal presence-absence, density, vital rates) occurs at another location with similar habitat characteristics. Finally, inference applies quantitative models to predict variables (e.g., fish abundances, vital rates) over the full ranges of environmental variables shown to be significant predictors. The research priorities for habitat utilization and productivity and habitat recovery rates were revised by adding "apply information from EFH studies at regional scales."

EFH Descriptions are to be defined at the highest level of information available (Levels 1-4). In Alaska, EFH is limited to mainly adult life stages and are fairly broad. To refine EFH, analytical methodologies and models are needed to refine EFH Descriptions. However, the goal of scaling information to region in practice may conflict with the goal of collecting higher level EFH information in habitat utilization and productivity studies. These goals conflict because of the high cost of collecting more information (Level 3 and 4 information) for a large study area. The recommended balance for these priorities is to pursue both Level 2 analyses of existing data at regional scales and Level 3 and 4 collections of new data at small scales that follow a sound statistical pathway, recognizing that it may take years to reach regional scale inference.

Emphasize Measurement of Habitat Recovery Rates

A recovery rate model developed for Alaska (Fujioka 2006) is an essential tool for assessing the effects of fishing on habitat and habitat-forming species. New research to update and validate the model, including measurement of habitat recovery rates, remains a high priority because few habitat recovery studies have been completed. Habitat recovery rates were identified in the 2006 plan as a research priority and an emphasis on this priority was added following a progress review of EFH research in 2008. During 2005-2009, about 15% of AFSC EFH studies addressed habitat recovery (NPFMC 2010). More research is needed, in particular because recovery rate studies are usually long-term studies conducted over several years. Currently three long-term studies are underway (Recruitment and response to damage of Alaska gorgonian coral; Reproductive ecology of red tree coral; Recovery of deep water sponges and sea whips from bottom trawling) and a study of eelgrass disturbance and recovery has been completed (www.afsc.noaa.gov/HEPR/EFH_research_projects.htm). Recovery rate studies remain as a high priority for habitat research because of relevance to fishery management.

The long-term studies of coral and sponge recovery rates mentioned in the previous paragraph provide one approach to measure recovery rates. In this approach, the size and condition of organisms at the study site(s) are measured on the first visit and a subset of organisms are mechanically damaged. On subsequent visits, size and condition are measured, which provide an estimate of recovery rate over time which typically is measured for several years. Comparing habitat characteristics in areas currently closed to fishing to those adjacent areas open to fishing provides another approach to measure recovery rates. In this approach, size and condition of organisms are measured in both the open and closed areas and the results compared to estimate a recovery rate for the length of the closure. Evaluations have been conducted on soft bottom sediments of the Bering Sea (McConnaughey et al. 2000; McConnaughey et al. 2005) and Gulf of Alaska (Stone and Masuda 2003). In addition, evaluations have been conducted on skate nursery sites (potential HAPC) (Hoff 2008, 2010) and Gulf of Alaska high-relief sites (existing HAPC). Similar work is needed to understand habitat recovery in other geographic areas and from other sources of anthropogenic impacts (e.g., contaminants or loss of aquatic vegetation).

Geographic-based Database for Offshore Habitat Information

Currently no comprehensive geographic-based database exists for offshore habitat information[2]. The 5-year EFH review recommended beginning development of a GIS relational database for habitat, including development of a historical time series of the spatial intensity of interactions between commercial fisheries and habitat, which will be needed to evaluate impacts of changes in EFH on the growth, reproduction, and distribution of fish and shellfish (NPFMC 2010). An offshore habitat database would enable habitat assessments, a goal of the NMFS Habitat Assessment Improvement Plan (NMFS 2010).

A habitat database would support several general functions including data ingestion, storage and distribution, queries for EFH information level for FMP species by life stage, and links to EFH project publications and other information resources. A habitat database also would support several specific functions:

[2] The ShoreZone and FishAtlas geographic databases store nearshore habitat information (alaskafisheries.noaa.gov/habitat/shorezone/szintro.htm).

- A place to store and integrate information from EFH studies and habitat classifications based on seafloor mapping data and other available data.
- An inventory that would indicate data gaps, which in some cases in the past has brought forward information from other agencies that fill a gap.
- A tool for geographic-based analyses of habitat data.

A geographic-based database would form the backbone of analyses such as an updated habitat impacts model for use in characterizing EFH and refining EFH descriptions and to support EFH consultations. A geographic-based database also would facilitate the generalization of study results to regional scales; the lack of a geographic-based database inhibits our ability to interpret habitat studies which often occur in small areas. For offshore, this database along with the ShoreZone/FishAtlas database, would form the data management part of EFH research. The expectations are that this work will build on existing efforts and that data collected during EFH studies will be stored in this database. The research priority for improve the habitat impacts model was revised by adding "begin to develop geographic-based database for offshore habitat data".

Emphasize Habitat Blueprint Initiative

Within 2012, the Alaska Regional Office and AFSC will identify a priority area to focus habitat-related research and management efforts in support of the NOAA Fisheries Habitat Blueprint, advanced by Assistant Administrator for Fisheries Eric Schwaab. Alaska's marine waters support the Nation's largest and most valuable fisheries. While considered remote, Alaska also faces large-scale developments including commercial ports, oil and gas explorations, large-scale mineral extraction, commercial fishing, hydroelectric and tidal energy projects, and is home to major recreational and subsistence fishing opportunities, all of which are key parts of Alaska's economy. Marine habitats remain mostly natural and intact, yet face mounting pressure from these activities.

The Habitat Blueprint identifies implementation of a systematic and strategic approach to habitat science to inform effective decision-making in order to support the Blueprint's desired outcomes: 1) sustainable and abundant fish populations; 2) recover threatened and endangered species (as applicable); 3) protect coastal and marine habitats at risk; 4) resilient coastal communities; and 5) increased coastal and marine tourism, access, and recreation. Collaboration efforts include other NOAA line offices, such as the National Ocean Service, other federal agencies, and the State of Alaska. An increased effort will be made to reach out, develop, and expand partnerships with other coastal entities and communities.

Using the terminology of the Habitat Blueprint Initiative, our Habitat Conservation Strategy will involve two basic habitat science objectives: 1) Improve scientific understanding of marine resources and habitat conditions through expanded biological surveys and new predictive modeling to link habitat attributes to fish species or assemblages, and 2) Identify habitat areas and functions of greatest concern for supporting fish and marine mammals. These objectives are achievable through development of a science plan and studies that document seasonal habitat usage by fish and marine mammals, including nearshore habitat surveys , deeper water surveys where EFH has been designated for managed species (NPFMC 2010).

Research Priorities for the Revised Plan

Characterize habitat utilization and productivity; increase the level of information available to describe and identify EFH; apply information from EFH studies at regional scales[3] – This priority focuses on understanding the relationship between habitat type, patterns of use by species, and differences between habitats in productivity of managed species. Our approach is to support integrated research projects that combine measurements of habitat characteristics, habitat utilization, and habitat productivity in one study, and also combine laboratory experiments, controlled field manipulations, and field observations. Our approach also includes conducting studies that support refining the description and identification of EFH in FMPs.

Currently the level of EFH information for all managed Alaska species is classified as either Level 1 or no information is available. The level of EFH information could be elevated to Level 2 for the adult stages of most FMP species and the juvenile stage of a subset of these species through analysis of existing data. The level of EFH information could be elevated to Level 3 through collection of new data during field studies that address the habitat utilization and productivity research priority.

EFH studies should follow a scientifically sound pathway to scale EFH information to apply at regional scales and eventually at the population level. In particular, proposals should build upon previous research and emphasize statistical principles such as replication, representative sampling, validation and prediction, and inference. The goal of scaling information to region in practice may conflict with the goal of collecting higher level EFH information in habitat utilization and productivity studies. The recommended balance for these priorities is to pursue both Level 2 analyses of existing data at regional scales and Level 3 and 4 collections of new data at small scales that follow a sound statistical pathway, recognizing that it may take years to reach regional scale inference.

Assess sensitivity, impact, and recovery of disturbed benthic habitat – Habitat-forming biota such as corals and sponges often are sensitive to human activity and may take many years to recover from disturbance. Some managed fish and shellfish species use this habitat for protection and camouflage. Estimates of habitat impacts, sensitivity, and recovery rates are necessary to understand the effects of human activities. Recovery rates are defined as the rate of change of impacted habitat back to un-impacted habitat following disturbance. Sensitivity is defined as the susceptibility of habitat to degradation. Habitat may be affected by fishing and studies of sensitivity to and recovery from these effects are a priority. In addition, coastal areas often are affected by non-fishing impacts. Recovery and monitoring studies of impacted coastal areas, such as LTF sites and marine ports, are needed to determine if these sites have returned to their pre-utilization state following facility closure or development. Recovery rate studies remain as a high priority for habitat research.

Validate and improve habitat impacts model; begin to develop geographic-based database for offshore habitat data – A habitat impacts model has been used to estimate effects of fishing in Alaska, but the parameter estimates were not well resolved and had a high degree of uncertainty. Model validation remains a priority because the habitat impacts model played a key role in evaluating the

[3] The priority to conduct EFH studies that can be applied at regional scales also applies to the third research priority.

effects of fishing and deciding on measures to conserve and protect habitat areas from fishing gear impacts (i.e., closure areas).

Currently no comprehensive geographic-based database exists for offshore habitat information. A habitat database would support several general functions including data ingestion, storage and distribution, queries for EFH information level for FMP species by life stage, and links to EFH project publications and other information resources. A geographic-based database for offshore data, along with the ShoreZone/FishAtlas database, would form the data management part of EFH research.

Map the seafloor – Information characterizing fish habitat and utilization in Alaska is limited to coarse depth and habitat information (e.g., nautical charts) and utilization information from AFSC surveys for the adult stage of commercially important species. Missing are fine-scale depth and habitat information, as well as juvenile stage information, especially nearshore. Seafloor mapping is costly and time-consuming. The research approach is support of low-cost mapping efforts with existing sampling platforms (e.g., trawl survey vessels, NOAA vessels) to reduce costs.

Assess coastal and marine habitats facing development - Characterization of coastal habitats susceptible to disturbance from non-fishing activities is a priority. These non-fishing activities include oil and gas development, logging, mining, urbanization, and contaminants. The research approach includes coastal habitat mapping (ShoreZone) as well as field surveys of a representative subset of the mapped habitats to measure fish and shellfish utilization. Priority coastal habitats for study are those utilized by managed fish and shellfish species and facing development pressure.

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Table 1.--Federally managed species and species groups (within Fishery Management Plans) of the Exclusive Economic Zone off Alaska.

	EFH Species	Scientific Name	Eggs	Larvae	Early Juveniles	Late Juveniles	Adults
Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands	Walleye pollock	*Theragra chalcogramma*	1	1	x	1	1
	Pacific cod	*Gadus macrocephalus*	x	1	x	1	1
	Sablefish	*Anoplopoma fimbria*	x	1	x	1	1
	Yellowfin sole	*Limanda aspera*	x	x	x	1	1
	Greenland turbot	*Reinhardtius hippoglossoides*	1	1	x	1	1
	Arrowtooth flounder	*Atheresthes stomias*	x	x	x	1	1
	Northern rock sole	*Lepidopsetta polyxystra*	x	1	x	1	1
	Alaska plaice	*Pleuronectes quadrituberculatus*	1	x	x	1	1
	Rex sole	*Errex zachirus*	x	x	x	1	1
	Dover sole	*Microstomus pacificus*	x	x	x	1	1
	Flathead sole	*Hippoglossoides elassodon*	1	1	x	1	1
	Pacific ocean perch	*Sebastes alutus*	x	1	x	1	1
	Northern rockfish	*Sebastes polyspinus*	x	1	x	1	1
	Shortraker rockfish	*Sebastes borealis*	x	x	x	x	1
	Blackspotted\Rougheye rockfish	*Sebastes aleutianus*	x	x	x	x	1
	Dusky rockfish	*Sebastes ciliatus*	x	1	x	x	1
	Thornyhead rockfish	*Sebastolobus*	x	1	x	1	1
	Atka mackerel	*Pleurogrammus monopterygius*	x	1	x	x	1
	Squid	*Cephlapoda, Teuthida*	x	x	x	1	1
	Sculpins	*Cottidae*	x	x	x	1	1
	Skates	*Rajidae*	1	x	x	x	1
	Sharks	*Lamnidae; Squalidae*	x	x	x	x	x
	Octopus	*Octopoda; Vampyromorpha*	x	x	x	x	x
	Forage fish complex	*Osmeridae*	x	x	x	x	x
Fishery Management Plan for Groundfish of the Gulf of Alaska	**EFH Species**	**Scientific Name**	**Eggs**	**Larvae**	**Early Juveniles**	**Late Juveniles**	**Adults**
	Walleye pollock	*Theragra chalcogramma*	1	1	x	1	1
	Pacific cod	*Gadus macrocephalus*	1	1	x	1	1
	Sablefish	*Anoplopoma fimbria*	1	1	x	1	1
	Yellowfin sole	*Limanda aspera*	1	1	x	1	1
	Northern rock sole	*Lepidopsetta polyxystra*	x	1	x	1	1
	Southern rock sole	*Lepidopsetta bilineatus*	x	1	x	1	1
	Alaska plaice	*Pleuronectes quadrituberculatus*	1	1	x	1	1
	Rex sole	*Errex zachirus*	1	1	x	1	1
	Dover sole	*Microstomus pacificus*	1	1	x	1	1
	Flathead sole	*Hippoglossoides elassodon*	1	1	x	1	1
	Arrowtooth flounder	*Atheresthes stomias*	x	1	x	1	1
	Pacific ocean perch	*Sebastes alutus*	x	1	x	1	1
	Northern rockfish	*Sebastes polyspinus*	x	x	x	x	1
	Shortraker rockfish	*Sebastes borealis*	x	x	x	x	1
	Blackspotted\Rougheye rockfish	*Sebastes aleutianus*	x	x	x	x	1
	Dusky rockfish	*Sebastes ciliatus*	x	1	x	x	1
	Yelloweye rockfish	*Sebastes ruberrimus*	x	1	1	1	1
	Thornyhead rockfish	*Sebastolobus*	x	1	1	1	1
	Atka mackerel	*Pleurogrammus monopterygius*	x	1	x	x	1
	Squid	*Cephlapoda, Teuthida*	x	x	x	1	1
	Sculpins	*Cottidae*	x	x	x	1	1
	Skates	*Rajidae*	x	x	x	x	1
	Sharks	*Lamnidae; Squalidae*	x	x	x	x	x
	Octopus	*Octopoda; Vampyromorpha*	x	x	x	x	x
	Forage fish complex	*Osmeridae*	x	x	x	x	x
Fishery Management Plan for the Scallop Fishery off Alaska	**EFH Species**	**Scientific Name**	**Eggs**	**Larvae**	**Juveniles**	**Late Juveniles**	**Adults**
	Weathervane scallop	*Patinopectin caurinus*	**x**	**x**	**x**	**1**	**1**
Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs	**EFH Species**	**Scientific Name**	**Eggs**	**Larvae**	**Early Juveniles**	**Late Juveniles**	**Adults**
	Red king crab	*Paralithodes camtschaticus*	x	x	x	1	1
	Blue king crab	*Paralithodes platypus*	x	x	x	x	x
	Golden king crab	*Lithodes aequispina*	x	x	x	x	x
	Snow crab	*Chionoecetes opilio*	inferred	x	x	1	1
	Tanner crab	*Chionoecetes bairdi*	x	x	x	1	1
Fishery Management Plan for Fish Resources of the Arctic	**EFH Species**	**Scientific Name**	**Eggs**	**Larvae**	**Juveniles**	**Late Juveniles**	**Adults**
	Arctic cod	*Boreogadus saida*	x	x	x	1	1
	Saffron cod	*Eleginus gracilis*	x	x	x	1	1
	Snow crab	*Chionoecetes opilio*	inferred	x	x	1	1
Fishery Management Plan for the Salmon Fisheries in the EEZ off the Coast of Alaska	**EFH Species**	**Scientific Name**	**Freshwater Eggs and Adults**	**Freshwater Larve and Juveniles**	**Estuarine Juveniles**	**Marine Juveniles**	**Marine Immature and Maturing Adults**
	Chinook salmon	*Oncorhynchus tshawytscha*	1	1	1	1	1
	Chum salmon	*Oncorhynchus keta*	1	1	1	1	1
	Coho salmon	*Oncorhynchus kisutch*	1	1	1	1	1
	Sockeye salmon	*Oncorhynchus nerka*	1	1	1	1	1
	Pink salmon	*Oncorhynchus gorbuscha*	1	1	1	1	1

Appendix: Request for EFH Proposals

Each year the Alaska Fisheries Science Center (AFSC) will request proposals for scientific research on Essential Fish Habitat (EFH) in Alaska. The anticipated annual amount is up to $500,000. Individual project amounts of up to $150,000 will be considered. To be funded, proposals must involve habitat for species managed under a North Pacific Fishery Management Council Fishery Management Plan (FMP) (Table 1 of main document) and meet research priorities of the Alaska EFH research plan. Priority coastal habitats for study are those facing development pressure (Appendix Table 1). Projects that address habitat information for Habitat Focus areas as defined by the Habitat Blueprint Initiative will receive priority consideration.

Proposals should describe complete projects. Both single and multi-year projects, including multi-year recovery rate proposals that skip one or more years (e.g., visit study site in years 1, 3 and 5) will be considered. Proposals must be submitted for each year of multi-year projects, but priority will be given for the duration of the project. A status report is required at the end of the fiscal year for every project that receives EFH funding. Proposals are limited to five pages exclusive of reference and budget pages. Send electronic copies of full proposals to Mike.Sigler@noaa.gov by 31 October of each year.

Review Schedule

Approximate Date	**Activity**
31 August	Request for proposals released
31 October	Proposal deadline
Early November	Proposal review
Mid-December	Prioritized list of proposals released
When amount of EFH funds is certain	Final funding decision

Proposal Rating

Proposals will be rated based on relevance to the EFH research priorities, scientific merit, probability of success, and quality of presentation; equal weight will be given to each factor. Scoring: Excellent (5), Very Good (4), Good (3), Fair (2), Poor (1). Proposals will be discussed jointly by the Habitat and Ecological Processes Research (HEPR) Team and Alaska Regional Office, Habitat Conservation Division staff. Separate recommendations will be prepared. The HEPR Team recommendation will consist of a ranked list of proposals. The HEPR Program Leader and Assistant Regional Administrator for Habitat Conservation will subsequently prepare a consolidated recommendation based on the scientific rating and overall priority for fisheries management for the final decision by the AFSC Science and Research Director and Alaska Regional Administrator. Recovery rate studies will continue to receive priority status in the ranking for relevance to fishery management, although no specific point score will be added.

Well-written proposals are easy to score. A good proposal incorporates several elements. We request that all proposals:

- List objectives or hypotheses.
- Map study area(s).
- Explain acronyms.
- Provide thorough study purpose and background.
- Explain why the proposal is habitat-related rather than, for example, stock assessment-related.
- Describe previous funding history of the study (e.g., funding year and amount).
- Describe how the revision responds to last year's Team comments if the proposal is a resubmission.
- For habitat utilization and productivity studies, state the level of EFH information that will be collected and describe how the study will increase the level of EFH information for the species (for a description of the levels see the 'Increase the level of EFH information" section of the Alaska EFH research plan).
- State and justify sample sizes planned for the study. Describe methods for statistical analysis of the results. State which results of the anticipated analyses will answer which stated hypothesis/objective.
- EFH studies should follow a scientifically sound pathway to scale EFH information to region. In particular, proposals should build upon previous research and emphasize statistical principles of replication, representative sampling, validation and prediction, and inference, where the method for scaling-up is explicitly stated. Nesting, replication and representative sampling are principles of study design that determine the limits of inference for study results. Justify the choice of study sites in this context, regardless of the size of the study area(s).
- Compare multiple habitats to determine whether the hypothesized essential fish habitat in fact has, for example, higher fish densities. Studies that contrast data from multiple treatments or conditions (e.g., different habitat types, temporal patterns of use, recovery rates) are preferred over single-treatment approaches.
- Write one proposal for each distinct study, rather than multiple studies within one proposal.
- Include the status report as an appendix if the proposal describes a continuing study.

Write complete proposals that provide sufficient information for the review panel to judge your proposal.

Title

Principal Investigators:

Research Priority:

Justification:

Project Description:

Required Resources: Provide details of, for example, travel, rent (charters), equipment, and supplies (fuel)

Expected Products: List the milestones to be achieved this year, the products to be delivered upon completion, and when the milestones and products will be completed. Product descriptions should include the method of dissemination (e.g., refereed publication).

References:

Status Report: Provide a status report if you are requesting funding for a project which received EFH funding in the past and include the status report with your proposal.

Budget

Title

Object Class	Description	Amount ($)
1100	Direct Labor: Funds will not be approved for labor or benefits.	
1150	Overtime and hazard pay	
1200	Benefits: Funds will not be approved for labor or benefits.	
2100	Travel	
2200	Transportation	
2300	Rents (vessel charter)	
2400	Printing	
2500	Contracts: List name or type of contractor	
2600	Supplies and Materials: Itemize large items, group small stuff	
3100	Equipment: Itemize large items, group small stuff	
4100	Grants	
	Total	

Essential Fish Habitat project status report

Reporting date:

Project number:

Title:

PIs:

Funding year:

Funding amount:

Status: ☐ Complete ☐ Incomplete, on schedule ☐ Incomplete, behind schedule

Planned completion date if incomplete:

Reporting: Have the project results been reported? If yes, state where the results were reported and attach an electronic copy of the report.

Results: What is the most important result of the study?

Appendix Table 1. -- Alaska Regional Office, Habitat Conservation Division recommended coastal essential fish habitat research areas.

Area/Specific sites/Nearest community	Recently sampled (Month-Year)	Who? (if known)	On contiguous road system	Small boat support	Rationale
Cook Inlet/Fire Island & Pt MacKenzie /Anchorage	Aug-09; Jul-10; Jun/Jul/Sep-12	ABL; Johnson	Yes	HCD/Anchorage	Sparse information; chiefly completed by private research efforts. Alaska's largest population center. Tidal energy site alternative. Possible site for LNG facility.
Cook Inlet/Eagle River Bay & Trading Bay/Anchorage	Jul-10	ABL; Johnson	Yes	HCD/Anchorage	Area is a known feeding area for endangered beluga whales.
Cook Inlet/Nikiskha Bay/Nikiski/Kenai			Yes	HCD/Anchorage	Tidal energy site alternative LNG Facility and expansion.
Cook Inlet/Chuitna R. estuary/Tyonek	2007 and 2008	NGO's	No	HCD/Anchorage	Area proposed for large-scale coal mining
Cook Inlet/Iniskin & Iliamna Bays/Tyonek			No	HCD/Anchorage Possible	Area is an existing access point to service a large-scale mining district (several different mines). Semi-private road (15mi) serves Lake Iliamna from Pile Bay in Cook inlet and listed in ADOT Industrial Roads Plan for AK.
Resurrection Bay/Head of Bay/Seward	Aug-09	ABL; Johnson	Yes	HCD/Anchorage	Little to no nearshore information exists.
Resurrection Bay/Harbor Area/Seward	Mar-09	COE CW EA	Yes	HCD/Anchorage	Dive focused on art reef placement. No fish sampling conducted.
Resurrection Bay/4th of July Creek/Seward	Aug-09	ABL; Johnson	Yes	HCD/Anchorage	Possible site for LNG facility and aquaculture site.
Resurrection Bay/Lowell Point/Seward			Yes	HCD/Anchorage	Partnering with Sea Life Center exists
Kachemak Bay/KBERR & outlet of Battle Creek/Homer			No	HCD/Anchorage	Partnering with NOS KBay NERR & CIRCAC Site of proposed hydro project (Snyder Falls)
Northern PWS/Harbor Area/Valdez	Jul-10	ABL; Johnson	Yes	HCD/Anchorage	Information is dated (>20 years).
Northern PWS/Mineral Creek/Valdez	Jul-10	ABL; Johnson	Yes	HCD/Anchorage	LNG facility for Alaska Natural Gas Pipeline.

Area/Specific sites/Nearest community	Recently sampled (Month-Year)	Who? (if known)	On contiguous road system	Small boat support	Rationale
Northern PWS/Gold Creek/Valdez	Jul-10	ABL; Johnson	Yes	HCD/Anchorage	LNG facility for Alaska natural gas pipeline.
Northern PWS/Shoup Bay/Valdez	Jul-10	ABL; Johnson	Yes	HCD/Anchorage	LNG facility for Alaska natural gas pipeline.
Northern PWS/outlet of Allison Creek/Valdez			Yes	HCD/Anchorage	Site of proposed hydro project (Allison Lake) which would flow into estuarine and anadromous habitat of lower Allison Creek
Eastern PWS/Shepard Point/Cordova		COE	AK Ferry	HCD/Anchorage Possible	Information is dated (>20years). Community still suffers from Exxon Valdez incident.
Eastern PWS/Harbor Area/Cordova	Jan-08	COE CW EA	AK Ferry	HCD/Anchorage	HCD Dive investigation only - no shore
Eastern PWS/Fleming Spit/Cordova			AK Ferry	HCD/Anchorage Possible	Information is dated (>20years). Community still suffers from Exxon Valdez incident.
Eastern PWS/outlet of Snyder Creek/Cordova			No	HCD/Anchorage Possible	Site of proposed hydro project (Snyder Falls) which would flow into estuarine and anadromous habitat of lower Snyder Creek
Cold Bay/King Cove Art Reef/King Cove	May-97	COE CW EA	AK Ferry	No	Artificial reef needs to be re-assessed. ROV needed; site@50m.
Upper Lynn Canal/Skagway River & Bay/Skagway			Yes	ABL or JNU FWS?	No baseline data; Harbor expansion, ore dock, cruise ships
Upper Lynn Canal/Haines Harbor Area	Aug-10	ABL; Johnson	Yes	ABL or JNU FWS?	Data limited to recent nearshore work.
Upper Lynn Canal/Portage Cove/Haines			Yes	ABL or JNU FWS?	Lush, unmapped eelgrass; Few patches known in upper Lynn Canal
Upper Lynn Canal/Lutak Inlet/Haines			Yes	ABL or JNU FWS?	No baseline data; LTF and contaminated uplands
Upper Lynn Canal/Katzehin Bay/Haines			No	ABL or JNU FWS?	No baseline data; Juneau Access Project proposed ferry terminal
Upper Lynn Canal/Endecott River estuary/Haines			No	ABL or JNU FWS?	No baseline data; Juneau Access Project proposed route

Area/Specific sites/Nearest community	Recently sampled (Month-Year)	Who? (if known)	On contiguous road system	Small boat support	Rationale
Lower Lynn Canal/William Henry Bay/Juneau			No	ABL or JNU FWS?	No baseline data; Juneau Access Project proposed route
Lower Lynn Canal/St. James Bay/Juneau			No	ABL or JNU FWS?	No baseline data; Juneau Access Project proposed route
Lower Lynn Canal/Yankee Cove/Juneau			Yes	ABL	Need long-term monitoring of artificial reefs; Have extensive baseline (dives), control, and colonization information
Frederick Sound/Thomas Bay/Petersburg			No		Site of three potential hydropower developments with no information on nearshore marine resources
Balboa Bay/Albatross Anchorage/Sand Point			No		Proposed GOA-side marine terminal to service future Bristol Bay Region /North Aleutian Basin Oil & Gas exploration and development.
Nushagak & Kvichak Bays//Dillingham & Naknek	Jul-05	AFSC Ormseth; UAF Norcross	No		Area faces an increase in oil, gas, and mineral exploration and development. Pebble Mine downstream water quality conditions too.
St. Paul Island/Salt Lagoon/St. Paul	Jun-05	COE CW EA; LGL			Salt lagoon was sampled prior to recent development. Information post-project will assess changes.
St. Paul Island/East Landing (follow-up)/St. Paul	Apr-94	ABL; Freese			Seafood outfall area; noted repeated work needed. Dive assessment.
St. Paul Island/Artificial Wave Dampening Reefs/St. Paul		COE CW EA			Reefs are heavily kelp forested after placement. Fish community unsampled / unobserved. Dive assessment needed.
St. George Island/Zapadni Bay/St. Paul		COE CW EA			Seafood processing discharge. Debris accumulation; continued habitat loss; fish assemblages unknown.
St. George Island/Village Cove/St. Paul		COE CW			Seafood processing discharge. Debris accumulation; continued habitat loss; fish assemblages unknown.
Norton Sound/Near Sun River and Along coast/Nome		COE CW EA	No		Some offshore info exists, however dated (1980s BIMA project). Large offshore gold mine dredge activity in marine substrates deeper than 30 ft and nearshore areas. Region also faces an increase in oil, gas, and mineral exploration and development.

Area/Specific sites/Nearest community	Recently sampled (Month-Year)	Who? (if known)	On contiguous road system	Small boat support	Rationale
Kotzebue Sound//Kivalina	late 90s	COE CW EA; Tech Cominco	No	HCD/Anchorage Possible	Region may serves as new gateway to the Arctic. Port and large fuel storage exists for Red Dog Mine. Area will see an increase in oil & gas exploration and development.
Chukchi & Beaufort Seas/ marine areas/ nearshore & barrier lagoons	80s: Aug 2004-09 & Sep 2009	OCSEAP; Barrow Area-ABLJohnson	No	HCD/Anchorage Possible	Region faces increased oil exploration & development activities. Infrastructure non-existent.
Prudhoe Bay//West Dock Causeway	early 90s	Thorsteinson	Yes (with Oil Field permission)	HCD/Anchorage Possible	Region faces an increase in oil & gas exploration and development. Deep-water access & fill in W.D. breach.
Mikkelsen Bay//Pt Thompson			No	HCD/Anchorage Possible	Natural gas pipeline facility.
Foggy Island Bay/Liberty/Bullen Point		COE	No	HCD/Anchorage Possible	Oil drill site (pipelines and offshore island)
Eastern Camden Bay//Kaktovik	early 90s	Thorsteinson	No	HCD/Anchorage Possible	Region faces an increase in oil & gas exploration and development.