COVER SHEET
Essential Fish Habitat Designation and Minimization of Adverse Impacts

Proposed Action:	Amend the Pacific Coast Groundfish FMP, pursuant to section 303(a)(7) of the Magnuson-Stevens Act, to (1) describe and identify essential fish habitat (EFH) for the fishery, (2) designate Habitat Areas of Particular Concern, (3) minimize to the extent practicable the adverse effects of fishing on EFH, and (4) identify other actions to encourage the conservation and enhancement of EFH. The project area for this action extends from the seaward boundary of the Pacific Coast Exclusive Economic Zone shoreward to the inland extent of estuaries.
Type of Statement:	Final Environmental Impact Statement
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Abstract: This environmental impact statement (EIS) evaluates the effects of a comprehensive strategy to conserve and enhance essential fish habitat (EFH) for fish managed under the *Pacific Coast Groundfish Fishery Management Plan* (FMP). The comprehensive strategy to conserve EFH, including its identification and the implementation of measures to minimize, to the extent practicable, adverse impacts to EFH from fishing, must be consistent with provisions in the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations. Implementation of the strategy may require that the groundfish FMP be amended to describe any change in the EFH identification and description, among other things. New regulations may also be required to implement minimization measures. Preparation of this EIS stems from a 2000 court order in *American Oceans Campaign et. al. v. Daley et. al.,* Civil Action No. 99-982 (GK)(D.D.C. September 14, 2000), which requires NMFS and the Pacific Fishery Management Council, to prepare an EIS to evaluate the effects of fishing on EFH and identify measures to minimize those impacts, to the extent practicable. This final EIS (FEIS) includes an analysis of a reasonable range of alternatives, identification of the final preferred alternative, responses to comments, and appropriate revisions to the draft document. After publication of the FEIS a 30-day "cooling off" period ensues before the responsible official may sign a record of decision and implement the proposed action. NMFS must approve any FMP amendment and implementing regulations by May 6, 2006.

Executive Summary

INTRODUCTION

This environmental impact statement (EIS) evaluates the effects of alternatives for a comprehensive strategy to conserve and enhance essential fish habitat (EFH) for fish managed under the *Pacific Coast Groundfish Fishery Management Plan* (groundfish FMP). The comprehensive strategy to conserve and enhance EFH, including its identification and the implementation of measures to minimize, to the extent practicable, adverse impacts to EFH from fishing, is required by the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and implementing regulations. The MSA is the principal legal basis for fishery management within the Exclusive Economic Zone (EEZ), which extends from the outer boundary of the territorial sea to a distance of 200 nautical miles from shore. Implementation of the strategy may require that the groundfish FMP be amended to describe any change in the EFH identification and description, among other things. New regulations may also be required to implement minimization measures.

Preparation of this EIS stems from a 2000 court order in *American Oceans Campaign et. al. v. Daley et. al.,* Civil Action No. 99-982 (GK)(D.D.C. September 14, 2000) (*AOC v. Daley)*, which required NMFS and the Pacific Fishery Management Council (PFMC, or the Council), to prepare an EIS to evaluate the effects of fishing on EFH and identify measures to minimize, to the extent practicable, those impacts. NMFS published a draft EIS for public comment on February 11, 2005, after working closely with the Council. The public comment period on the draft ended on May 11, 2005. The Pacific Fishery Management Council identified a final preferred alternative at their June 13-17, 2005, meeting in Foster City, California. This final EIS (FEIS) includes an analysis of a reasonable range of alternatives, the identification of the final preferred alternative, responses to comments on the DEIS and appropriate revisions to the draft document. After the FEIS is published, a 30-day "cooling off" period ensues before the responsible official may sign a record of decision (ROD) and implement the proposed action. NMFS must approve any FMP amendment and implementing regulations by May 6, 2006.

The Proposed Action

The proposed action is to ensure compliance with section 303(a)(7) of the Magnuson-Stevens Act by amending the Pacific Coast Groundfish FMP to (1) describe and identify essential fish habitat (EFH) for the fishery, (2) designate Habitat Areas of Particular Concern, (3) minimize to the extent practicable the adverse effects of fishing on EFH, and (4) identify other actions to encourage the conservation and enhancement of EFH.

The purpose of proposed action is: first, to provide the Council and NMFS with the information they need to better account for the function of Pacific Coast groundfish EFH when making fishery management decisions; second, to ensure that this EFH is capable of sustaining groundfish stocks at levels that support sustainable fisheries; and third, that EFH is a healthy component of fully functioning ecosystems.

The proposed action is needed because the Council and NMFS have not had the tools to consider habitat and ecosystem function, and their relation to other biological and socioeconomic conditions affecting the groundfish fishery, in management decision-making. The West Coast groundfish fishery suffers from numerous challenges. Although identifying and conserving EFH cannot address all these problems, the proposed action will allow managers to provide solutions in a more comprehensive way, including consideration of EFH. Among the problems facing the

fishery are overcapacity, or too many boats chasing too few fish and declining stock sizes, the latter of which led the Secretary of Commerce to declare nine groundfish stocks overfished;[1] and changing ocean conditions, which may have contributed to the failure of some groundfish stocks to replace themselves (recruitment failure). An overriding problem has been the challenge of managing fisheries with limited scientific data. This increases the risk that decisions exacerbate the kinds of fishery- and stock-related problems just identified. NMFS and the Council will be able to use information on EFH to consider the importance of habitat when making decisions on fishery management.

In the Magnuson-Stevens Act, Congress found that "one of the greatest long-term threats to the viability of commercial and recreational fisheries is the continuing loss of marine, estuarine, and other aquatic habitats" and "habitat considerations should receive increased attention for the conservation and management of fishery resources of the United States." Furthermore, one of the long-term goals for the groundfish fishery, adopted by the Council in its strategic plan, is "to protect, maintain, and/or recover those habitats necessary for healthy fish populations and the productivity of those habitats" (PFMC 2000).

Background

NMFS and the Council used a scientific risk assessment process to analyze information for the four parts of the proposed action. Acting on the advice of the National Research Council's (NRC) Committee on the Ecosystem Effects of Fishing (NRC 2002), NMFS and the Council have engaged in a public process to develop a comprehensive risk assessment (Appendix A) to determine if EFH-related problems exist, and if so, which of these problems could be appropriately considered through the Council and NEPA processes. The risk assessment focuses on the identification of EFH, threats to its health and function, and the delineation of gaps in the available data, which if filled would improve the risk assessment and support its ongoing use. Once the risk assessment was completed, the following problem statement was developed, in order to highlight the issues that this EIS is intended to resolve:

> *Based on the results of the risk assessment, public input received during scoping, and the legal mandate from the Magnuson-Stevens Act, the Council, NMFS, and partner organizations have developed the following objectives for this EIS:*
>
> - *consider alternatives for the identification and description of EFH;*
> - *consider alternatives for the designation of Habitat Areas of Particular Concern (HAPC);*
> - *consider alternatives for minimization of adverse effects of fishing on EFH;*
> - *address gaps in available data; and,*
> - *identify other actions to encourage the conservation of EFH.*

The Pacific Coast groundfish fishery encompasses the management institutions and processes used to manage diverse fishery sectors, which are defined by regulations, gear type, and target

[1] One of these stocks, Pacific whiting, has subsequently been declared rebuilt.

species. Although not bearing directly on EFH identification and description and impact minimization, the discussion here provides the context for the implementation of any such measures. Depletion of several groundfish species, and the implementation of measures needed to recover those stocks, has resulted in a reduction in allowable groundfish landings: from 277,848 mt in 1998 to 155,646 mt in 2002, or a 44% contraction (PFMC 2004). Measures to minimize the adverse effects of fishing on EFH broadly involve reducing fishing effort or fleet capacity, regulating the use and configuration of fishing gear, or closing areas to fishing (NRC 2002). Although not specifically directed at EFH impacts, the Council and NMFS have already implemented measures in all three of these categories.

ALTERNATIVES INCLUDED IN THE EIS

Four categories of alternatives are included in the EIS: (A) Identifying and describing EFH, (B) designating habitat areas of particular concern (HAPCs), (C) mitigating the adverse effects of fishing, and (D) research and monitoring. The alternatives in each category are described below. The Council selected its final preferred alternative from those described in the DEIS, in some cases modifying them in the process. The final preferred alternative is described separately.

Alternatives to Identify and Describe EFH

Alternative A1: No Action

The no action alternative would maintain the current EFH identification and description, incorporated into the groundfish FMP by Amendment 11 in 1998, which is all waters from the mean higher high water line, and the upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon, and California to the seaward boundary to the U.S. EEZ.

The FMP groups the various EFH descriptions into seven units called composite EFHs. This approach focuses on ecological relationships among species and between the species and their habitat, reflecting an ecosystem approach in defining EFH.

Alternative A.2: Depths less than 3,500 m (Component of the Final Preferred Alternative)

In this alternative, EFH would be identified as 100% of the area where Habitat Suitability Probability (HSP^2) is greater than zero for all species and any additional area in depths less than or equal to 3,500 m (1,914 fm). By including areas out to the 3,500 m depth curve, this alternative includes all habitats where groundfish have been observed with the addition of 100 m depth as a precautionary adjustment in case of unobserved fish.

Alternative A.3: 100% HSP Area

Designate 100% of the area where HSP is greater than zero for all species.

Alternative A.4: HSP^1 Based on Management Status

Designate the upper 90% of the HSP area of overfished species HSP, upper 80% of the HSP area for precautionary zone species, and upper 60% of the HSP area for all other groundfish, and all seamounts. HSP refers to the probability that the habitat is suitable for a managed species.

Alternative A.5: 70% HSP[1] Area

Designate the upper 70% of the area where HSP is greater than zero. HSP refers to the probability that the habitat is suitable for a managed species.

Alternative A.6: 30% HSP[2] Area

Designate the upper 30% of the area where HSP is greater than zero for all species. HSP refers to the probability that the habitat is suitable for a managed species.

DEIS Alternatives to Designate HAPC

Alternative B.1: No Action

No HAPCs are currently designated for groundfish. Choosing this alternative would maintain no HAPC designations.

Alternative B.2: Estuaries (Component of the Final Preferred Alternative)

Estuaries are protected nearshore areas such as bays, sounds, inlets, and river mouths, influenced by ocean and freshwater.

Alternative B.3: Canopy Kelp (Component of the Final Preferred Alternative)

Areas where kelp has been documented and mapped would be designated as HAPC. GIS data for the floating kelp species, *Macrocystis* spp. and *Nereocystis* sp., are available from state agencies in Washington, Oregon, and California.

Alternative B.4: Seagrass (Component of the Final Preferred Alternative)

Seagrass species found on the West Coast of the U.S. include eelgrass (*Zostera* spp., *Ruppia* sp.) and surfgrass (*Phyllospadix* spp.). These grasses are vascular plants, not seaweeds, forming dense beds of leafy shoots year-round in the lower intertidal and subtidal areas. Eelgrass is found on soft-bottom substrates in intertidal and shallow subtidal areas of estuaries. Surfgrass is found on hard-bottom substrates along higher energy coasts.

Alternative B.5: Core Habitat

This alternative designates core areas, defined as the upper 10% of area with an HSP greater than 0%, for the juvenile and adult life history stages of overfished and precautionary zone groundfish species. HSP refers to the probability that the habitat is suitable for a managed species.

Alternative B.6: Rocky Reefs (Component of the Final Preferred Alternative)

This alternative designates all rocky reef areas. Rocky habitat may be composed of bedrock, boulders, or smaller rocks such as cobble and gravel.

[2] HSP refers to the probability that the habitat is suitable for a managed species.

Alternative B.7: Areas of Interest (Component of the Final Preferred Alternative)

This alternative would designate areas that are of special interest due to their unique geological and ecological characteristics, such as Olympic Coast National Marine Sanctuary (NMS),Thompson Seamount, and the Cowcod Conservation Area(s).

Alternative B.8: Oil Production Platforms (Component of the Final Preferred Alternative)

This alternative designates areas around oil production platforms in Southern California waters. There are 27 such platforms (CARE 2004) of which 23 are in federal waters and four are in California state waters. 22 platforms in federal water and one platform in state water are considered for HAPC designation.

Alternative B.9: Process for New HAPC Designations (Component of the Final Preferred Alternative)

This alternative establishes a streamlined process for designating new HAPCs, based on proposals submitted to the Council. The process would allow organizations and individuals to petition the Council at any time to consider a new designation and ensures that the Council will consider their proposal, provided they submit specified information.

Alternatives to Minimize Adverse Impacts to EFH

Alternative C.1: No Action

There is a broad range of regulatory measures in effect on the West Coast, including areas that are closed to fishing or non-fishing activities, fishing gear restrictions, and measures to reduce fishing effort which may have a beneficial effect on EFH. These measures would be maintained.

Alternative C.2: Depth-based Gear-specific Restrictions (Component of the Final Preferred Alternative)

This alternative contains three options, which vary by the areas closed to large footrope trawl gear and fixed gear. The footrope runs along the bottom of the net opening and its size is regulated to dictate the maximum size of rollers that can be affixed to the footrope. Without larger footrope gear, bottom trawl nets snag more easily on rough, irregular terrain; thus restrictions on footrope size discourage fishing in rocky areas.

Alternative C.3: Close Sensitive Habitat

Area closures are defined using gear and habitat specific sensitivity and recovery index values. Habitat areas above index value thresholds for any gear type would be closed to all fishing. This alternative has four options, specifying the closed areas by various index values and a threshold value on higher historic trawl effort are excluded from closure.

Alternative C.4: Prohibit the Geographic Expansion of Fishing (Component of the Final Preferred Alternative)

Under this alternative, areas that have not been fished recently (2000-2002) would be closed to fishing to protect areas that are potentially pristine. This alternative has two options applying to either bottom trawling or all bottom-tending gear types.

Alternative C.5: Prohibit a Krill Fishery

This alternative would designate krill as a component of EFH as part of this EIS and prohibit fisheries that target it.

Alternative C.6: Close Hotspots

This alternative prohibits trawling in hotspot areas defined as habitat that has high probability of being EFH for a large number of groundfish. Areas that are associated with a high HSP value for 50 or more species/lifestage combinations would be closed to bottom trawling.

Alternative C.7: Close Areas of Interest (Component of the Final Preferred Alternative)

This alternative closes the areas of interest HAPCs designated under Alternative B.7 to fishing by specified gear types. (The 21 areas of interest listed under Alternative B.7 are underwater features, such as seamounts and submarine areas, or are currently under some form of protection.) This alternative has two options, which would close areas of interest to either bottom trawling or all bottom-contact fishing.

Alternative C.8: Zoning Fishing Activities

Under this alternative NMFS limits the use of bottom-tending fishing gear to specified zones where the agency determines that such activities can be conducted without altering or destroying a significant amount of habitat. Areas deeper than the 2,000 m (1,094 fm) are closed to bottom contact gear and additional areas in shallower depths are considered for closure during a five-year transition period, creating areas zoned for specific gear types. This alternative has two options, which differ based on the types of gear considered for zoning.

Alternative C.9: Gear Restrictions (Component of the Final Preferred Alternative)

This alternative includes specific gear modifications and prohibitions. Eight different gear modifications and prohibitions are separate options under this alternative.

Alternative C.10: Central California No-trawl Zones (Component of the Final Preferred Alternative)

This alternative is based on a project being undertaken by two environmental advocacy organizations, The Nature Conservancy (TNC) and Environmental Defense Fund (EDF). It involves a public-private partnership under which private funds are used to purchase groundfish limited entry trawl licenses and vessels in concert with the designation, through the Council and NMFS, of no-trawl zones off the central California coast.

Alternative C.11: Relax Gear Endorsement Requirements

Vessels holding a groundfish limited entry permit account for a large portion of groundfish landings. Currently, limited entry permits include a gear endorsement specifying the type of gear the permit holder may use. Under this alternative, gear endorsements are relaxed but the sablefish endorsement is not. This would allow permit holders to switch gear types, providing fishermen greater flexibility in changing strategies based on prevailing conditions in the fishery.

Alternative C.12: Close Ecologically Important Areas to Bottom Trawl (Component of the Final Preferred Alternative)

This alternative would close a network of areas to bottom trawling; set a maximum footrope size of eight inches on bottom trawl gear within open area; require Vessel Monitoring Systems on all bottom trawl vessels with positions recorded every five minutes; increase onboard observer coverage on bottom trawl vessels to a level determined to be necessary by NOAA to estimate annual bycatch of habitat-forming invertebrates; establish a process for setting a limit on the bycatch of habitat-forming invertebrates; require ongoing research including comprehensive benthic mapping.

Alternative C.13: Close Ecologically Important Areas to Bottom-contacting Gear (Component of the Final Preferred Alternative)

Under this alternative, the areas identified in Alternative C.12 are closed to all bottom-contacting gear types, defined as both fixed gear (longlines, pots, and traps) and bottom trawl.

Alternative C.14: Close Ecologically Important Areas to Fishing

Under this alternative, the areas identified in Alternative C.12 are closed to all fishing.

DEIS Research and Monitoring Alternatives

Alternative D.1: No Action

NMFS conducts extensive fishery-related research relevant to groundfish and has a variety of methods to monitor these fisheries. Section 7.1 in the 2005-2006 groundfish harvest specifications FEIS (PFMC 2004) describes groundfish monitoring programs carried out by NMFS, the states, and tribes, and is hereby incorporated by reference. Current monitoring programs especially relevant to the alternatives described here include the limited entry trawl logbook program, the West Coast Groundfish Observer Program, and VMS covering limited entry trawl and fixed gear vessels. These programs are primarily intended to monitor discards and landings of groundfish and to enforce current harvest limits and area restrictions. There is no component specifically intended to monitor the effects of fishing on EFH.

Alternative D.2: Expanded Logbook Program (Component of the Final Preferred Alternative)

Under this alternative vessels in all commercial sectors, including recreational charter (for hire) vessels, will participate in an expanded logbook program. This alternative has two options for how an expanded program would be implemented.

Alternative D.3: Expanded Vessel Monitoring System (Component of the Final Preferred Alternative)

This alternative will identify expansion of the Vessel Monitoring Program to cover all West Coast groundfish commercial and recreational charter vessels.

Alternative D.4: Research Reserve System (Component of the Final Preferred Alternative)

This alternative will establish a system of designated research areas within areas closed to fishing to foster habitat-related research and comparison of fished areas with unfished areas.

THE FINAL PREFERRED ALTERNATIVE

The elements of the final preferred alternative are described according to the same four categories used to organize alternatives in the DEIS. As noted above, the preferred alternative contains elements drawn from alternatives in each of these categories.

Identification and Description of EFH

The preferred alternative identifies EFH as all waters and substrate in depths less than or equal to 3,500 m, to the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow, and areas associated with seamounts in depths greater than 3,500 m. The 100% HSP area, all of which occurs in depths less than 3,500 m, constitutes a part of EFH for all species and life stages within the Groundfish FMP. This EFH identification is precautionary because it is based on the currently known maximum depth distribution of all life stages of fishery management unit (FMU) species. This precautionary approach is taken because uncertainty still exists about the relative value of different habitats to individual groundfish species/life stages, and thus the actual extent of groundfish EFH. While recognizing these limitations, the 100% HSP area, all of which occurs in depths less than 3,500 m, is identified as a part of groundfish EFH, recognizing that the best scientific information demonstrates this area is particularly suitable groundfish habitat for all species and life stages within the Groundfish FMP, even if they are not specifically included in the HSP model. Additionally, there is a lack of information on the value of seamounts, in depths greater than 3,500 m, to groundfish. Designating these seamounts is also precautionary because they may prove to be essential to certain life stages of fish in the groundfish fishery.

This component of the final preferred alternative is based on Alternative A.2.

Habitat Areas of Particular Concern (HAPCs) Designations

The preferred alternative identifies the following HAPCs:

- Estuaries (Alternative B.2)
- Canopy kelp (Alternative B.3)
- Seagrass (Alternative B.4)
- Rocky reefs (Alternative B.6)
- Areas of interest (modification of Alternative B.7). Not all of the areas of interest described in Alternative B.7 were incorporated into the preferred alternative. In addition, the final preferred alternative includes some areas not identified in Alternative B.7.
- Oil production platforms (modification of Alternative B.8). This component of the final preferred alternative includes 13 of the 27 oil production platforms identified in Alternative B.8.

The preferred alternative also includes a component substantially based on Alternative B.9 (process for new HAPC designations). It differs from Alternative B.9 in that the process would also allow consideration of the modification or elimination of existing HAPCs.

Minimize Adverse Fishing Impacts to EFH

The component of the final preferred alternative intended to mitigate the adverse effects of fishing on groundfish EFH comprises management measures in three categories: (1) gear modifications, (2) closed areas, and (3) promotion of reductions in fishing effort.

Gear Modifications and Prohibitions

The preferred alternative includes the following gear modifications and prohibitions:

- Prohibit bottom trawl roller gear with a footrope diameter greater than 19 inches on bottom trawl gear throughout the EEZ (modification of Alternative C.9.1).
- Prohibit bottom trawl roller gear with a footrope diameter greater than eight inches eastward of a line approximating the 100 fathom depth contour (modification of Alternative C.2.1).
- Prohibit dredge gear (Alternative C.9.5).
- Prohibit beam trawl gear (Alternative C.9.6).

Restrictions in state waters will be implemented by state law, as appropriate. Although dependent on state regulation, the restrictions on dredge and beam trawl gear are not intended to apply in internal waters (Puget Sound, San Francisco Bay, etc.).

Closed Areas

The final preferred alternative contains two types of closed areas: a "trawl footprint" closure and ecologically important closed areas.

Footprint Closure: This component of the final preferred alternative is a modification of the trawl footprint closure described under Alternative C.4. Under that alternative, areas that were not trawled from 2000 to 2003 would be permanently closed to bottom trawl. The final preferred alternative closes depths greater than 700 fathoms to bottom trawl.

Ecologically Important Closed Areas: This component of the final preferred alternative is a modification and combination of Alternative C.10, C.12, and C.13. It also includes a new procedural element that was not described in the DEIS applicable to areas closed to bottom trawl, which would allow reconsideration of these areas upon the receipt of new scientific information. Ecologically important closed areas are sited shoreward of 700 fathoms in the area not already closed to bottom trawl with the footprint closure and include areas closed to bottom trawl and all bottom-contacting gear types.

Effort Reduction

The final preferred alternative incorporates the element of Alternative C.10 involving public-private partnerships under which private funds are used to purchase groundfish limited entry trawl licensees by adding language to the FMP by amendment. The proposed language notes the

Council will support such efforts, as feasible, through their consideration of actions upon which the execution of contracts may be contingent.

Research and Monitoring

Elements of Alternatives D.2-D.4, addressing EFH-related research and monitoring were incorporated into the final preferred alternative, although these elements will not be implemented as part of the proposed action evaluated in this EIS. Rather, they are identified as programmatic elements, either expressing priorities and objectives (expansion of the logbook program, research reserves) or identifying another process as the vehicle for implementation (expansion of VMS).

Expanded Logbook Program: The preferred alternative would amend the groundfish FMP to indicate Council support for an expanded logbook program, to the degree practicable (modification of Alternative D.2).

Expanded Vessel Monitoring System: Expansion of the current Vessel Monitoring System (VMS) program currently is being considered by the Council as part of a separate action. Under that action the Council will consider expanding the VMS requirement to a range of trawl and nontrawl fisheries including, in order to support EFH conservation objectives, all bottom trawl vessels (modification of Alternative D.3).

Research on the Impacts and Results of Bottom Trawl Closed Areas: The preferred alternative makes focusing research on the impacts and results of closing areas to bottom trawl a Council priority (modification of Alternative D.4).

APPLICATION OF THE ALTERNATIVES TO TRIBES

NMFS does not intend for any of the alternatives described below to apply to tribal fisheries in usual and accustomed (u&a) grounds described in 50 C.F.R. 660.324(c). NMFS will continue to work with the tribes to ensure that within the u&a grounds, adequate measures are in place to protect EFH and HAPCs. In the future, in the event that it is determined that additional measures need to be developed, NMFS would follow the procedures outlines in 50 C.F.R. 660.324(d).

ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

Environmental Consequences of the Alternatives to Identify and Describe EFH

Designation of EFH, in accordance with section 303(a)(7) of the Magnuson-Stevens Act, does not in and of itself have any direct environmental or socioeconomic affects. However, EFH designation is likely to result in indirect environmental and socioeconomic affects.

Actions taken by a Council to minimize adverse effects of fishing on EFH may include fishing equipment restrictions, time or area closures, harvest limits, or other measures. Any such measures would be designed to reduce ongoing effects to EFH and/or promote recovery of disturbed habitats. These measures may result in socioeconomic effects for the affected sectors of the fishing industry, but will be designed to promote sustainable fisheries and long-term socioeconomic benefits.

Second, Federal and state agency actions that may adversely affect EFH trigger consultation and/or recommendations under sections 305(b)(2)-(4) of the Act. Under section 305(b)(2) of the Magnuson-Stevens Act, each federal agency must consult with NMFS regarding any action

authorized, funded, or undertaken by the agency that may adversely affect EFH. The EFH regulations require that federal agencies prepare EFH Assessments as part of the consultation process (50 CFR 600.920(e)). Under section 305(b)(4)(A) of the Act, NMFS must provide EFH Conservation Recommendations to federal and state agencies regarding any action that would adversely affect EFH. Under section 305(b)(3) of the Act, Councils may comment on and make recommendations to federal and state agencies regarding any action that may affect the habitat, including EFH, of a fishery resource under Council authority.

EFH recommendations from NMFS or a Council to federal or state agencies are non-binding. Nevertheless, as a result of EFH coordination, consultations, and recommendations, Federal or state agencies may decide to restrict various activities to avoid or minimize adverse effects to EFH. Such restrictions could result in project modifications that lead to higher costs for the applicants for federal or state permits, licenses, or funding. It would be speculative to predict the specific socioeconomic effects of future restrictions on development that may be imposed by agencies that authorize, fund, or undertake actions that may adversely affect EFH. Moreover, such agencies typically evaluate socioeconomic effects and other public interest factors under NEPA and other applicable laws before taking final action on any given activity. NMFS conducts approximately 6,000 EFH consultations and related EFH reviews nationwide every year, and is unaware of substantial project delays or significant increases in costs resulting from EFH consultations. Habitat conservation resulting from EFH consultations is expected to support healthier fish stocks and more productive fisheries over the long-term, with associated environmental and socioeconomic benefits. EFH consultations may also lead to indirect benefits for other species that use the same habitats as federally managed species of fish and shellfish.

Costs associated with consultations will likely vary depending on the number of species associated with an EFH designation, and the amount of habitat designated as EFH. If an entity chooses not to participate in consultations, then the EFH designation will ultimately have no effect on that entity. If consultations result in conservation recommendations, then there are likely to be increased costs in the short-term and possibly in the long-term depending on the amount of offsetting benefits realized from enhanced habitat productivity resulting from EFH designation. The designation process may negatively affect agencies if consultations use increased agency time and resources in addition to those currently required for the ESA process.

Environmental Consequences of the final preferred Alternative component for EFH Identification and Description

The final preferred alternative for describing EFH represents a significant refinement over the status quo in that the entire EEZ would no longer be described as EFH. The final preferred alternative would describe 59.2% of the EEZ as EFH which equates to 48,719,109 ha (142,042 square miles) in addition to state waters such as bays and estuaries.

The generic consequences of the final preferred alternative are described in Section 4.2.1. The specific data elements used to formulate the alternative are expected to be used during consultation activities and improve the quality of conservation recommendations. For instance, conservation recommendations for a project proposed in a specific area can now be based on analyses of HSP, habitat types, and other information sources available from the preferred alternative. In addition to supporting the delineation of suitable habitat for the individual species and life stages, these assessment-related techniques can be used as a basis for an ecosystem approach to management. For example, the HSP profiles for individual species/life stages can be combined by GIS analyses into ecosystem-level fish assemblages to investigate and predict environmental consequences of proposed projects. The specific conservation recommendations

for non-fishing activities which may result from the implementation of the final preferred alternative are fully described in appendix 14 to the Risk Assessment. The consequences of the final preferred alternative to describe EFH are considered Environmentally Positive (E+).

The final preferred alternative for describing EFH does not encompass the entire EEZ and as such may limit the geographic extent of specific components of the final preferred alternative measures to minimize adverse impacts to EFH that would otherwise apply throughout the EEZ. Those specific components approved by the Council that could be interpreted to include areas seaward of EFH are: (1) footprint closure in which bottom trawling would be prohibited seaward of 700 fathoms; (2) ban of dredge gear; (3) ban of beam trawl gear; and, (4) ban of trawl roller gear greater than 19". An analysis of the area that would be excluded from the implementation of these components is shown in Figure 4-29. NMFS has decided to apply the measures throughout the EEZ, including areas that would not be described as EFH, for purposes of the final preferred alternative. Management measures to minimize adverse impacts on EFH could apply in the EEZ in areas not described as EFH, if there is a link between the fishing activity and adverse effects on EFH. NMFS will highlight this issue in the Notice of Availability for the FMP Amendment and Proposed Rule to implement the measures and request public comment and additional information that would support or not support including non-EFH areas in the management measures.

Environmental Consequences of the Alternatives to Designate HAPCs

Designation of HAPCs, like designation of EFH generally, does not have any direct environmental or socioeconomic effect, but may result in indirect effects greater than those associated with EFH because resource managers and regulators are likely to place a high priority on protecting areas that have been designated as HAPCs. HAPCs are used by NMFS and the Councils to focus conservation and management efforts on particularly valuable or vulnerable subsets of EFH. Although HAPC designation does not convey any higher regulatory standards for minimizing adverse effects of fishing or conducting EFH consultations, NMFS and the Councils may apply more scrutiny to fishing and non-fishing activities that affect HAPCs as compared to EFH. NMFS and the Council may be more risk averse when developing management measures to minimize adverse effects of fishing on HAPCs, and when recommending measures to federal and state agencies to minimize adverse effects of non-fishing activities on HAPCs. The potential environmental and socioeconomic affects from management measures to protect HAPCs would be comparable to those described for EFH. As with EFH, conservation of HAPCs is expected in the long-term to support healthier fish stocks and more productive fisheries over the long-term, which, in turn, will provide added environmental and socioeconomic benefits. If an entity participates in consultations with NMFS, then it is possible that increased costs associated with time and effort expended in consultation may occur, though most nearshore consultations involving groundfish may be merged with ESA listed salmon consultations and any cost incurred may be borne through the ESA process.

Environmental Consequences of the final preferred Alternative Component to Designate HAPCs

The final preferred alternative to designate HAPC incorporates components of Alternatives B.2, B.3, B.4, B.6, B.7, B.8 and B.9. The generic consequences of the final preferred alternative to designate HAPC are described in Sections 4.3.1 and 4.3.3. The final preferred alternative to designate HAPC represents a significant change from the status quo under which there are no HAPC designations. Under the final preferred alternative, approximately 4.51% of the EEZ would be designated as HAPC which equates to 3,711,978 ha (10,822 square miles). Due to the

generic consequences of designating HAPC, the final preferred alternative is considered Environmentally Positive (E+).

Practicability and Environmental Consequences of the Alternatives to Minimize Adverse Effects to EFH

All alternatives–except the status quo alternative–are expected to have positive effects to the ecological environment and, therefore, positive effects to non-consumptive users of marine resources. However, some alternatives within this EIS have aspects which may make implementation impracticable to industry, while other alternatives may not be feasible to implement on the part of management agencies.

Impact minimization alternatives C.2.1 and C.2.2, if the fixed gear components were implemented, are likely to also close the West Coast Dungeness crab fishery which is likely to translate into a loss of over $100 million to the nation annually. Depending on how impact minimization alternative C.11 would be implemented, this alternative may make it unfeasible for management agencies to predict catch levels and to stay within–or achieve–management targets. The trawl and fixed gear "bycatch models" may be dramatically compromised if analysts are unable to predict the use of gear types by fishing vessels. This alternative may be feasible for management agencies to implement if a periodic gear declaration and grace period is put in place.

Other alternatives can be considered practicable from the standpoint of population and ecosystem effects and from the standpoint of non-consumptive users of marine resources since these other alternatives have positive environmental effects due to habitat protections. It is unknown whether these other alternatives are practicable from the standpoint of industry and agencies since the amount of revenues at risk does not necessarily equate to lost revenues, and potential management boundaries and requirements have not been clearly defined at this stage. However this EIS analyzes a range of alternatives for use in contrasting potential social and economic effects with habitat protections. Additionally, while some of the alternatives may be practicable individually, they become impracticable when added to the final preferred alternative.

Practicability and Environmental Consequences of the Minimize Adverse Effects to EFH Component of the final preferred Alternative

The final preferred alternative represents a significant change from the status quo under which there are no measures in place to minimize adverse fishing effects on EFH. Under the final preferred alternative, a combination of gear restrictions, effort reduction, and closed areas would be implemented to protect a broad range of habitat types, species, and provide protection over both the Oregonian and San Diego zoographic provinces and is considered Environmentally Positive (E+). These management measures are practicable because they provide protection of EFH while having minimal cost to the fishing industry and other parts of the public sector.

Environmental Consequences of the Research and Monitoring Alternatives

The research and monitoring alternatives are expected to provide environmental benefits when compared to the status quo by improving the information available to scientists and managers on the function of habitat and how it is affected by fishing. These alternatives are likely to require additional resources on the part of management agencies, and may put fishing revenues at risk or require industry to bear additional costs.

Over the long term, positive benefits may result from increased information on the relationship between habitat and living marine resources, and spatial fishing effort. Additional spatial information would assist agencies in making better fisheries management decisions, and this may translate into additional fishing opportunities, less risk of exceeding management targets, or a greater understanding of the relationship between fishing and habitat. A research reserve system may increase the amount of knowledge relating habitat to fish and other living marine resources, and this may result in improvements in stock status (e.g. fewer precautionary zones and overfished stocks), higher fishery yields, and improved resources for marine-based education.

Environmental Consequences of the Research and Monitoring Component of the final preferred Alternative

The final preferred alternative for research and monitoring incorporates components of D-2, D.3, and D.4. The research and monitoring elements of the final preferred alternative are expected to increase the amount of information available for EFH related decisions and regulations. The final preferred alternative is considered Environmentally Positive (E+).

SUMMARY OF THE ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

The table below summarizes the environmental consequences of the alternatives to minimize adverse effects to EFH. To interpret the table, the following abbreviations are used:

0 = No Change
E+ = Environmentally Positive
E- = Environmentally Negative
U = Unknown

Summary of the Environmental Consequences of the Alternatives.

Environmental Component	Impacts Minimization Alternatives														
	Final Pref. Alt.	C.1	C.2	C.3	C.4	C.5	C.6	C.7	C.8	C.9	C.10	C.11	C.12	C.13	C.14
Marine Habitat, Ecosystem, Marine Resources	E+	0	E+	E+	E+	E+	E+	E+	E+	E+	E+	U	E+	E+	E+
Protected Species	U	0	U	U	U	U	U	U	U	U	U	U	U	U	U
Trawl Fisheries	E+/U/O	0	E-	E-	0	0	E-	E-	E-	E-	U	E-/E+	E-	E-	E-
Fixed Gear Fisheries	E+/U/O	0/U	E-	E-/E+	0	0	E-	E-/0	0/E-	E-	U	E-/E+	0	E-	E-
Recreational Fisheries	U/E+	0	0	0	0	0	E-	0/E-	0/E-	E-	U	0	0	0	E-
Other Fisheries	E+/U/O	0	0	E-	0	0	E-	0/E-	0/E-	E-	U	0	0	0	E-
Tribal Fisheries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumers	U	0	E-	0	0	0	0	0	0	0	U	0	0	0	0
Safety	U	0	U	E+	E+	0	E+	E+	U/E+	0	U	U	0	0	0
Buyers and Processors	U	0	E-	0	0	0	U	0	U	0	0	0/E+	U	U	U
Communities	U	0	E-	0	0	0	U	0	U	0	U	0/E+	U	U	U
Management and Enforcement	E-	0	U	E-	E-	E-	E-	E-	E-	E-	E-	E-	E-	E-	E-
Non-Fishing Activities	U	0	U	U	U	U	U	U	U	U	U	U	U	U	U
Non-Fishing Values	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U

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Chapter 1 Purpose and Need

1.1 Introduction

This environmental impact statement (EIS) evaluates the effects of a comprehensive strategy to conserve and enhance essential fish habitat (EFH) for fish managed under the *Pacific Coast Groundfish Fishery Management Plan* (groundfish FMP). The National Marine Fisheries Service (NMFS), in collaboration with the Pacific Fishery Management Council (hereafter, the Council), prepared this document. The comprehensive strategy to conserve EFH, including its identification and the implementation of measures to minimize adverse impacts to EFH from fishing, to the extent practicable, must be consistent with provisions in the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et. seq.) and implementing regulations. The MSA is the principal legal basis for fishery management within the Exclusive Economic Zone (EEZ), which extends from the outer boundary of the territorial sea to a distance of 200 nautical miles from shore. Implementation of the strategy will require that the groundfish FMP be amended to describe any change in the EFH identification and description, among other things. New regulations will also be required to implement impact minimization measures.

Preparation of this EIS stems from a 2000 court order in *American Oceans Campaign et. al. v. Daley et. al.,* Civil Action No. 99-982 (GK)(D.D.C. September 14, 2000) (*AOC v. Daley),* which required several Councils, including the Pacific Council, to prepare EISs to evaluate the effects of fishing on EFH and identify measures to minimize those impacts, to the extent practicable. The Council's Pacific groundfish FMP was affected by this order.

According to Section 102(2)(C) of the National Environmental Policy Act (NEPA), any "major federal action significantly affecting the quality of the human environment" must be evaluated in an EIS. The Council on Environmental Quality (CEQ) regulations (40 CFR 1502.9) require agencies to prepare and circulate a draft EIS (DEIS), which "must fulfill and satisfy to the fullest extent possible the requirements established for final statements in Section 102(2)(C) of [NEPA]." CEQ regulations, 40 CFR 1506.10(c), and NOAA Administrative Order 216-6. 5.01.b.1(i) stipulate a minimum 45-day public comment period on the DEIS. However, a joint stipulation pursuant to the aforementioned court order specified the date on which the DEIS must be published (February 11, 2005) and the end of the public comment period (May 11, 2005), thereby establishing a 90-day comment period. The FEIS includes: comments, response to comments, the Council action on the preferred alternative, and changes to the document based on public comment received. The Council identified a final preferred alternative after the close of the public comment period at their June 13-17, 2005, meeting in Foster City, California. NMFS then prepared this final EIS (FEIS) which supplements material in the DEIS with description and analysis of the final preferred alternative, responses to comments on the DEIS, and additional revisions to the DEIS text as appropriate. The stipulation required the FEIS to be published by December 9, 2005. After this date a 30-day "cooling off" period ensues before the responsible official may sign a record of decision (ROD) and implement the proposed action. The stipulation requires the ROD to be signed by February 28, 2006. NMFS must approve any FMP amendment or implementing regulations by May 6, 2006.

1.2 How This Document is Organized

Environmental impact analyses have four essential components: a description of the purpose and need for the proposed action, a set of alternatives that represent different ways of accomplishing the proposed

action, a description of the human environment affected by the proposed action, and an evaluation of the predicted direct, indirect, and cumulative impacts of the alternatives.[3] (The human environment is interpreted comprehensively to include the natural environment and the relationship of people with that environment, 40 CFR 1508.14.) These elements allow the decision maker to look at different approaches to accomplishing a stated goal and understand the likely consequences of each choice or alternative. A public comment period allows the decision maker to also consider comments provided by the public. This EIS has ten chapters, plus appendices, covering the following topics:

- The rest of this chapter discusses why NMFS and the Council are designating EFH and considering measures to minimize the adverse impact of fishing on EFH. This description of ***purpose and need*** defines the need for, and goals and objectives of, the proposed action. The ***purpose and need*** also defines the scope of the subsequent analysis. In addition, Chapter 1 provides some background on the proposed action, the groundfish fishery management regime, and the process of developing this EIS.

- Chapter 2 provides different ***alternatives*** the Council considered to address the purpose and need, including the final preferred alternative identified by the Council. These alternatives are organized in four categories: designation of EFH, designation of habitat areas of particular concern (HAPCs), measures to minimize the adverse effects of fishing on EFH, and research and monitoring program alternatives to improve understanding of habitat function and the effects of fishing on EFH.

- Chapter 3 describes the ***affected environment***, or ***baseline*** environmental and social conditions as they exist before implementation of the proposed action.

- Chapter 4 assesses the predicted ***environmental consequences*** (including socioeconomic impacts) of the alternatives outlined in Chapter 2. This analysis compares and contrasts the alternatives and evaluates how the human environment may potentially be changed by the proposed action in comparison to the baseline conditions described in Chapter 3.

- Chapter 5 explains how these management measures are consistent with the groundfish FMP and 10 National Standards set forth in the MSA (§301(a)) and governing plans, plan amendments, and accompanying regulations.

- Chapter 6 describes how this EIS addresses relevant laws and executive orders, other than the MSA. As appropriate, it also includes additional elements and determinations required by these mandates.

- Chapters 7 and 8 provide background information on the staff who prepared this document and its distribution to other agencies and interested parties.

- Chapter 9 defines acronyms and contains the glossary.

- Chapter 10 contains the literature cited.

[3] Federal regulations at 40 CFR 1502 detail the required contents of an EIS. Although there are several additional components, this list is of the core elements.

- Chapter 11 describes the Public Comment received on the Draft EIS, the process of responding to comments, NMFS response to comments and reproductions of the comment letters received.

- Several appendices provide additional background information on methodologies used in developing this EIS and the alternatives considered in the analyses.

1.3 Purpose and Need for the Proposed Action

1.3.1 The Proposed Action

The proposed action is to ensure compliance with section 303(a)(7) of the Magnuson-Stevens Act by amending the Pacific Coast Groundfish FMP to (1) describe and identify essential fish habitat (EFH) for the fishery, (2) designate Habitat Areas of Particular Concern, (3) minimize to the extent practicable the adverse effects of fishing on EFH, (4) provide research needs, and (5) identify other actions to encourage the conservation and enhancement of EFH. The project area for this action is the Pacific Coast EEZ shoreward to the inland extent of estuaries (Figure 1-1). NMFS and the Council used a scientific risk assessment process to analyze information for the four parts of the proposed action.

1.3.2 Purpose of the Proposed Action

The purpose of proposed action is: first, to provide the Council and NMFS with the information they need to better account for the function of Pacific Coast groundfish EFH when making fishery management decisions; second, to ensure that EFH is capable of sustaining groundfish stocks at levels that support sustainable fisheries; and third, that EFH is capable of sustaining enough groundfish to function as a healthy component of the ecosystem.

1.3.3 Need

The proposed action is needed because the Council and NMFS have not had the tools to consider habitat and ecosystem function, and their relation to other biological and socioeconomic conditions affecting the groundfish fishery, in management decisionmaking. The West Coast groundfish fishery suffers from numerous challenges; although identifying and conserving EFH cannot address all these problems, the proposed action will allow managers to provide solutions in a more comprehensive way, including consideration of EFH. Among the problems facing the fishery are declining stock sizes which led the Secretary of Commerce to declare nine groundfish stocks overfished;[4] and changing ocean conditions, which may have contributed to the failure of some groundfish stocks to replace themselves (recruitment failure). An overriding problem has been the challenge of managing fisheries with limited scientific data. This increases the risk that decisions exacerbate the kinds of fishery- and stock-related problems just identified.

In the Magnuson-Stevens Act, Congress found that "one of the greatest long-term threats to the viability of commercial and recreational fisheries is the continuing loss of marine, estuarine, and other aquatic habitats" and "habitat considerations should receive increased attention for the conservation and management of fishery resources of the United States." Furthermore, one of long-term goals for the groundfish fishery, adopted by the Council in its strategic plan, is "to protect, maintain, and/or recover those habitats necessary for healthy fish populations and the productivity of those habitats" (Ad-Hoc Pacific Groundfish Fishery Strategic Plan Development Committee 2000).

[4] One of these stocks, Pacific whiting, has subsequently been declared rebuilt.

Each of the key problems mentioned earlier is related to the need to sustain fully functional EFH and underscores the importance of understanding EFH and EFH conservation as part of a holistic approach to fishery management.

1.4 Objectives Satisfied By This EIS

Acting on the advice of the National Research Council's Committee on the Ecosystem Effects of Fishing (National Research Council 2002), NMFS and the Council have engaged in a public process to develop a Comprehensive Risk Assessment (Appendix A) to determine if EFH-related problems exist, and if so, which of these problems could be appropriately considered through the Council and NEPA processes. The risk assessment focuses on the identification of EFH, threats to its health and function, and the delineation of gaps in the available data, which if filled would improve the risk assessment and support its ongoing use. Once the risk assessment was completed, the following problem statement was developed, in order to highlight the issues that this EIS is intended to resolve:

> *Based on the results of the risk assessment, public input received during scoping, and the legal mandate from the Magnuson-Stevens Act, the Council, NMFS, and partner organizations have developed the following objectives for this EIS:*
>
> - *consider alternatives for the designation of EFH;*
> - *consider alternatives for the designation of HAPCs;*
> - *consider alternatives for minimization of adverse effects of fishing on EFH;*
> - *address gaps in available data; and,*
> - *identify other actions to encourage the conservation of EFH.*

1.5 The Mandate to Identify and Conserve Essential Fish Habitat

The MSA, enacted in 1976, establishes the framework for managing fisheries in the EEZ. Broadly speaking, its provisions promote sustainable use of fishery resources. This requires maintaining healthy fish stocks, and in the case of overfished stocks, ending overfishing and rebuilding them, in order to increase long-term economic and social benefits to the nation from living marine resources. The Act also establishes a unique institutional framework through a system of eight regional fishery management Councils. The Councils, composed of representatives from state and federal agencies, tribes, and appointees representing resource users, develop policies, plans, and management measures for the fisheries occurring in each of the eight regions. FMPs developed by the Council are the primary vehicle for establishing a management framework. NMFS (as designated by the Secretary of Commerce) has approval authority for the FMPs and amendments, as well as implementation that include regulations.

The MSA has been amended several times, including significant amendments in 1996 by the Sustainable Fisheries Act (SFA). The SFA added habitat conservation provisions in the MSA by introducing a requirement that FMPs "describe and identify essential fish habitat…, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat" (16 U.S.C. 1853(a)(7)). This provision also directed NMFS to develop guidelines for describing and identifying EFH. These guidelines are published in the Code of Federal Regulations at 50 CFR Part 600, Subpart J. Subpart J also addresses consideration of fishery management measures to minimize to the extent practicable adverse effects on EFH from fishing.

The MSA also states "Each Federal agency shall consult with the Secretary [of Commerce] with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by

such agency that may adversely affect any essential fish habitat identified under this Act" (16 U.S.C. 1855(b)(2)).NMFS (on behalf of the Secretary of Commerce) consults on federal actions affecting EFH, and provides recommendations to conserve and protect EFH. During this time the Councils may comment and make recommendations to the federal action agency and NMFS. Regulations at 50 CFR Part 600, Subpart K detail this consultation process. The majority of consultations address the potential effects of various nonfishing activities that may be permitted or undertaken by other federal agencies. In the case of federal fishing regulations, NMFS is required to make recommendations to the Council and work through the Council process to develop measures that may be deemed necessary to minimize adverse impacts of EFH to the extent practicable.

Regulations at 50 CFR 600.815(a)(8) define habitat areas of particular concern (HAPCs) as a subset of EFH that should be identified in an FMP. HAPCs must meet at least one of the four criteria identified in the regulations:

1) The importance of the ecological function provided by the habitat.
2) The extent to which the habitat is sensitive to human-induced environmental degradation.
3) Whether, and to what extent, development activities are, or will be, stressing the habitat type.
4) The rarity of the habitat type.

HAPCs help to focus the consultation process, by identifying habitat areas that may be especially important or vulnerable. This helps in the allocation of scarce human and budgetary resources. When the Council identified the range of alternatives analyzed in this EIS, including several designating HAPCs, they noted that the effects of fishing on HAPCs should be considered when evaluating future management actions.

The Endangered Species Act (ESA) is also a consideration in the EFH consultation process. (Chapter 6 describes this cross-cutting mandate.) NMFS shares ESA authority with the U.S. Fish and Wildlife Service (USFWS), which has responsibility over terrestrial animals, birds, and freshwater fishes. Federal agencies must consult with NMFS (or the USFWS) pursuant to Section 7 of the ESA if an action it authorizes, funds, or carries out may affect an ESA-listed species. NMFS and USFWS may issue conservation recommendations, terms and conditions, or a list of reasonable and prudent alternatives to reduce adverse effects. Because the geographic extent of a listed species can overlap with that of MSA-managed species, EFH regulations allow for EFH consultations to be incorporated into ESA consultations with NMFS.

1.6 The Current Management Framework For Pacific Coast Groundfish

The Pacific Coast groundfish fishery encompasses the management institutions and processes used to manage diverse fishery sectors, which are defined by regulations, gear type, and target species. Although not bearing directly on EFH identification and description and impact minimization, the discussion here provides the context for the implementation of any such measures. Depletion of several groundfish species, and the implementation of measures needed to recover those stocks, have resulted in a reduction in allowable groundfish landings: from 277,848 mt in 1998 to 155,646 mt in 2002, or a 44% reduction (PFMC 2004). Measures to minimize the adverse effects of fishing on EFH broadly involve reducing fishing effort or fleet capacity, regulating the use and configuration of fishing gear, or closing areas to fishing (National Research Council 2002). Although not specifically directed at EFH impacts, the Council and NMFS have already implemented measures in all three of these categories.

1.6.1 The Institutional Framework

The Pacific Council manages fisheries off the coasts of Washington, Oregon, and California. As with all the Councils, its membership is specified in the MSA. Voting members include representatives from state resource management agencies in California, Idaho (because anadromous salmon spawn in state rivers), Oregon, and Washington; NMFS; and Indian tribes with federally recognized fishing rights. In addition to these governmental representatives, the Secretary appoints eight additional voting members, chosen from nominations put forward by the four states' governors. Nonvoting members on the Council represent the USFWS, the Coast Guard, the State Department, the Pacific States Marine Fisheries Commission, and the State of Alaska.

The Council system fosters cooperation between member states, Indian tribes, and the federal government in fishery management. Management measures implemented through a federal FMP apply to vessels operating in the EEZ (50 CFR 660.301). Groundfish catch limits also apply to federal FMP-managed fish caught in state waters (50 CFR 660.302(a)). If, for instance, a vessel fishes in both state and federal waters, any fish caught count toward the limits in the federal groundfish regulations, whether the fish were caught in state or federal waters. A state can also regulate vessels registered under the laws of that state in federal waters as long as the state's laws and regulations are consistent with a federal FMP and applicable federal law. Otherwise, states retain jurisdiction in waters within three nautical miles from shore. For example, federal regulations implement closed areas in federal waters and state regulations implement closed areas in state waters.

Treaties between the United States and numerous Pacific Northwest Indian tribes reserve to these tribes the right of taking fish at usual and accustomed grounds and stations (u & a grounds) in common with all citizens of the United States. See U.S. v. Washington, 384 F. Supp. 312, 349-350 (W.D. Wash. 1974). NMFS recognizes four tribes as having u & a grounds in the marine areas managed by the groundfish FMP: the Makah, Hoh, and Quileute Tribes, and the Quinault Indian Nation. The Makah Tribe is a party to the Treaty of Neah Bay, Jan. 31, 1855, 12 Stat. 939. See 384 F. Supp. at 349, 363. The Hoh and Quileute Tribes and the Quinault Indian Nation are successors in interest to tribes that signed the Treaty with the Quinault, et al. (Treaty of Olympia), July 1, 1855, 12 Stat. 971. See 384 F. Supp. at 349, 359 (Hoh), 371 (Quileute), 374 (Quinault). The tribes' u&a grounds do not vary by species of fish. U.S. v. Washington, 157 F. 3d 630, 645 (9th Cir. 1998).

Courts recognize two separate aspects to the tribal treaty right. First, the "geographical" aspect provides that the treaty tribes have the right to fish throughout the entirety of their usual and accustomed fishing grounds. See U.S. v. Oregon, 718 F.2d 299 (9th Cir. 1983); Muckleshoot Indian Tribe v. Hall, 698 F.Supp. 1504 (W.D. Wash. 1988); Northwest Sea Farms, Inc. v. U.S. Army Corps of Engineers, 931 F. Supp 1515 (W.D. Wash. 1996). Second, the "fair share" aspect provides that the treaty tribes have the "right to a fair share of the catch passing" through their usual and accustomed fishing grounds. U.S. v. Oregon at 303. The fair share of the fish is interpreted as up to 50 percent of the harvestable surplus of fish that pass through the tribes' u&a grounds. The courts apply the conservation necessity principle to federal actions relating to treaty rights. See Makah v. Brown, No. C85-160R/ United States v. Washington, Civil No. 9213 - Phase I, Subproceeding No. 92-1, Order on Five Motions Relating to Treaty Halibut Fishing, at 6-7, (W.D. Wash. Dec. 29, 1993); Midwater Trawlers Co-op. v. Department of Commerce, 282 F.3d 710, 718-719 (9th Cir. 2002). Under the conservation necessity principle, any regulation must be "a reasonable and necessary conservation measure" and its application to the tribes is "necessary in the interest of conservation." See Antoine v. Washington, 420 U.S. 194, 207 (1975). The concept of conservation has particular meaning when applied in the context of Indian treaty rights. See United States v. Washington, 384 F.Supp. at 342, aff'd, 520 F.2d at 685-686; United States v. Oregon, 718 F.2d at 305.

The treaty right was originally adjudicated with respect to salmon and steelhead. However, it is now recognized as applying to all species of fish and shellfish within the tribes' u&a grounds. U.S. v. Washington, 873 F.Supp. 1422, 1430, aff'd 157 F. 3d 630, 644-645 (9th Cir. 1998), cert. denied, 119 S.Ct. 1376; Midwater Trawlers Co-op. v. Department of Commerce, 282 F.3d 710, 717 (9th Cir. 2002) ["The term 'fish' as used in the Stevens Treaties encompassed all species of fish, without exclusion and without requiring specific proof. (citations omitted)"].

NMFS recognizes the areas set forth in 50 C.F.R. 660.324(c) as marine u&a grounds for groundfish for the four Washington coastal tribes. The Makah u&a grounds were adjudicated in U.S. v. Washington, 626 F.Supp. 1405, 1466 (W.D. Wash. 1985), aff'd 730 F.2d 1314 (9th Cir. 1984); see also Makah Indian Tribe v. Verity, 910 F.2d 555, 556 (9th Cir. 1990); Midwater Trawlers Co-op. v. Department of Commerce, 282 F.3d 710, 718 (9th Cir. 2002). The u&a grounds of the Quileute, Hoh, and Quinault Tribes have been recognized administratively by NMFS. The u&a grounds recognized by NMFS may be revised as ordered by a federal court.

In recognition of the sovereign status and co-manager role of these Indian tribes over shared Federal and tribal fishery resources, the regulations at 50 C.F.R. 660.324(d) establish procedures that will be followed for the development of regulations regarding tribal fisheries within the u&a grounds. The regulations provide that the agency will develop regulations in consultation with the affected tribe(s) and insofar as possible, with tribal consensus.

1.6.2 Fishery Sectors

Groundfish fishery sectors are defined through a combination of cross-cutting regulatory definitions, gear types, target species, and user groups. Regulatory sectors stem from the license limitation program implemented by groundfish FMP Amendment 6, adopted in 1992. A fixed number of licenses were issued, and a specific gear endorsement (either trawl, longline, or fish pot) associated with the license is required to harvest groundfish with that gear. This established three broad regulatory sectors: limited entry trawl, limited entry fixed gear (longline or fish pot), and open access. A mix of vessels falls into the open access category, which includes vessels that may target groundfish directly or take it incidentally to fisheries for nongroundfish species. Gear types permissible in the open access fisheries are governed by federal regulations at 50 CFR 600.725 and 660.302. Vessels participating in the nongroundfish fisheries that take groundfish incidentally may hold a license for that target fishery, issued by NMFS or a state government, yet still be considered in the open access sector for the purpose of groundfish fishing. Different management measures, as described below, are applied to these three sectors. The distinction between commercial and recreational sectors—and within the recreational sector, charter (for hire) and private vessels—provides an even broader definition of fishery sectors. Finally, within these regulatory and user group categories, further subdivisions may be made based on target species, gear type, or geographic region. Specific management measures may be, in turn, applied to these subsectors. For example, the limited entry trawl sector includes vessels targeting Pacific whiting, an abundant low-value pelagic species caught with midwater trawl nets. Vessels in this whiting sector, which includes at-sea processors and shore-based boats, are managed differently from other groundfish trawl vessels. The states manage recreational fisheries, although the measures they enact are coordinated through the Council and are implemented in federal regulations by NMFS. Geographic sub-sectors, comprising recreational fisheries in each state, can be identified for the recreational sector.

1.6.3 The Harvest Management Framework

The Council has developed four FMPs, for salmon, groundfish, coastal pelagic species, and highly migratory species. The groundfish FMP was approved in 1982. The management unit includes more than 80 species. These species include over 60 species of rockfish in the family *Scorpaenidae*, seven

roundfish species, 12 flatfish species, assorted sharks and skates, and a few miscellaneous bottom-dwelling marine fish species. Management of these groundfish species is based on principles outlined in the MSA, groundfish FMP, and national standard guidelines, which provide guidance on the 10 national standards in the MSA. The groundfish FMP has been amended 17 times to date. Many of the recent amendments respond to new requirements of the SFA and subsequent court-ordered remands of those amendments.

Amendment 11 incorporated a range of new SFA requirements related to setting harvest levels, determining when a stock is overfished, addressing bycatch concerns, and designating EFH. No measures to minimize adverse impacts to EFH from fishing were implemented as part of this amendment. According to the amendment document, the rationale for not adopting such measures was the lack of information "connecting fishing gear or activities to the destruction of groundfish EFH" and on appropriate minimization measures, if the effects of fishing could be assessed (PFMC 1998, p. 18).

Although not directly related to EFH issues, the harvest management framework established by Amendment 11 and Amendment 12—for setting harvest limits, or optimum yield, determining when a stock is overfished, and procedures for rebuilding overfished stocks—has profoundly affected the management system, and West Coast groundfish fisheries, over the past five years. Abundance-based reference points were identified, relative to an estimate of "virgin" or unexploited biomass of a given stock (denoted B_0). The concept of maximum sustainable yield (MSY) is used to identify a harvest limit, the Maximum Fishing Mortality Threshold (MFMT, denoted as F_{MSY}).[5] For a given population, and set of ecological conditions, there is a biomass that produces MSY (denoted as B_{MSY}), which is less than B_0. (Generally, population sizes above B_{MSY} are less productive because of competition for resources.) The Council-specified proxy MSY abundance for most West Coast groundfish species is 40% of B_0 (denoted as $B_{40\%}$). Two additional harvest rate related reference points are described in the groundfish FMP: the allowable biological catch (ABC) and optimum yield (OY). The ABC, which is the maximum sustainable harvest, is calculated by applying an estimated or proxy F_{MSY} harvest rate (MFMT) to the estimated abundance of the exploitable stock. OY represents a precautionary reduction from ABC due to uncertainty or the need to rebuild stocks to B_{MSY}. The ABC and OY for a stock are translations of harvest rates into a specific quantify of fish (measured by weight) that can be harvested in a year. The OY is considered a total catch limit. This means that managers need to account for or estimate both landed catch and discards when managing harvests.

These reference points establish the framework for management. Any harvest rate that exceeds the MFMT is considered overfishing. The Council may not set an OY representing a harvest rate above this threshold. The Council has also specified a minimum stock size threshold (MSST) at 25% of B_0 (denoted as $B_{25\%}$). Once a stock falls below this threshold it is declared overfished by the Secretary. This triggers a requirement to implement a stock rebuilding plan consistent with requirements in the MSA and groundfish FMP. Stocks estimated to be above this overfishing threshold, yet below an abundance level that supports MSY, are considered to be in the "precautionary zone." The Council has specified precautionary reductions in harvest rate for such stocks to increase abundance to $B_{40\%}$, referred to as the 40-10 adjustment.[6] Most stocks with an estimated abundance greater than $B_{40\%}$ are managed by setting

[5] MSY represents a theoretical maximum surplus production from a population of constant size; national standard guidelines (50 CFR 600.310(c)(1)) define it as "the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions."

[6] The "40-10" refers to percentages of unfished biomass. As the stock declines below $B_{40\%}$, the total catch OY is reduced from the ABC until, at 10% of B_0, the OY is set to zero. However, in practice the 40-10 adjustment only

harvest to the ABC. In summary, stocks can be classified in three categories according to their status: the biomass of healthy stocks is at or above B_{MSY}, the biomass of precautionary zone stocks is between B_{MSY} and the MSST; the biomass of overfished stocks is initially below the MSST. Stocks that have been declared overfished retain that description, and are subject to rebuilding requirements, until their size has returned to B_{MSY}. Therefore, a stock's size could be in the precautionary zone, but because it had previously dipped below the MSST, the stock would still be considered overfished.

1.6.4 Current Issues Affecting Groundfish Management

As noted above, eight groundfish stocks are currently declared overfished and subject to rebuilding plans.[7] They are: bocaccio (*Sebastes levis*), cowcod (*S. levis*), canary rockfish (*S. pinninger*), darkblotched rockfish (*S. crameri*), Pacific ocean perch (*S. alutus*), widow rockfish (*S. entomalas*), yelloweye rockfish (*S. ruberimus*), and lingcod (*Ophidon elongates*). The need to rebuild these stocks has had a major effect on the groundfish management regime. Many groundfish species co-occur, making it difficult or impossible for fishermen to completely avoid the overfished species while targeting healthy stocks. The very low OYs that have to be set for some overfished species therefore act to constrain fishing opportunity for healthy stocks. Furthermore, because the eight overfished species occur across a range of depths, geographic regions, and habitats, diverse West Coast fisheries, from large catcher-processors targeting Pacific whiting to recreational anglers up and down the coast, are subject to overfished species protection constraints. Historically, the main tool for managing commercial groundfish catches has been landing limits. In their current form these cumulative landing limits set the amount of a species or a mix of species that may be landed in a two-month period. While these limits are based on landings, or the amount of fish brought to the dock, total catch must be accounted for when determining whether there is a risk of an OY being breached. At the same time, once fishermen have reached the landing limit for a species, they have an incentive to discard fish at sea so that they may continue landing other species. These at-sea discards, or bycatch, have become a focus of management, both to better monitor the amount and institute measures to reduce it.

NMFS and the Council use a three-part strategy to meet Magnuson-Stevens Act mandates on bycatch monitoring and minimization: (1) gather data through a standardized reporting methodology on the amount and type of bycatch occurring in the fishery; (2) assess these data through bycatch models to estimate when, where, and with which gear types bycatch of varying species occurs; and (3) implement management measures through Federal fisheries regulations that minimize bycatch and bycatch mortality to the extent practicable, and that keep the total mortality of groundfish within the OYs of the various groundfish species and species groups.

NMFS uses the West Coast groundfish observer program (WCGOP) established in August 2001 and required in the FMP in Section 6.5.1.2, as its primary standardized reporting methodology for bycatch in the groundfish fisheries. The WCGOP focuses on vessels participating in the shore-delivery cumulative limit fisheries for non-whiting groundfish. Although WCGOP deploys observers on vessels of all major gear types, the program initially focused on observing trawl vessel fishing activity. As WCGOP has developed, it has expanded into more observations in the limited entry nontrawl fleet. About 75 percent of WCGOP's observer hours tend to be spent on trawl vessels, with the remaining 25 percent primarily

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applies to stocks above $B_{25\%}$ (the MSST) because once a stock falls below this level, an adopted rebuilding plan supplants it.

[7] The rebuilding plans for these eight species are found in section 4.5.4 of the FMP. Implementing regulations are at 50 CFR 660.365.

focused on limited entry longline and pot vessels. Through 2003, NMFS's observer coverage of the limited entry fixed gear fleet focused on vessels participating in the primary sablefish fishery. Beginning in 2004, the agency began adding observer coverage to the remainder of limited entry fixed gear fishing strategies and to the open access directed groundfish fisheries. Vessels participating in the at-sea whiting fisheries (catcher-processors and motherships) have been voluntarily carrying observers since 1991, although these vessels are now required to do so under federal regulations at 50 CFR 660.314. The WCGOP and the whiting observer programs, in combination with state fish ticket and logbook programs and fisheries-independent data, are used to support groundfish bycatch assessment models. In addition to these Federal programs, the Council relies on state recreational fisheries sampling programs, which use a combination of at-sea and at-dock samplers to gather catch and discard data on the recreational fisheries.

NMFS and the Council use data on bycatch and discard in models intended to estimate the amount and type of bycatch occurring in the groundfish fisheries. NMFS first introduced a groundfish fisheries total catch assessment model (known as "the bycatch model") in late 2001 for the 2002 fishing season. As the WCGOP has evolved, so has the bycatch model. During its first year, the bycatch model focused on overfished species taken incidentally in the trawl fisheries, and was populated with data from observation experiments from the mid-1990s and prior years. By January 2003, NMFS had analyzed data from the first year of the WCGOP and the bycatch models for fishing years 2003 and 2004 were updated with WCGOP-generated data. Prior to 2004, the bycatch model had focused on co-occurrence ratios for overfished species taken in target species fisheries without also looking at potential discard of target species. For the 2004 fishing year, NMFS expanded the bycatch model to set discard rates for target species by depth. Like initial WCGOP efforts, the models for the 2002-2003 fishing years also focused on the trawl fisheries. For 2005-2006, NMFS has again updated the trawl bycatch model with trawl fisheries data from WCGOP. NMFS has also revised the new fixed gear bycatch model, initially used in 2004, for the 2005-2006 fisheries that uses observer data from the limited entry fixed gear fisheries.

The third part of the NMFS and Council bycatch reduction strategy is a series of management programs intended to either directly control fishing activities or to create incentives for bycatch reduction. NMFS has implemented a wide array of fishery management measures intended to minimize bycatch and bycatch mortality over the past several years. The agency has supported a series of state-sponsored exempted fishing permit (EFP) programs to test bycatch-reducing gear types, full retention programs, and area closures. Working with the states and the Council, NMFS has also implemented shorter-than-year-round fishing seasons for various species and sectors of the groundfish fleet to protect overfished groundfish species. NMFS and the Council have also reduced overcapacity in the fleets, ultimately reducing the number of vessels on the water. Amendment 14 to the FMP implemented a permit stacking program for the limited entry fixed gear fleet that reduced the number of vessels participating in the primary sablefish fishery by about 40 percent. In late 2003, NMFS implemented a buyback of limited entry trawl vessels and their permits, reducing the groundfish trawl fleet by about 35 percent. Since 2000, NMFS has required gear modifications that restrict the use of trawl gear in rockier habitat coastwide, and that constrain the catching capacity of recreational fishing gear off California. Higher groundfish landings limits have been made available for trawl vessels using gear or operating in areas where overfished species are less likely to be taken. Species-to-species landings limit ratios have been thoroughly examined in the bycatch model mentioned earlier, and are re-examined each year as new observer program data become available. As an additional tool to manage overfished species bycatch, NMFS has implemented a suite of areas that are closed to specific types of fishing known collectively as the Rockfish Conservation Areas (RCAs).

1.6.5 The Harvest Specification Process

In accordance with the groundfish FMP, since 1990 the Council has annually set Pacific Coast groundfish harvest specifications (acceptable and sustainable harvest amounts) and management measures designed

to achieve those harvest specifications, with harvest specifications and management measures in effect for the calendar year January 1 to December 31. A shift to a biennial management cycle, as implemented by groundfish FMP Amendment 17, takes effect in 2005–2006. Thus, 2004 was the last year under the annual process. Under the biennial management cycle, harvest specifications and management measures are established for the two-year period in advance of the biennium. Separate ABCs and OYs are established for each calendar year in the two-year cycle. Council decisionmaking for this action occurs over three meetings, culminating in June of the year preceding the biennium. In addition to allowing more careful consideration of management proposals, this process addresses an issue raised by the court ruling in *Natural Resources Defense Council* (NRDC) v. *Evans*, 2001 168 F. Supp. 2d 1149 (N.D. Cal. 2001). The court found that NMFS was not allowing sufficient time for public notice and comment on the regulations before they were implemented at the beginning of a new year. The biennial process allows more time to complete full notice-and-comment rulemaking before the January 1 start date.

1.7 The Development of This EIS

The preceding description establishes the management context within which the EFH-related measures evaluated in this EIS should be considered. The development of this EIS covers roughly the same period cited at the beginning of Section 1.6: in 1999, a coalition of environmental groups challenged the Secretarial approval of the EFH FMP amendments prepared by the Gulf of Mexico, Caribbean, New England, North Pacific, and Pacific Fishery Management Councils in *AOC v. Daley*. The court found that the agency's decisions on the EFH amendments were in accordance with the MSA, but held that the environmental assessments (EAs) on the amendments were in violation of NEPA and ordered NMFS to complete new and more thorough NEPA analyses for each of these EFH amendments.

NMFS entered into a joint stipulation with the plaintiff organizations, which called for each affected Council to complete EISs to consider actions to minimize, to the extent practicable, adverse effects of fishing on EFH (*AOC v. Evans*, Civil No. 99-982 (GK)(D.D.C. December 5, 2001)). NMFS decided that the scope of the EISs should include all the EFH-related actions described in Section 1.2. EIS development has proceeded in four phases, as described in the following sections.

1.7.1 Initial Scoping

According to the NEPA, the public and other agencies must be involved in the decisionmaking process for agency actions. "Scoping" is an important part of this process. Scoping is designed to provide interested citizens, government officials, and tribes an opportunity to help define the range of issues and alternatives that should be evaluated in the EIS. NEPA regulations stress that agencies should provide public notice of NEPA-related proceedings and hold public hearings whenever appropriate during EIS development (40 CFR 1506.6).

The scoping process is designed to ensure all significant issues are properly identified and fully addressed during the course of the EIS process. The main objectives of the scoping process are to provide stakeholders with a basic understanding of the proposed action; explain where to find additional information about the project; provide a framework for the public to ask questions, raise concerns, identify issues, and recommend options other than those being considered by the agency conducting the scoping; and ensure those concerns are included within the scope of the EIS.

NMFS published a Notice of Intent (NOI) to prepare an EIS on April 10, 2001 (66 FR 18586), announcing public scoping meetings during May and June 2001 in Seattle, Washington; Newport and Astoria, Oregon; and Eureka, Los Alamitos, and Burlingame, California. According to the NOI, the EIS would evaluate the groundfish FMP from a broad, programmatic perspective, presenting "an overall picture of the environmental effects of fishing as conducted under Pacific Coast Groundfish FMP."

However, as a result of this initial public scoping, NMFS decided the process would be improved if the programmatic evaluation of the groundfish FMP were shifted from an EIS more narrowly focused on EFH issues (67 FR 5962).[8]

1.7.2 Development of the Decisionmaking Framework

At a March 2002 workshop NMFS habitat scientists agreed on a rough decisionmaking framework, which was presented to the Council as a "road map" for the EIS at their April 2002 meeting in Portland, Oregon. Since the development of Amendment 11, which had initially identified and described groundfish EFH, much more data had become available. For example, the 1998 designation was based primarily on catch records and a literature review of species' habitat associations; but newly available data on physical and biological substrate types, which play key ecological roles in groundfish habitat function, would allow more detailed analysis and interpretation.

The decisionmaking framework is designed so that the best available science is interpreted for policy makers before they develop alternatives for the EIS. Scientific information is consolidated and interpreted through a comprehensive risk assessment. Through use of this assessment, policy discussions can benefit from the best available science. Figure 1-2 shows the overall scheme of the decisionmaking framework, including the comprehensive risk assessment. Data relating to habitat, habitat use, fishing and non-fishing impacts to habitat, and current protection measures were consolidated in a geographic information system (GIS), a database containing geo-referenced attribute data that can be analyzed and mapped. A separate habitat use database was constructed, bringing together information on groundfish in the scientific literature in a framework that allows information to be queried and sorted. These data are used in two GIS-based models related to the major actions evaluated in this EIS: EFH identification and description, HAPC designation, and impact minimization. (As discussed below, the impacts model could not be fully used in policy development due to data limitations.)

The Council modeled development of the comprehensive risk assessment on the relationship between stock-assessments, which provide the basis for setting harvest levels, and the use of that scientific information for policy decisions. The Council in turn, uses scientific information to make social choices, within a legal framework, relating to risk and the allocation of potential costs and benefits. Similarly, the EFH decisionmaking framework separates the scientific endeavor from policymaking. Development of the comprehensive risk assessment shares two other features of the stock assessment process. First, results were vetted through a process of scientific peer review. Second, it was an open process, which allowed the public to follow and comment on its development.

After the Council approved the decisionmaking framework in April 2002, NMFS began organizing the necessary technical infrastructure, including contracting agency personnel and outside experts and consolidating data, which continued throughout implementation of the comprehensive risk assessment. In order to guide the technical team developing the risk assessment, at their November 2002 meeting the Council established the Ad Hoc Groundfish Habitat Technical Review Committee (Habitat TRC), composed of experts on groundfish biology and ecology, marine geologists, fishermen, and environmental advocates. The Habitat TRC met three times to provide guidance on risk assessment development: a February 19–20, 2003, meeting in Seattle, Washington; an August 4, 2003, teleconference (with public listening posts in Seattle, Washington; Gladstone and Newport, Oregon; and, Santa Cruz, California); and a November, 20-21, 2003, meeting Santa Cruz, California. The Habitat TRC also met

[8] The scope of the programmatic EIS was subsequently narrowed to focus on bycatch minimization. The FEIS for this action was published in September 2004 (NMFS 2004).

December 7-8, 2004, in Portland, Oregon, to conduct a technical review of the alternatives developed by the Council for inclusion in this EIS, which was a requirement of the joint stipulation in *AOC v. Daley*.

As the comprehensive risk assessment neared completion in early 2004, the Council's Scientific and Statistical Committee (SSC) reviewed its components and provided recommendations to the Council on its use by the Council for developing the alternatives evaluated in this EIS. Along with the guidance provided by the Habitat TRC, this comprised the scientific peer review mentioned previously. Based on an initial review by their Groundfish Subcommittee, the SSC advised the Council that the EFH identification and description component could be used for developing EIS alternatives. The Council ratified this recommendation at their April 2004 meeting.

Having explored all available data sources and considered various approaches, the technical team developing the risk assessment narrowed the impacts component to focus on the limited entry trawl sector. This is the only sector where sufficient spatial data are available, through logbook reporting, to model fishing impacts. (The scarcity of geo-referenced data on non-fishing impacts prevented their inclusion in the model as well.) The SSC Groundfish Subcommittee met again in May 2004 to review this component and concluded with a qualified endorsement. Based on their report, the SSC advised to the Council to use some elements of this model while recommending that more work be done on other elements before use in decisionmaking. Because of constraints on time and resources, further development of the model could not be completed before the Council began considering the range of alternatives to be evaluated in this EIS. Therefore, at their June 2004 meeting, the Council directed that only those elements approved by the SSC be used to formulate fishing impact minimization alternatives in this EIS.

A complete data gaps analysis explaining NMFS compliance with the CEQ regulations at 1502.22, regarding what to do when there is incomplete or unavailable information, is available in Section 5.3 of the Risk Assessment (Appendix A to this EIS).

1.7.3 Production of the DEIS

In addition to partially approving the fishing impacts component of the risk assessment at their June 2004 meeting, the Council asked its Ad Hoc EFH EIS Oversight Committee to meet and develop a preliminary range of alternatives. Membership of the Committee includes the Washington, Oregon, and California state representatives on the Council, fishermen, and environmental advocates. Work by the Committee represented the initiation of the policy phase shown in Figure 1-2. The Committee held a three-day meeting in August 2004 and developed the preliminary range of alternatives. These alternatives were considered by the Council at their September 2004 meeting and adopted with some modifications. At their next meeting, in November 2004, the Council further refined the range of alternatives and identified their preliminary preferred alternatives.

In addition to the initial public scoping period described above in Section 1.7.1, these Council meetings allow for public participation and comment during Council, subcommittee, and advisory body meetings. The advisory bodies involved in groundfish management include the Groundfish Management Team (GMT), with representation from state, federal, and tribal fishery scientists; and the Groundfish Advisory Subpanel (GAP), whose members are drawn from the commercial, tribal, and recreational fisheries, fish processors, and environmental advocacy organizations. These committees and others, such as the Habitat Committee (HC), provided comment and advice on the range of alternatives to be included in the EIS and which should be chosen as preferred by the Council.

1.7.4 Identification of the Final Preferred Alternative and Production of the FEIS

As discussed in Section 2.1, the Council and NMFS did not choose a final preferred alternative in advance of the publication of the DEIS. Instead, they identified a set of preliminary preferred alternatives at their November 1-5, 2004, meeting, which were noted in the DEIS. This indicated to the public a narrower range of alternatives from which the Council was mostly likely to select a final preferred alternative. At their June 13-17, 2005, meeting, which occurred after the end of the public comment period on the DEIS, they chose the final preferred alternative. This allowed the Council to benefit from the large volume of public comment on the range of alternatives and the Council's preliminary preferred alternatives. The final preferred alternative is described in this FEIS

Chapter 2 Alternatives

2.1 Introduction

This chapter describes four sets of alternatives, as identified by the objectives in Section 1.4, to (1) identify and describe EFH (Section 2.3), (2) designate HAPCs (Section 2.4), (3) minimize fishing impacts to EFH to the extent practicable (Section 2.5), and (4) implement habitat-related research and monitoring initiatives (Section 2.6). Section 2.7 describes the Council's comprehensive final preferred alternative, which combines alternatives from each of these four categories, with some modifications based on public comment. In the DEIS the alternatives were organized into four separate categories related to the objectives described in Section 1.4 in order to simplify the analysis and make it easier for the public to compare the alternatives and understand how they address the purpose and need for the proposed action. This organization is retained in the FEIS, but the final preferred alternative is described in a separate section in order to demonstrate how it comprehensively combines elements from each of these four categories.

The Council's Ad Hoc EFH EIS Oversight Committee developed a preliminary range of alternatives during a meeting held August 16-18, 2004, in Portland, Oregon. The Council adopted this preliminary range for analysis in the DEIS, with some modifications, at their meeting in San Diego, California, September 13-17, 2004. At their November 1-5, 2004, meeting in Portland, Oregon, the Council identified preliminary preferred alternatives. They also refined the range of alternatives by eliminating some alternatives from further detailed analysis (Section 2.6). The Council chose their final preferred alternative at the June 13-17, 2005, meeting in Foster City, California.

CEQ's regulations to implement NEPA at 40 CFR 1502.14(e) require an agency to identify a "preferred alternative or alternatives, if one or more exists, in the [DEIS] and identify such alternative in the final statement unless another law prohibits the expression of such a preference." In addition, identification of a preliminary preferred alternative or alternatives in the DEIS is required by the joint stipulation in *AOC v. Daley*. In order to satisfy this requirement in a way that fosters public input and informed decisionmaking, the Council chose preliminary preferred alternatives for EFH identification and description, HAPCs, and fishing impact minimization measures at their November 2004 meeting and these were identified in the DEIS. They explicitly construed this choice as preliminary.—At their June 2005 meeting, after the public comment on the DEIS had been received, the Council identified the final preferred alternative described in Section 2.7.

The final preferred alternative contains some elements that were not among those they identified as preliminary preferred in the DEIS. Some of the alternatives incorporated into the final preferred alternative have also been modified. However, the effects of the preferred alternative are within the range of effects predicted for the alternatives described in the DEIS. Table 2-2 summarizes these differences.

The next five sections briefly describe the alternatives. The level of detail provided here is sufficient for framing the analysis and Council decisionmaking. As appropriate, measures contained in the final preferred alternative selected by the Council in June 2005 are described in more detail in Section 2.7, as well as in FMP amendment language and any implementing regulations. In order to reduce confusion, the alternatives are identified using an alphanumeric label.

2.2 Application of the Alternatives to Tribal Fisheries

NMFS does not intend for any of the alternatives described below to apply to tribal fisheries in usual and accustomed grounds described in 50 C.F.R. 660.324(c). NMFS will continue to work with the tribes to ensure that, within the u&a grounds, adequate measures are in place to protect EFH and HAPCs. In the future, in the event that it is determined that additional measures need to be developed, NMFS would follow the procedures outlines in 50 C.F.R. 660.324(d). See also Section 1.6.1.

2.3 EFH Identification and Description Alternatives

Requirements for identifying and describing EFH are found in the Magnuson-Stevens Act and implementing regulations at 50 CFR part 600; subpart J. The regulations require the agency to undertake a scientific process to determine the extent of habitat that is essential for managed species throughout their life history. EFH identification and description provides the basis for the statutory requirement to consult and provides geographic focus for development of conservation strategies.

The identification and description of EFH does not in and of itself have direct effects on habitat, the status of groundfish stocks, or the ecosystem; however, the geographic focus it provides can serve as a tool for managers to focus conservation efforts and stewardship over the habitat component of groundfish resources. Section 303(a)(7) of the Magnuson-Stevens Act requires that adverse effects from fishing on EFH must be minimized to the extent practicable and other actions encouraged that would conserve and enhance such habitat. In addition, the identification and description of EFH serves to facilitate the consultation process as described in section 305(b) of the Magnuson-Stevens Act, which states that federal action agencies must consult with NMFS on any action that may adversely affect EFH. Identification and description of EFH is a management tool that is the starting point for considering conservation and enhancement.

2.3.1 Scientific Basis for the EFH Identification and Description Alternatives

The alternatives to identify and describe EFH were developed by a scientific process to comply with the requirements of the EFH regulations at 50 CFR part 600; subpart J, and to describe and identify EFH. This sub-section summarizes the results of that process, which is explained in detail in the Risk Assessment, included as Appendix A.

The Risk Assessment involved a data consolidation phase in which the best available ecological, environmental, and fisheries information was assembled and incorporated into appropriate databases. Data were prioritized and obtained in consultation with scientific advisory committees and agency scientists. The specific information assembled and applied to the EFH identification and description alternatives includes:

- Geological substrate data (GIS);
- Estuaries (GIS);
- Canopy kelp (GIS);
- Seagrass (GIS);
- Structure-forming invertebrate information;
- Bathymetric data (GIS);
- Latitude (GIS);
- Information on pelagic habitat;

- Data quality (GIS and other); and,
- Information on the functional relationships between fish and habitat (literature review, Habitat Use Database).

Ideally, EFH would be identified by delineating habitat in terms of its contribution to growth, reproduction, survival, and production of groundfish; however, such information is not available. There is limited information on the distribution and habitat-related density of species that was compiled and utilized in developing the alternatives.

Alternatives to the no action alternative were developed through a process of scientific modeling. Due to a generally poor availability of data on how and where fish utilize and rely on habitat to carry out basic life functions, such as spawning, breeding, feeding, and growth to maturity, a model was developed to predict an overall measure of the suitability of habitat in particular locations for as many species as possible. Where possible, the suitability of habitat was measured using the occurrence of fish species in NMFS trawl survey catches. For species not well represented in the trawl catches, information from the scientific literature was used. Species and life stages for which no specific information could be found were considered using the precautionary principle.

The model characterizes habitat in terms of three variables: depth, latitude, and substrate (both physical and biogenic substrate, where possible). For the purposes of the model these three characteristics provide a reasonable representation of the essential features of habitat that influence the occurrence of fish. Depending on these characteristics and the observed distributions of fish in relation to them, each location (a parcel or polygon of habitat in the GIS) is allocated a suitability value between 0 and 100%. This is called the *Habitat Suitability Probability*, or HSP, and it is calculated for as many species and life stages in the FMP as possible based on available data. These scores and the differences between scores for different locations are then used to develop a proxy for the areas that can be regarded as "essential". The higher the HSP, the more likely the habitat area should be identified as EFH.

The EFH identification model provides spatially explicit estimates of HSP for 160 groundfish species/life stage combinations, including the adults of all species in the FMP. Distribution ranges for depth and latitude were derived where possible from in-situ observations of occurrence in NMFS trawl survey catches. Where survey data were insufficient, depth and latitude ranges were extracted from reports and papers in the scientific literature. Preferences for substrate types were also taken from the scientific literature. The HSP values for each habitat polygon are mapped using GIS software. For the reader unfamiliar with GIS, a primer is contained on page 14 of the Risk Assessment.

The alternatives represent a range of threshold HSP values or percentages of total area (ranked by HSP), below which the habitat polygons are not identified as EFH and above which they are. The higher the threshold value, the larger the area of habitat identified as EFH for a given species/life stage. To address all species/life stages, the GIS polygons are ranked from highest to lowest HSP value for each modeled species/life stage. Next, polygons are selected in descending rank order until some pre-determined percentage of the total area covered by polygons with an HSP value greater than 0.01% has been included in the set. Once this has been done for all of the modeled species, the resulting areas are combined into a single area to be identified as EFH.

For example, Alternative A.5 identifies the "top 70% HSP area" as EFH, meaning that highest-ranked polygons were selected successively until 70% of the area was included. Higher HSP thresholds are more "risk averse" in that there is a greater probability that suitable habitat is included. By varying the HSP values, the action alternatives represent alternative levels of risk aversion. Alternatives A-2 and A-3 are the most risk averse in that they apply an HSP threshold of 100%. Alternative A-6 is the least risk averse in that an HSP threshold of 30% is applied.

A feature of the HSP approach is that the thresholds can be varied for individual species/life stages depending on the level of management concern. Alternative A.4 demonstrates this feature by applying different thresholds based on management categories used by the Council. Overfished species[9] are treated with the most risk aversion through application of a 90% HSP threshold. Species in the precautionary[10] zone are treated with slightly less risk aversion through application of an 80% HSP threshold. The remaining groundfish are treated with the least amount of risk aversion through application of a 60% HSP threshold. To account for uncertainty in the results of the HSP model, two of the action alternatives contain precautionary adjustments. Alternative A.2 is based on an HSP threshold of 100% with a precautionary adjustment out to depths of 3500 meters. Seamounts were included in A.4 to account for potential importance that is not revealed in the results of the HSP model. Further discussion of seamounts is contained in the discussion of the alternative below.

The HSP approach represents an important advance in NMFS' ability to delineate suitable habitat at the individual species/life stage and apply GIS software in an "ecosystem" approach to management. The HSP profiles for individual species/life stages can be combined by GIS analyses into ecosystem-level fish assemblages to investigate and predict environmental consequences of proposed projects.

There are six EFH identification and description alternatives, which are listed according to total area encompassed. The Council identified two preliminary preferred alternatives in this category.

While efforts to identify and describe EFH for the Pacific Groundfish fishery have been encouraging, unfortunately the project team realized at a late date that some of the essential fish habitat maps generated from the information collected on the managed species were incorrect. Since publication of the DEIS the project team has continued to correct and update the underlying data sets used to generate HSP maps describing groundfish EFH. This FEIS contains updated maps in Appendix I and a report of the final peer review process in Appendix D. Additionally, the EFH identification alternatives have been updated to reflect the corrected HSP information (although changes to the alternatives are insignificant compared to those published in the DEIS).

By using this approach to analyzing the information, HSP provides a better method to analyze the EFH information and develop the description and identification of EFH than the method outlined in the guidelines at 50 CFR 600.815. This is because it takes advantage of computer analyses of a large amount of information that is organized in such a way that it provides a clear understanding of the relationship between groundfish and habitat. The EFH model, including a description of the reliability of the information, used to develop HSP values for individual groundfish species/life stage is further described in Appendix A.

Alternative A.1: No Action

The no action alternative would maintain the current EFH identification and description, incorporated into the groundfish FMP by Amendment 11 in 1998 (see Figure 2-1).

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[9] Overfished species include bocaccio (*Sebastes paucispinis*), cowcod (*S. levis*), canary rockfish (*S. pinninger*), darkblotched rockfish (*S. crameri*), Pacific ocean perch (*S. alutus*), widow rockfish (*S. entomalas*), yelloweye rockfish (*S. ruberimus*), and lingcod (*Ophidon elongates*).

[10] Precautionary zone species are sablefish (*Anoplopoma fimbria*), Dover sole (*Microstomus pacificus*), and shortspine thornyhead (*Sebastolobus alascanus*).

The more than 80 groundfish species in the management unit occupy diverse habitats at all stages in their life histories. As a consequence of the large number of groundfish fishery management unit (FMU) species and their diverse habitat associations, when all the individual EFHs are taken together, all waters from the mean higher high water line, and the upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon, and California to the seaward boundary to the U.S. EEZ become EFH.

Therefore, the FMP groups the various EFH descriptions into seven units called composite EFHs. This approach focuses on ecological relationships among species and between the species and their habitat, reflecting an ecosystem approach in defining EFH. Seven major habitat types are proposed as the basis for such assemblages or composites. These major habitat types are readily recognizable by those who potentially may be required to consult about impacts to EFH, and their distributions are relatively stationary and measurable over time and space.

The seven composite areas identified as EFH are as follows.

1. **Estuarine** – Those waters, substrates, and associated biological communities within bays and estuaries of the EEZ, from the mean higher high water level (MHHW, which is the high tide line) or extent of upriver saltwater intrusion to the respective outer boundaries for each bay or estuary as defined in the Coast Guard lines of demarcation at 33 CFR 80.1.

2. **Rocky Shelf** – Those waters, substrates, and associated biological communities living on or within 10 meters (5.5 fathoms) overlying rocky areas, including reefs, pinnacles, boulders and cobble, along the continental shelf, excluding canyons, from the high tide line MHHW to the shelf break (approximately 200 meters or 109 fathoms).

3. **Nonrocky Shelf** - Those waters, substrates, and associated biological communities living on or within 10 meters (5.5 fathoms) overlying the substrates of the continental shelf, excluding the rocky shelf and canyon composites, from the high tide line MHHW to the shelf break (approximately 200 meters or 109 fathoms).

4. **Canyon** – Those waters, substrates, and associated biological communities living within submarine canyons, including the walls, beds, seafloor, and any outcrops or landslide morphology, such as slump scarps and debris fields.

5. **Continental Slope/Basin** - Those waters, substrates, and associated biological communities living on or within 20 meters (11 fathoms) overlying the substrates of the continental slope and basin below the shelf break (approximately 200 meters or 109 fathoms) and extending to the westward boundary of the EEZ.

6. **Neritic Zone** - Those waters, substrates, and associated biological communities living in the water column more than 10 meters (5.5 fathoms) above the continental shelf.

7. **Oceanic Zone** - Those waters, substrates, and associated biological communities living in the water column more than 20 meters (11 fathoms) above the continental slope and abyssal plain, extending to the westward boundary of the EEZ.

Because it designates the entire EEZ including areas shoreward to the mean higher high water line, this alternative encompasses the largest area, 317,690 square miles.

Alternative A.2: Depths less than 3,500 m (Component of the Final Preferred Alternative)

In this alternative, EFH would be identified as 100% of the area where HSP is greater than zero for all species and any additional area in depths less than or equal to 3,500 m (1,914 fm) (see Figure 2-2). This alternative would designate 187,741 square miles in the EEZ, and to the mean higher high water line and upriver extent of salt water, as EFH. The deepest observation of groundfish is 3,400 m (Wakefield, Pers. Com.). By including areas out to the 3500 m depth curve, this alternative includes all habitats where groundfish have been observed with the addition of 100 m depth as a precautionary adjustment in case of non-observed groundfish species. The additional 100 m depth also acts to buffer uncertainty in the HSP model. This alternative includes all 7 composite areas as in alternative A.1, but a smaller amount of square miles.

Alternative A.3: 100% HSP Area

Designate 100% of the area where HSP is greater than zero for all species (see Figure 2-3). This alternative would designate 87,160 square miles as EFH, all of it within the area that would be designated by Alternative A.2. The scientific rationale for this alternative is provided in section 2.3.1.

Alternative A.4: HSP Based on Management Status

Designate the upper 90% of the HSP area of overfished species HSP, upper 80% of the HSP area for precautionary zone species, and upper 60% of the HSP area for all other groundfish, and all seamounts (see Figure 2-4). The alternative would designate 79,481 square miles as EFH, most of which falls within the area described by the previous alternatives, with the addition of some deeper areas around seamounts. The scientific rationale for this alternative is provided in section 2.3.1.

Alternative A.5: 70% HSP Area

Designate the upper 70% of the area where HSP is greater than zero (Figure 2-5). The alternative would designate 78,569 square miles as EFH, all of which falls within the area described by alternatives A.1, A.2, and A.3. The scientific rationale for this alternative is provided in section 2.3.1.

Alternative A.6: 30% HSP Area

Designate the upper 30% of the area where HSP is greater than zero for all species (Figure 2-6). The alternative would designate 66,589 square miles as EFH, all of which falls within the area described by the previous alternatives. The scientific rationale for this alternative is provided in section 2.3.1.

2.4 Alternatives for HAPC Designation

Although the Magnuson-Stevens Act does not require Councils to designate HAPCs, NMFS encourages them to do so, based on one or more of the following considerations from the EFH regulations at 50 CFR 600.815 (a)(8):

1) The importance of the ecological function provided by the habitat;

2) The extent to which the habitat is sensitive to human-induced environmental degradation;

3) Whether, and to what extent, development activities are, or will be, stressing the habitat type; and,

4) The rarity of the habitat type.

There are nine HAPC designation alternatives in this EIS. At the November, 2004 meeting, the Council chose seven of these as their preliminary preferred alternatives. These alternatives are not mutually exclusive and all could be included in a final preferred alternative, even if some of the designated areas were to overlap one another. HAPC must be a subset of EFH so the HAPC alternatives may be limited by the EFH identification that results from this EIS. Chapter 4 contains a full analysis of the overlap of the HAPC alternatives with the EFH alternatives.

Alternative B.1: No Action

No HAPCs are currently designated for groundfish. Choosing this alternative would maintain no HAPC designations.

Alternative B.2: Estuaries (Component of the Preferred Alternative)

Estuaries are protected nearshore areas such as bays, sounds, inlets, and river mouths, influenced by ocean and freshwater. Tidal cycles and freshwater runoff varies salinity within estuaries and results in great diversity, offering freshwater, brackish and marine habitats within close proximity (Haertel and Osterberg 1967).

The inland extent of the estuary HAPC is defined as MHHW, or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow. The seaward extent is an imaginary line closing the mouth of a river, bay, or sound; and to the seaward limit of wetland emergents, shrubs, or trees occurring beyond the lines closing rivers, bays, or sounds. This HAPC also includes those estuary-influenced offshore areas of continuously diluted seawater. This definition is based on Cowardin et al. (1979 #1222)

Estuaries are naturally dynamic and complex, and human actions that degrade or eliminate estuarine conditions have the effect of stabilizing and simplifying this complexity (Williams et al. 1996), reducing their ability to fulfill fish and wildlife needs for reproduction, feeding, refuge, and other physiological necessities (Gunter 1957; Good 1987; Phillips 1984; Simenstad et al. 1991). Estuaries tend to be shallow, protected, nutrient rich, and are biologically productive, providing important habitat for marine organisms, including groundfish. Estuaries are vulnerable to damage from a wide range of non-fishing activities because estuaries are often close to human population centers and receive runoff from adjacent land areas. Anthropogenic impacts to estuaries may include nutrient loading, introduction of non-native species, changes in water temperature, increased turbidity etc.

Estuaries were included as an HAPC designation alternative under 50 CFR 600.815(a)(8)(1)-(3) because they are of ecological importance, are sensitive to human-induced environmental degradation and are hosts to environmentally stressful development activities.

Figure 2-7 shows the location of these HAPCs. GIS data on West Coast estuaries were derived primarily from the USFWS' National Wetlands Inventory (NWI). Where digital data for the NWI were unavailable, data from NOAA's Coastal Assessment Framework were used.

Alternative B.3: Canopy Kelp (Component of the Preferred Alternative)

Of the habitats associated with the rocky shelf habitat composite, canopy kelp forests are of primary importance to the ecosystem and serve as important groundfish habitat. Lush kelp forest communities (e.g., giant kelp, bull kelp, elk kelp, and feather boa kelp) are found relatively close to shore along the open coast and the canopy kelp HAPC includes those waters, substrate, and other biogenic habitat associated with canopy-forming kelp species. On the rocky shelf, these subtidal communities provide vertically-structured habitat through the water column. The stands provide nurseries, feeding grounds and shelter to a variety of groundfish species and their prey (Ebeling, et al. 1980; Feder, et al. 1974). Giant kelp communities are highly productive relative to other habitats, including wetlands, shallow and deep sand bottoms, and rock bottom artificial reefs (Bond *et al.*, 1998). Foster and Schiel (1985) reported that the net primary productivity of kelp beds may be the highest of any marine community. Kelp forest ecosystems undergo distinct phase shifts between kelp dominated and sea urchin dominated states (Steneck et al. 2002). Kelp forests are vulnerable to cascading effects of top-down forcing and fishing down food webs (Steneck et al. 2002; Estes et al. 2004). Kelp forest phase shifts have complex explanations and consequences with linkages across multiple species, large areas and long periods of time (Estes et al. 2004).

Canopy kelp were included as an HAPC designation alternative under 50 CFR 600.815(a)(8)(1) and (2) because they are of ecological importance and are sensitive to human-induced environmental degradation.

GIS data for the floating kelp species, *Macrocystis* spp. and *Nereocystis* sp., are available from state agencies in Washington, Oregon, and California. These data have been compiled into a comprehensive data layer delineating kelp beds along the West Coast. The kelp source data were provided for each state by the following agencies: Washington Department of Natural Resources (WDNR), Oregon Department of Fish and Game (ODFW), and California Department of Fish and Game (CDFG). Source data were collected using a variety of remote sensing techniques, including aerial photos and multispectral imagery. Because kelp abundance and distribution is highly variable, these data do not necessarily represent current conditions. However, data from multiple years were compiled together with the assumption that these data would indicate areas where kelp has been known to occur. Washington State has the most comprehensive database, covering 10 years of time (1989-1992, 1994-2000), and surveying the Straits of Juan de Fuca and the Pacific Coast every year. Oregon did a coastwide survey in 1990, and then surveyed select reefs off southern Oregon in 1996-1999. A comprehensive kelp survey in California was performed in 1989, and additional surveys of most of the coastline occurred in1999 and 2002. Figure 2-8 shows the location of these HAPCs.

Alternative B.4: Seagrass (Component of the Preferred Alternative)

Seagrass species found on the West Coast of the U.S. include eelgrass (*Zostera* spp., *Ruppia* sp.) and surfgrass (*Phyllospadix* spp.). These grasses form dense beds of leafy shoots year-round in the lower intertidal and subtidal areas. Eelgrass is found on soft-bottom substrates in intertidal and shallow subtidal areas of estuaries. Surfgrass is found on hard-bottom substrates along higher energy coasts. The seagrass HAPC includes those waters, substrate, and other biogenic features associated with eelgrass or surfgrass.

Seagrass beds have high primary productivityand provide habitat for many invertebrates and epiphytes, and provide many crustaceans, fish, and birds with protection and food. Several commercially important species use seagrass beds including Dungeness crab (Spencer 1932) and Pacific herring (Taylor 1964). Pacific coast seagrasses have been shown to be vulnerable to anthropogenically introduced species of seagrasses such as *Spartina alterniflora* (Taylor et al. 2004) and *Zostera japonica* (Harrison and Bigley 1982).

Seagrasses were included as an HAPC designation alternative under 50 CFR 600.815(a)(8)(1) and (2) because they are of ecological importance and are sensitive to human-induced environmental degradation.

Despite their known ecological importance for many commercial species, seagrass beds have not been as comprehensively mapped as kelp beds. Wyllie-Echeverria and Ackerman (2003) published an excellent coastwide assessment of seagrass that identifies sites known to support seagrass and estimates of seagrass bed areas; however, their report does not compile existing GIS data. GIS data for seagrass beds have been located and compiled for the EFH EIS and mapped in Figure 2-9.

Potential data sources for seagrass were identified through database searches via the internet as well as initial contacts provided by NMFS EFH staff and Sandy Wyllie-Echeverria at the University of Washington. Twenty-eight individuals or organizations were contacted for seagrass data or to provide further contacts.

Eelgrass mapping projects have been undertaken for many estuaries along the West Coast. These mapping projects are generally done for a particular estuary, and many different mapping methods and mapping scales have been used. Therefore, the data that have been compiled for eelgrass beds are an incomplete view of eelgrass distribution along the West Coast. Data depicting surfgrass distribution are very limited—the only GIS data showing surfgrass are in the San Diego area.

Figure 2-9 shows the location of these HAPCs.

Alternative B.5: Core Habitat

This alternative designates core areas, defined as the upper 10% of area with an HSP greater than 0%, for the juvenile and adult life history stages of overfished and precautionary zone groundfish species. HSP is explained in section 2.3.1. Figure 2-10 shows the location of these HAPCs. This alternative is consistent with 50 CFR 600.815(a)(8)(1).

Alternative B.6: Rocky Reefs (Component of the Preferred Alternative)

Rocky habitats are generally categorized as either nearshore or offshore in reference to the proximity of the habitat to the coastline. Rocky habitat may be composed of bedrock, boulders, or smaller rocks such as cobble and gravel. Hard substrates are one of the least abundant benthic habitats, yet they are among the most important habitats for fishes. Typical shallow water hard bottom fishes include rockfish (e.g. *Sebastes* spp.), lingcod, and sculpins (MMS 2002).

Managed species known to use tide pools (Section 3.2.2.1.3) and other nearshore hard bottom habitat (Section 3.2.2.1.5) in the coastal zone include black rockfish, black-and-yellow rockfish, brown rockfish, cabezon, calico rockfish, California scorpionfish, canary rockfish, chilipepper, copper rockfish, grass rockfish, gopher rockfish, kelp greenling, leopard shark, lingcod, olive rockfish, quillback rockfish, redstripe rockfish, rosethorn rockfish, shortbelly rockfish, silvergray rockfish, and spotted ratfish.

In the offshore area, many managed species are dependent on hard bottom habitat during some portion of their life cycle. Typically, deeper water hard bottom habitats are inhabited by large, mobile fishes such as rockfish, sablefish, Pacific hake, spotted ratfish, and spiny dogfish (MMS 2002). Cross and Allen (1993) estimated that about 30% of the fish species and 40% of the families occur over hard substrates.

This alternative designates all rocky reef areas including those waters, substrates and other biogenic features associated with hard substrate (bedrock, boulders, cobble, gravel, etc.) to MHHW. A first approximation of its extent is provided by the substrate data in Figure 2-11, which shows the location of these HAPCs. At finer scales, through direct observation, it may be possible to further distinguish between hard and soft substrate in order to define the extent of this HAPC.

Fishing with certain gear types can modify rocky habitat and have a negative impact on plants and animals found there. A full discussion of impacts to rocky reef areas is contained in several sections of Chapter 3.

Rocky reefs were included as an HAPC designation alternative under 50 CFR 600.815(a)(8)(1) and 50 CFR 600.815(a)(8)(2) because they are of ecological importance and are sensitive to human-induced environmental degradation.

Alternative B.7: Areas of Interest (Component of the Final Preferred Alternative)

This alternative would designate areas that are of special interest due to their unique geological and ecological characteristics.

The following areas of interest are:

- Off of Washington: the northern portion of the northwest Olympic Coast National Marine Sanctuary (NMS) and Grays Canyon

- Off of Oregon: Daisy Bank/Nelson Island, Rogue Canyon, Heceta Bank, Astoria Canyon, Thompson Seamount, and President Jackson Seamount

- Off of California: Gumdrop Seamount, Pioneer Seamount, Guide Seamount, Taney Seamount, Davidson Seamount, and San Juan Seamount; Eel River Canyon, Mendocino Canyon; Morro Ridge, Gorda Escarpment, Cordell Bank; Monterey Bay, Monterey Canyon, and the Cowcod Conservation Area(s)

The Council could choose any combination of these areas as part of a preferred alternative. Figure 2-12 shows the location of these HAPCs.

Seamounts and canyons are prominent features in the coastal underwater landscape, and may be important in rockfish management because “rockfish distributions closely match the bathymetry of coastal waters” (Williams and Ralston 2002).

Seamounts rise steeply to heights of over 1000 m from their base and are typically formed of hard volcanic substrate. They are unique in that they tend to create complex current patterns (Lavelle et al, 2003; Millineaux and Mills 1997) and have highly localized species distributions (de Forges et al, 2000). Worldwide, it is estimated that 15% of species that live on seamounts are possibly seamount endemics, but a recent study on a southwest Pacific seamount suggested a greater portion (29-34%) of the species found there were potentially endemic (de Forges et al, 2000) and therefore require careful management. Currents generated by seamounts retain rockfish larvae (Mullineaux and Mills 1997; Dower and Perry

2001) and zooplankton, a principal food source for rockfish (Genin et al, 1988; Haury et al, 2000). Several species observed on seamounts, such as deep sea corals, are particularly vulnerable to anthropogenic impacts (Sanctuary Integrated Monitoring Network ([SIMoN]) website September 30, 2004). Seamounts also provide habitat for many groundfish prey species (See Section 3.3.3.2)

Canyons are complex habitats that have enhanced biomass due to on-shore transport and high concentrations of zooplankton, a principal food source of juvenile and adult rockfish (Brodeur 2001). Canyons may have hard and soft substrate and are high relief areas that can provide refuge for fish, and localized populations of groundfish may take advantage of the protection afforded by canyons (SIMoN website September 30, 2004) and the structure-forming invertebrate megafauna that grow there. A canyon in the North Pacific was observed to have dense aggregations of rockfish associated with sea whips (*Halipteris willemoesi*), while damaged sea whip "forests" had far fewer rockfish (Brodeur 2001).

Cordell Bank is an offshore granite bank about 45 nautical miles (nm) northwest of San Francisco, California. The vertical relief and hard substrate of the Bank provides benthic habitat with near-shore characteristics in an open ocean environment 20 nm from shore. Unpublished observations indicate the presence of many rockfish species, sponges, anemones, hydrocorals, hydroids, tunicates, and scattered crabs, holothurians, and gastropods (CBNMS and MBNMS 2004). Many species have been observed, either deeper, farther north, or farther south than ever before known (Schiemder 1991). Four fisheries have occurred throughout the range of the entire Cordell Bank National Marine Sanctuary: Dungeness crab, highly migratory, groundfish and salmon (CBNMS and MBNMS 2004).

Daisy Bank is a highly unique geological feature that occurs in federal waters due west of Newport, Oregon and appears to play a unique and potentially rare ecological role for groundfish and large invertebrate sponge species. The bank was observed in 1990 to support more than 6,000 juvenile rockfish per hectare; a number thirty times higher than those observed on adjacent banks during the same study period. The same study also indicated that Daisy Bank seems to support more and larger lingcod and large sponges than other nearby banks (Hixon August 2004). This alternative is consistent with 50 CFR 600.815(a)(8)(1) and (3).

Alternative B.8: Oil Production Platforms (Component of the Final Preferred Alternative)

This alternative designates areas around oil production platforms in Southern California waters. According to a report submitted to the Council by the California Artificial Reef Enhancement Program (CARE 2004), currently there are 27 such platforms remaining out of the 34 constructed since the late 1950s. Of these platforms, twenty four are included for possible HAPC designation; twenty-three of in federal waters and one are in California state waters. Platforms included under this alternative are listed in Table 2-1. Figure 2-13 shows the location of these HAPCs. High concentrations of groundfish have been observed in association with many of the platforms off the California coast, including overfished species such as bocaccio and cowcod. In addition to providing suitable habitat, most of these structures are not fished and act as de facto reserves. The platforms rise steeply from the bottom and provide distinctive high relief habitat in primarily soft bottom habitat. Recent scientific study has yielded supporting evidence of the high productivity, and possibly strong ecological importance, of platform habitats to groundfish species. Therefore oil platforms are included as an HAPC designation alternative under 50 CFR 600.815(a)(8)(1); the importance of the ecological function provided by the habitat.

Alternative B.9: Process for New HAPC Designations (Component of the Final Preferred Alternative)

This alternative establishes a streamlined process for designating new HAPCs, based on proposals submitted to the Council. This procedural alternative recognizes that new scientific information could

reveal other important habitat areas that should be designated HAPCs, based on the criteria outlined above. This process allows organizations and individuals to petition the Council at any time to consider a new designation and ensures, provided they submit a complete package as described below, that their proposal will be considered by the Council. In establishing an HAPC designation process, this alternative is akin to the stock assessment review (STAR) process the Council has implemented, but would not be tied to a fixed schedule coordinated with biennial management. The designation process would include the following elements:

1) A petitioner submits a proposal for a new HAPC by letter to the Chairman and Executive Director of the Council.

2) Mandatory components of a proposal would be identified in the FMP (by amendment). Proposals would be required to include: (a) the location of the HAPC, defined by specified geographic characteristics such as coordinates, depth contours, distinct biogeographic characteristics; (b) how the HAPC meets one or more of the criteria specified in regulations at (50 CFR 600.815 (a)(8)); and (c) a preliminary assessment of potential biological and socioeconomic effects of the designation.

3) Council/NMFS staff determine whether the proposal contains the mandatory components outlined in step two. If this technical review determines that the proposal is inadequate, staff return it to the petitioner for revision and resubmission. If it is determined adequate, staff forward it to the Council for full consideration as described below.

4) Full consideration of HAPC proposals would occur over three Council meetings:

    i. At the first meeting the Council would establish a timeline for consideration, including merit review by the HC and the SSC.

    ii. At the second meeting the HC and SSC would provide their merit review to the Council. Depending on the results of this review, the Council could direct staff to begin developing any documentation necessary for implementation. The proposal would also be forwarded to other advisory bodies for additional review.

    iii. At the third meeting the Council would receive advisory body reports, review implementing documentation, and decide whether to approve an FMP amendment for Secretarial review.

Table 2-1: Oil Platforms considered for HAPC designation (added since Draft EIS).

Platform	Latitude/Longitude	Located in Federal or State Waters?	Included in Council Preferred Alternative	Included under Alternative A.6?
Ellen	33°35'N, 118°08'W	Federal	No	Yes
Elly	33°35'N, 118°08'W	Federal	No	Yes
Eureka	33°34'N, 118°07'W	Federal	No	Yes
Harmony	34°23'N, 120°10'W	Federal	No	Yes
Henry	34°20'N, 119°34'W	Federal	No	Yes
Heritage	34°21'N, 120°17'W	Federal	No	Yes
Hillhouse	34°20'N, 119°37'W	Federal	No	Yes
Hogan	34°20'N, 119°32'W	Federal	No	Yes
Holly	34°23'N, 119°54'W	State	No	Yes
Houchin	34°20'N, 119°33'W	Federal	No	Yes
Edith	33°36'N 118°08'W	Federal	Yes	Yes
Gail	34°08'N, 119°24'W	Federal	Yes	No
Gilda	34°11'N, 119°25'W	Federal	Yes	Yes
Grace	34°11'N, 119°28'W	Federal	Yes	Yes
Habitat	34°17'N, 119°35'W	Federal	Yes	Yes
Harvest	34°28'N, 120°41'W	Federal	Yes	Yes
Hermosa	34°27'N, 120°39'W	Federal	Yes	Yes
Hidalgo	34°30'N, 120°42'W	Federal	Yes	Yes
Hondo	34°23'N, 120°07'W	Federal	Yes	No
Irene	34°37'N, 120°44'W	Federal	Yes	Yes
Platform A	34°20'N, 119°37'W	Federal	Yes	Yes
Platform B	34°20'N, 119°37'W	Federal	Yes	Yes
Platform C	34°20'N, 119°38'W	Federal	Yes	Yes

Source: Coordinates for platforms in State waters were obtained from OCS MMS Report 2000-057, Oil-Spill Risk Analysis: Pacific Outer Continental Shelf Program; Coordinates for platforms in Federal waters were obtained from the Minerals Management Service website, February 4, 2004 by A. Bailey.

2.5 Alternatives to Minimize Adverse Fishing Impacts to EFH

The NRC report cited earlier characterizes three variables that directly influence fishing impacts on habitat: gear type, habitat type, and intensity of fishing effort (National Research Council 2002). The suite of management tools that can be used to minimize adverse impacts to EFH involve gear modification, area closures, or fishing effort reduction. The Council identified 14 alternatives, some with additional sub-options, for inclusion in the DEIS. These alternatives mainly employ gear-specific area closures and gear restrictions. Alternative C.10 has an explicit effort reduction component. However, the Council recognizes the need to reduce fishing effort, particularly in the groundfish limited entry trawl sector.

The Council chose seven preliminary preferred alternatives in this category, Alternatives C.4, C.9, C.10, C.11, C.12, C.13, and C.14. Alternative C.4 has two options; only one of which is included in the final preferred alternative. The other alternatives are not mutually exclusive. Furthermore, Alternatives C.12 through C.14 incorporate the concept outlined in Alternative C.4, limiting the expansion of fisheries into previously unfished areas.

2.5.1 Scientific Basis for Alternatives to Minimize Adverse Fishing Impacts to EFH

The Magnuson-Stevens Act mandates that the FMP contain measure to minimize, to the extent practicable, adverse effect from fishing on EFH. The EFH final rule establishes that Councils must act to minimize, to the extent practicable, adverse effects from fishing when such effects are more than minimal and temporary in nature (50 CFR 600.815). This is referred to in the remaining sections as the "minimal and temporary threshold." The Risk Assessment process for this EIS sought to geographically delineate where specific habitat/fishing gear combinations exceed the threshold to trigger Council action. The following sub-sections briefly summarize the results of the Risk Assessment and explain how they were applied in development of alternatives.

The Risk Assessment organizes the best available information into a GIS database for addressing the minimal and temporary threshold. There are strengths and weaknesses in the information. The following sub-sections are provided to disclose our capabilities in assessing impacts relative to a minimal and temporary threshold.

An assessment of the minimal and temporary threshold ideally addresses all effects on habitat (i.e. fishing and non-fishing) to produce a map of specific areas where adverse impacts should be minimized. Although the clear focus of the Council's responsibility is fishing impacts, the cumulative effects of all potential impacts are important.

Adverse effect means any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

To isolate areas that have been subjected to adverse effects as described in the EFH Final Rule, the TRC created a decisionmaking framework that identifies fundamental data inputs and interpretation (Figure 2-14). The data inputs are described in detail in the Risk Assessment and include the broad categories of habitat, habitat use, fishing effects, non-fishing effects, and existing protection. Chapters 4 and 5 of the Risk Assessment describe a robust attempt to bring the data inputs together in an interpretive model to output mapped areas of adverse impacts as defined in the EFH Final Rule. This attempt at modeling was

recognized as preliminary, and due to data and time constraints it was not possible to progress the analysis sufficiently to provide a fully integrated quantitative analytical tool capable of identifying areas of impacted habitat and demonstrating the effects of minimization alternatives. A report on the utility of the model by the Council's SSC is contained in Appendix D. The central constraint to the impacts analysis was insufficient data of the necessary resolution to model a relationship between the intensity of fishing effort and effects on habitat. The lessons learned through the modeling process are discussed here to illuminate the analytical capabilities available for the EIS and define the results of the assessment that form the basis for the alternatives.

2.5.1.1 Summary of the Assessment to Determine Adverse Effects and the Application for Developing the Alternatives

Although the impacts model described in the Risk Assessment was considered insufficiently developed for use in quantitative analysis of impacts, reviewers agreed with the authors that the risk assessment provided both essential data sets and relevant lessons for application in the EIS (Appendix D). The reviewers were constructive in separating useful elements for the EIS. The reader should note that analytical limitations are presented with the express purpose of informing decisionmakers so that, where appropriate, precautionary management principles (how to act in the absence of definitive information) can be considered.

State-of-the-art habitat effects research is focused on physical alteration to habitat and changes in biodiversity that result from impact. This means it is not possible to construct alternatives that are specifically targeted at objectives other than these two variables. The relevance of this limitation is that alternatives cannot be quantitatively constructed to increase production of groundfish or enhance ecosystem function.

Another limitation is that the status of habitat in reference to a pristine condition is not knowable through assessment. Three variables are fundamental to assessing the status of habitat: the locations and intensity of fishing impacts, the sensitivity of specific habitat types to specific impacts at differing levels of intensity, and the potential for habitat to recover between impact events. Each of the habitat types on the West Coast probably react differently to different types and intensity of impact; and, have unique rates of recovery. The status of habitat is a balance in how the habitat was affected by an impact and how much recovery takes place between impacts. The impacts model described in Chapters 4 and 5 of the Risk Assessment brought the available information together in a structured model to assess the status of habitat at the scale of the West Coast. Limited information on the relationship between fishing impact and the intensity of fishing effort rendered the results of the model presently unusable for purposes of analysis in the EIS.

Although it is not possible at this time to quantify the status of habitat, several important principles came out of the Risk Assessment process and were utilized to develop alternatives. Figure 2-15 is a theoretical representation of habitat impacts at differing intensities of fishing effort and is used here to illustrate principles for considering the ramifications of habitat impacts in this EIS. The curves represent the intersection of fishing effort and habitat impact and are shown for habitat types of differing sensitivity. The principles are discussed in terms of fishing but hold true for non-fishing and environmental variables as well. They are:

1. Habitat that has not been subject to impact is pristine. This simple point holds true for impacts, regardless of their source. The curves in the figure originate at 0 (for both effort and impact) to demonstrate this principle.

2. The sensitivity of habitat governs the slope of the impact function. This is represented in the figure by showing separate curves for unique sensitivity levels. The curve on the left rises steeply

to show a scenario in which highly sensitive habitat takes relatively little fishing effort to become highly impacted. In theory, a single contact between fishing gear and habitat would have devastating effects on the habitat. The curve to the right shows a scenario for less sensitive habitat where impact increases gradually with increased fishing effort. In theory, repeated contacts between fishing gear and habitat would result in only marginal increases to the overall habitat impact under this scenario.

3. There is a maximal level of impact at which additional fishing effort results in no additional impact. This is demonstrated in the three curves to the left that achieve an asymptote, or leveling off, in impact. At this level of impact, the habitat would be impacted as much as it possibly can be regardless of how much additional fishing effort is applied. Similarly, modest reductions in fishing effort are likely to have little benefit.

4. Habitat has a limited capacity to recover from impact, and recovery is ongoing from some point in time after the impact ceases. This is particularly true in cases where habitat impact is measured in reduced biodiversity where organisms may repopulate an area after impact.

5. Repeated contact with fishing gear will cause the status of habitats to move from left to right along these curves, while recovery between contacts will move the status from right to left back down the curves.

Another important principle that informed the development of alternatives is that adverse impacts to habitat can impair the ability of fish to carry out basic biological functions such as spawning, feeding, breeding, and growth to maturity. Fish, like all organisms, rely on habitat for their survival. The habitat requirements of many fish change depending on the life history stage. Pacific coast rockfish, for example, spend their early life history as eggs and larvae floating in the water column before settling as juveniles on the substrate, where they grow to maturity and reproduce. Although it cannot be quantified, healthy functioning habitat is critical for populations of fish to sustain themselves and there is a level at which adverse impacts to habitat will impair the ability of fish to do so.

Large-scale modification to habitat may have long-lasting or permanent implications at the scale of the ecosystem. Benthic and pelagic habitats are fundamental components of the ecosystems off the West Coast as are the fish and other organisms that rely on them. It follows that large-scale modification to habitat can result in fundamental change to the ecosystem. For example, if a complex habitat that supports reproduction of a species is modified to the point that the species can no longer reproduce successfully there, and the species is unable to adapt and reproduce elsewhere, the survival of the species and its role in the ecosystem would be threatened. The extent of the threat would depend on the extent of the modification (e.g., is all of the habitat non-functional or just a portion?), and the related ability of the habitat to recover and/or the species to adapt to alternative habitats. Some habitats may take a long time to recover or may reach an alternative stable state from which a return to its former state is highly unlikely, even following a complete removal of impacts and thus evolve into a new role in the ecosystem.

In light of this, NMFS and the Council took a precautionary approach to developing the alternatives. That is, although the alternatives cannot be specifically targeted to promote sustainable fisheries with predictable population-level results, the alternatives were developed to reduce adverse impacts in terms of physical modification to habitat and biodiversity. The paucity of quantified, spatially explicit data on adverse impacts, and the extent to which adverse impacts have reduced the ability of groundfish to sustain themselves, functioned as the problem statement around which the alternatives were constructed. The alternatives were deliberately developed to reflect the broad range of available data and present the full spectrum of precautionary choices for decisionmakers to meet the purpose and need of action to minimize the adverse effects of fishing. The remainder of this sub-section discusses the information compiled

through the Risk Assessment and scoping processes and how it was utilized as the basis for specific alternatives. Additional detail is provided under the alternative headings as appropriate. It should be noted that the complete Risk Assessment contains more information than is presented here and is incorporated by reference.

Sensitivity and Recovery Indices

The magnitude and duration of fishing gear effects on habitat are required components of the EIS and are considered here by incorporation of Appendix 10 to the Risk Assessment: *Pacific Coast Groundfish EFH; The Effects of Fishing Gears on Habitat: West Coast Perspective.* This study was done specifically for the EIS in order to put information from global habitat studies in the context of the West Coast. This was necessary because very little direct research on fishing impacts to habitat have been done on the West Coast. Practicable Council action is triggered by adverse effects that are more than minimal and not temporary in nature (50 CFR 600.815). There is a paucity of scientific information from the West Coast to help us understand the location of effects of fishing on habitat that exceed the "minimal and temporary threshold." However, there is significantly more information available from the rest of the world. If the analysis of adverse effects were to rely only on information from studies that were conducted on the West Coast, it would not be possible to make informed judgment on the location and nature of habitat impacts from fishing. In recognition of this problem, the TRC recommended during their February 19-20, 2003, meeting that the global literature be interpreted in the context of the West Coast. In doing so, they recognized that the effects of fishing on West Coast habitats could be inferred from studies conducted in other areas.

In summary, the West Coast perspective study assigns sensitivity values (magnitude of the effect; e.g., minimal) and recovery times (duration of the effect; e.g. temporary) to the habitat type/fishing gear combinations documented on the West Coast. The resulting values were then mapped using GIS.

The process of inference from global literature results in a loss of resolution in some cases. For instance, Appendix 9 to the Risk Assessment describes 30 fishing gears known to be in use (or that have been used) on the West Coast. To consider the global literature in the context of the West Coast, the gear types had to be filtered down into five major categories of dredge, trawl, nets, traps and pots, and hook and line.

Sensitivity values for each habitat type/fishing gear combination are resolved to a four-point scale that represents direct change to habitat and biodiversity as a result of fishing. The sensitivity of habitat is indexed as follows:

0 = No detectable adverse impacts on the seabed; i.e., no significant differences between impact and control areas in any metrics.

1 = Minor impacts such as shallow furrows on bottom; small differences between impact and control sites, less than 25% in most measured metrics.

2 = Substantial changes such as deep furrows on bottom; differences between impact and control sites 25-50% in most metrics measured.

3 = Major changes in bottom structure such as re-arranged boulders; large losses of many organisms with differences between impact and control sites greater than 50% in most measured metrics.

Recovery time is indexed in years.

This information is applied explicitly in alternative C-3.

HSP Profiles and Maps

HSP profiles and maps are summarized in section 2.3.1. This information is applied in alternative C-6.

Maps of Habitat Types and Habitat Use Data

GIS information compiled through the Risk Assessment and brought forward during scoping delineates the known habitat types for the West Coast. Additionally, a database that describes the association of groundfish with habitat types was assembled. Information on the location of and groundfish association with megahabitats (e.g., canyons and seamounts), substrate types (e.g., hard or soft), macro-scale habitat, biogenic habitat, bathymetry, and prey resources (e.g., krill) are examples of the information that was considered in the development of alternatives and used to identify areas of interest. This information forms the basis of alternatives C-5, C-7, and components of C-12 through C-14.

Structure-forming Invertebrate Information

Structure-forming invertebrates are habitat types of biological origin. There is insufficient data on structure-forming invertebrates to base alternatives on distinct polygons in the GIS analysis of habitat types (note that kelp and seagrass are structure forming and are included in the description of habitat types above). However, data from trawl surveys and other sources have been assembled and are described in Appendix B. These trawl surveys are directed to collect groundfish and information for the purposes of groundfish stock assessment, but some indirect information on invertebrates is also obtained. While the protection of structure-forming invertebrates cannot be quantified, enough information exists to perform a qualitative analysis though the effects of the alternatives are largely unknown. This information forms the basis of alternative C-4 and components of alternatives C-7, C-8, C-10, C-12, C-13, and C-14.

A recent innovation by Oceana is their calculation of "biogenic areas" based on trawl survey data. This methodology had not been peer-reviewed as of publication of the DEIS, but was used for components of alternatives C-12 through C-14, as well as the final preferred alternative. During the public comment period, the Council's Scientific and Statistical Committee reviewed the methodology and approved use of the information (See Appendix D).

Fishing Gear Descriptions

Appendix 8 of the Risk Assessment contains a detailed review of the fishing gear deployed on the West Coast, including potential impacts of each gear type, and was utilized in the development of alternatives C-9, C-11, C-12, C-13, and C-14.

Additionally, the effects of the 2000 trawl footrope restriction and associated landing limits on the spatial distribution of fishing effort within certain habitat types is discussed in Appendix 19 to the Risk Assessment and is the basis for alternative C-2.

Spatially Explicit Estimates of Fishing Effort and Revenue

Information from trawl logbooks was used to calculate spatially explicit estimates of trawl effort and revenue, which were utilized to site area-based alternatives in consideration of economic value. Similar information on fixed-gear and recreational fisheries does not exist at the scale of the West Coast. The information was considered in the development of all the area-specific alternatives, but most explicitly in C-3, C-4, C-12, C-13, and C-14, where adjustments were made for revenue thresholds.

Public Proposals and Other Information

Public proposals and other information were also used in the development of alternatives and are explained in the context of alternatives C-4, C-8, C-10, and C-12 through C-14.

Summary Conclusions

In summary, at this time NMFS and the Council are not able to make a definitive determination that adverse effects from fishing to EFH have occurred or are occurring. However, we have taken a precautionary approach, based on the best available science, to developing the alternatives based on the potential for adverse effects to EFH. The precautionary approach is justified by the potential for adverse effects to significantly impair the ability of fish to carry out basic biological functions. Based on the precautionary approach, and to make a broad range of choices available to decisionmakers, alternatives were developed from each available source of information as compiled through the risk assessment and public proposals.

2.5.2 Description of Impacts Minimization Alternatives

Alternative C.1: No-Action

Amendment 11 to the FMP, which originally incorporated EFH-related SFA requirements into the groundfish FMP, did not include measures to minimize fishing impacts on EFH. However, as discussed in Chapter 1, measures intended to reduce bycatch of overfished species may have a collateral beneficial effect on EFH. Restrictions on the use of large footrope gear have had a demonstrable effect on fishing behavior and the types of habitat that are accessible. As discussed in the description of Alternative C.2, as a result of these restrictions fishermen have avoided rocky areas, which are not only important habitat for some overfished species but may also be more sensitive if they harbor concentrations of benthic invertebrates such as corals and sponges. RCAs have closed areas to some forms of bottom-contacting fishing gear and thus may have some mitigative effect. The boundaries of these areas are based on depth ranges where, according to catch records, bycatch of overfished species is highest. Along parts of the coast where the continental shelf is narrow and the continental slope is steep, the RCAs are not very wide and may only affect a small portion of habitat. Furthermore, RCAs are designed using catch information; the functional importance of specific habitat types is not a factor in determining their extent.

Alternative C.2: Depth-based Gear-specific Restrictions (Component of Final Preferred Alternative)

The groundfish FMP allows fishing vessels to use large footrope, small footrope, and mid-water or pelagic trawl gear as defined at 50 CFR 660.302 and 660.322(b). Specific restrictions on the use of these gear types are established as part of the biennial harvest specifications process. The most recent biennial management period began on January 1, 2005. The Council also recommends inseason adjustments to these management measures, which may include gear-related measures.

This alternative contains three options closing waters shoreward of specific depth contours to large footrope trawl gear and fixed gear. The footrope runs along the bottom of the net opening and its size is regulated to dictate the maximum size of rollers that can be affixed to the footrope. Without larger footrope gear, bottom trawl nets snag more easily on rough, irregular terrain; thus restrictions on footrope size discourage fishing in rocky areas and have the potential to minimize adverse impacts to EFH. A recent study by Oregon State University researchers (Bellman and Heppell 2004) provides the rationale for this alternative. Bellman's work demonstrated that restrictions on the use of large footrope gear and associated landing limits, first implemented in 2000 in order to reduce catches of certain overfished

rockfish species, reduced bottom trawling in rocky habitat. However, this research did not conclusively separate the effect of limiting the large footrope gear alone, without the connection to associated landing limit changes.

Although the impacts of deploying fixed gear, such as longlines and traps, is considered less severe than that resulting from bottom trawling, these gear types can access the rocky habitat currently inaccessible to small footrope trawl gear. Therefore, this alternative closes shoreward areas to fixed gear.

Large footrope trawl gear is prohibited in areas shoreward of the RCAs north of Cape Mendocino, California. The seaward RCA boundary for limited entry trawl in the 2005-2006 biennial management period is 200 fathoms north of 38° N latitude and 150 fathoms south of 38° N latitude. The seaward boundary of the limited entry fixed gear RCA for 2005-2006 is 100 fathoms north of 40° 10' N latitude and 150 fathoms south of that line. Although prohibited to the shoreline off of Washington, fixed gear is allowed inside of a shoreward boundary varying between 20 fm and 60 fm, depending on location and season, off of Oregon and California.

This alternative contains three options for closures, which are similar to those in effect because of the RCAs and related gear restrictions. However, there are some important distinctions. First, the current closures are established and modified on a continuing basis in order to reduce bycatch of overfished species. Thus, their boundaries vary over time, although because of the long rebuilding periods for many of the overfished groundfish species, RCAs are likely to be in place for a long time. This alternative would establish permanent gear-specific closed areas intended not just to address overfished species bycatch, but also the effects of these gear types on bottom habitat. Second, these options would effectively close the nearshore areas currently open to limited entry fixed gear off of Oregon and California. Third, all fixed gear—not just those used by groundfish limited entry permit holders—would be prohibited in the designated closed areas. For example, the Dungeness crab trap fishery, managed by the states, is not subject to current limited entry fixed gear closures, but would be prohibited in the closed areas identified in this alternative.

This alternative has three options:

> **Option C.2.1**: Prohibit the use of large footrope trawl gear shoreward of 200 fm and prohibit all fixed gear shoreward of 100 fm north of 40°10' N latitude and 150 fm south of 40°10' N latitude. (See Figure 2-15)
>
> **Option C.2.2**: Prohibit the use of large footrope trawl gear throughout the EEZ and prohibit all fixed gear shoreward of 100 fm north of 40°10' N latitude and 150 fm south of 40°10' N latitude. (See Figure 2-16)
>
> **Option C.2.3**: Prohibit the use of large footrope trawl gear shoreward of 200 fm and prohibit all fixed gear shoreward of 60 fm coastwide. (See Figure 2-17)

Alternative C.3: Close Sensitive Habitat

Habitat sensitivity and recovery index values were developed as part of the fishing impact model component of the comprehensive risk assessment and are described in the preceding sub-section. Although the SSC did not approve the impact function component of the model for use in developing the alternatives in this EIS, the methodology for developing the indices was approved. Based on a comprehensive survey of the scientific literature on the effects of fishing on different habitat types, index values were developed and assigned to each of the unique habitat areas (or polygons) identified in GIS. The sensitivity index uses a zero to three integer scale (See Section 2.5.1.1). Each interval in the scale is

based on a descriptive assessment of effects. Recovery index values are the number of years required, in the absence of fishing, for a habitat to return to a pre-existing state. Index values are specific to a particular gear type. In other words, a particular habitat will have different index values for dredge gear, bottom trawl, nets, hook-and-line, and pots and traps. This alternative focuses on those habitats that, according to the sensitivity and recovery index, are the most sensitive to impact and the slowest to recover.

Area closures are defined using these gear-specific sensitivity and recovery index values. Habitat areas above index value thresholds for any gear type, as specified in the following options, are closed to all fishing. This alternative has four options:

> **Option C.3.1**: For each gear type, those areas where the sensitivity index value is greater than or equal to two and the recovery index value is greater than one are identified. The combined area is then screened to include only the area where the cumulative number of hours trawled from 2000 through 2002 is less than 100 hours. The resulting areas are closed to all fishing (i.e., to all gear types). (See Figure 2-18)
>
> **Option C.3.2**: For each gear type, those areas where both the sensitivity and recovery index values are greater than or equal to 0.5 are identified. The combined area is then screened to include only the area where the cumulative number of hours trawled from 2000 through 2002 is less than 100 hours. The resulting areas are closed to all fishing (i.e., to all gear types). (See Figure 2-19)
>
> **Option C.3.3**: The same as Option 1 except no adjustment is made for trawl effort. (See Figure 2-20)
>
> **Option C.3.4**: The same as Option 2 except no adjustment is made for trawl effort. (See Figure 2-21)

Alternative C.4: Prohibit the Geographic Expansion of Fishing (Component of the Final Preferred Alternative)

Under this alternative, areas that have not been fished recently (2000-2002) would be closed to fishing to protect areas that are potentially pristine. This alternative would prevent impact to organisms such as deep-sea corals that may occur in pristine areas and are particularly vulnerable to maximal impact in association with a single fishing event (Roberts and Hirshfield 2004). The alternative is modeled after a provision in Senate Bill 108-1953 that would create "coral management areas" where the seafloor has not been affected by fishing for a qualifying period. Because there is relatively little known about the abundance and distribution of deep sea coral, areas that have not been impacted are potentially pristine habitats. This alternative takes a precautionary approach to protection of such habitats.

The qualifying period, the years 2000-2002, was chosen to represent the time period during which regulations began to become more stringent in response to overfishing. The years after 2002 were excluded from the qualifying period; however, to avoid inclusion of areas, such as the RCAs, that have been closed on an annual and inseason basis to foster rebuilding of overfished species.

This alternative has two options:

> **Option C.4.1**: Trawl fisheries would be prohibited from fishing in areas that were untrawled during 2000-2002 (See Figure 2-22).

Option C.4.2: Apply the expansion limit to all bottom-tending gear types. Due to the absence of geo-referenced fishing effort data for fixed-gear fisheries, the closure would extend west from a line approximating the 2,000 m (1,094 fm) depth contour to the seaward margin of the EEZ (See Figure 2-23).

Alternative C.5: Prohibit a Krill Fishery

Krill, or euphausiid shrimp, are important prey for a wide range of fish species along the West Coast. As such, they may be primary prey for groundfish, or linked to groundfish in other ways through the food web (i.e., they are prey for groundfish prey). For this reason, they could be considered a part of pelagic EFH, meriting protection from the direct effects of fishing. A report to the Council (Smith 2004) notes that although eight krill species form the bulk of the euphausiid community in the California Current System, two cold-water species, *Euphausia pacifica* and *Thysanoessa spinifera*, form dense surface aggregations likely to serve as prey for fishery target species.

At their November 2004 meeting, the Council considered development of a formal prohibition on directed fisheries for krill in Council-managed waters. State laws currently prohibit krill landings by state-licensed fishing vessels at California, Oregon, and Washington ports. Thus, any Council action would provide for consistent federal and state management. There are currently no directed krill fisheries in Council-managed waters. The Council considered three options for implementing such a ban:

- Use the List of Fisheries established under §305(a) of the Magnuson-Stevens Act and published at 50 CFR 600.725(v). The list identifies all fisheries under the authority of each regional Council and all fishing gear used in such fisheries. It provides a means to prohibit the entry of new gear types into U.S. fisheries until a Council has had an opportunity to evaluate whether the entry would be consistent with the Council's management programs. Gear used to harvest krill would be prohibited through the List of Fisheries.

- Incorporate krill as a management unit species in the Council's Coastal Pelagic Species (CPS) FMP. The authority under this FMP could then be used to prohibit krill fisheries.

- Designate krill as forage under one or more FMPs. The Council's FMPs would be amended to designate krill as forage for managed species and then prohibit fishing for krill. This approach was used by the North Pacific Council, which amended its fishery management plans for Gulf of Alaska groundfish and Bering Sea groundfish to prohibit krill fishing.

- Designate krill as a component of EFH as part of this EIS and prohibit fisheries that target it.

This alternative would implement the last of the four proposals described above. However, at their November 2004 meeting, the Council decided to address this issue through an amendment to the CPS FMP due to the likelihood it could be implemented more quickly. Therefore, it was not chosen as a preliminary preferred alternative in this EIS.

Alternative C.6: Close Hotspots

This alternative prohibits trawling in habitat that has high probability of being EFH for a large number of groundfish as a means of focusing protection in areas of high groundfish diversity. First, for each modeled species the top 20% HSP area is found (see Section 2.2 for a discussion of this methodology). These GIS habitat polygons are then screened to include only those associated with 50 or more species/lifestage combinations. The resulting area is then closed to bottom trawling. Although these areas are termed "hotspots" because of their presumed value to a large number of groundfish, Figure 2-24

shows that most waters shallower than about 200 m would be closed to bottom trawling under this alternative.

Alternative C.7: Close Areas of Interest (Component of the Final Preferred Alternative)

This alternative closes any combination of the areas of interest HAPCs designated under Alternative B.7 to fishing by specified gear types. (The 21 areas of interest listed under Alternative B.7 are underwater features, such as seamounts and submarine areas, or are currently under some form of protection.) Figure 2-25 shows these areas of interest. Closures affect the following activities due to their potential for adverse effects:

Option C.7.1: Close areas of interest to bottom trawling.

Option C.7.2: Close areas of interest to all bottom-contacting activities.

Alternative C.8: Zoning Fishing Activities

Under this alternative NMFS limits the use of bottom-tending fishing gear to specified zones where the agency determines that such activities can be conducted without altering or destroying a significant amount of habitat. This alternative was put forward by the EIS Oversight Committee as a comprehensive strategy for minimizing adverse effects to EFH and adaptive management.

First, all areas deeper than the 2,000 m (1,094 fm) contour along the continental slope extending to the maximum westward range of groundfish EFH are closed to certain bottom-tending fishing gear types, according to the options described below. Second, a five-year transition period to gear specific zones is established for the remaining area inside the 2,000 m contour, which remains open to these activities, subject to any other restrictions, for the five years from implementation (e.g., 2007-2011). Third, during this five-year period, NMFS conducts the research necessary to delineate zones where specified fishing activities would be permitted. At the end of the five-year transition period, the gear-specific zones come into effect and any remaining unzoned area is closed to affected gear types, according to the options described below. (Restrictions applied outside 2,000 m remain in effect.)

Option C.8.1: Fishing zones are established for bottom-contact trawls, dredges, and similar bottom-tending mobile fishing gear. Other bottom-contacting gear types are unaffected by the zoning system, including the prohibition outside 2,000 m (Figure 2-26).

Option C.8.2: Fishing zones are established for all bottom-contacting gear types, including bottom longlines, traps, and pots. The immediate closure outside of 2,000 m applies to all bottom-contacting gear types (Figure 2-26).

In addition to establishing the zoning system, NMFS will conduct a gear substitution and modification research program, intended to redesign bottom fishing gear to reduce damage to habitat. This program will have a significant cooperative research element by employing fishermen in the design and testing of new gear.

The zoning system will be regularly modified to incorporate new information about habitat sensitivity and recovery factors, gear impacts on habitat, and to accommodate use of newly developed or modified gear.

Alternative C.9: Gear Restrictions (Component of the Final Preferred Alternative)

Changing the way fishing gear contacts habitat through gear modification can be an effective way to minimize adverse impacts on habitat. Appendix 8 to the Risk Assessment describes all of the fishing gears that are, or have been, utilized on the West Coast and includes a description of how the gear interacts with benthic habitat. This alternative includes specific gear modifications and prohibitions that are based on that interaction due to the potential for adverse impacts to EFH. Under this alternative the following gear restrictions would be implemented in areas identified as EFH for groundfish:

- C.9.1: Prohibit roller gear larger than 15 inches on bottom trawls.
- C.9.2: Prohibit the use of flat trawl doors (i.e., require cambered doors).
- C.9.3: Limit the length of a single longline groundline to 3 nm.
- C.9.4: Employ Habitat-Friendly Anchoring Systems
- C.9.5: Prohibit dredge gear.
- C.9.6: Prohibit beam-trawl gear.
- C.9.7: Prohibit set-gillnets in waters deeper than 60 fm.
- C.9.8: Prohibit dingle bar gear (troll groundfish gear).

The restrictions are intended to make fishing gear less damaging to bottom habitat.

Alternative C.10: Central California No-trawl Zones (Component of the Final Preferred Alternative)

This alternative is based on a project being undertaken by two environmental advocacy organizations, The Nature Conservancy (TNC) and Environmental Defense Fund (EDF). It involves a public-private partnership under which private funds are used to purchase groundfish limited entry trawl licenses and vessels in concert with the designation, through the Council and NMFS, of no-trawl zones off the central California coast. Figure 2-27 shows the extent of the project area. Any closed areas will be located within this area. TNC and EDF provided a technical write-up of their proposal that is included in Appendix F.

The project area extends from Point Conception to Davenport, California, and includes adjacent offshore seamounts (Gumdrop, Guide, Pioneer, Davidson, and Rodriguez). This area has high biological diversity and ecological value to groundfish and their habitats. It contains nearly the full range of habitat types found on the continental shelf and slope, including estuaries, nearshore rocky reefs, kelp forests, highly diverse soft and mixed bottom habitats, deep canyons, offshore banks, and seamounts. These diverse habitat types are important for the support of a correspondingly rich array of species, including 21 cetacean species, six pinniped species, 184 species of shore and sea birds, and hundreds of fish and invertebrate species. In addition, there is evidence suggesting that benthic biodiversity peaks in upwelling zones found in this area.

TNC/ED have identified 23 permit holders they believe regularly trawl inside the project area. Most homeport in Morro Bay, Moss Landing, Monterey, or Half Moon Bay. TNC/EDF intend to purchase a significant majority of the bottom trawling permits and vessels in this region if the Council/NMFS designates a significant portion of the project area as no-bottom-trawl zones. TNC/ED will identify areas they think should be designated no-trawl zones using the GIS data developed as part of this EIS in combination with a participatory process involving trawl fishermen in the project area. If this alternative is adopted as an FMP and regulatory amendment, these areas will be closed to bottom trawling by NMFS

once TNC/EDF have negotiated purchase contracts or options for at least half of the limited trawl permit holders they have identified as operating in the project area. Closed areas and effort reduction are cited by NRC as priority measures to reduce adverse impacts to EFH (NRC 2000).

Alternative C.11: Relax Gear Endorsement Requirements

This alternative would allow fishermen to choose among gear types and potentially use gears that, according to the sensitivity and recovery index, are less damaging to EFH. Vessels holding a groundfish limited entry permit account for a large portion of groundfish landings. Currently, limited entry permits include a gear endorsement specifying the type of gear the permit holder may use. These endorsements identify three gear categories: trawl, longline, and pot. In addition, longline and pot gear permit holders may also have a sablefish endorsement. Permit holders with this species-specific endorsement may participate in the high-value primary sablefish fishery and are allocated vessel-specific catch quotas, known as tier limits because the endorsements fall into one of several categories, or tiers, with different catch quotas. This regime is further complicated by measures that allow a fisherman to "stack" several sablefish-endorsed permits for use by a single vessel, making him eligible for the combined quota of the individual endorsements.

Under this alternative, gear endorsements are relaxed but the sablefish endorsement is not. This would allow permit holders to switch gear types, providing fishermen greater flexibility in changing strategies based on prevailing conditions in the fishery. In terms of mitigating habitat impacts, a benefit may occur if fishermen with trawl-endorsed permits switched to longline or pot gear, since trawl gear is indexed as more damaging to benthic habitat. However, implementing this alternative would also be complicated from a management perspective if it made it more difficult to predict total catches. Currently, management measures, primarily cumulative landing limits, are established according to regulatory categories by modeling predicted total catch for each sector under different cumulative limits. If vessels could freely switch gear during the fishing year, catches in a given regulatory sector might unexpectedly go up or down.

Alternative C.12: Close Ecologically Important Areas to Bottom Trawl (Component of the Final Preferred Alternative)

As discussed in Section 1.7, this EIS is being prepared pursuant to a joint stipulation in *AOC v. Daley*. According to the subsequent joint stipulation, NMFS proposed to the Council that an alternative specified by the plaintiffs, represented by Oceana, be adopted and fully analyzed in the DEIS. Plaintiffs provided their alternative to NMFS as a "specific fishery management action" before the Council meeting at which the alternatives were adopted for analysis in the DEIS. Oceana gave the Council a presentation of their proposal at the September 2004 meeting and a written description at the November 2004 meeting. The Council moved both to include it for analysis in the DEIS and identified it as one of their preliminary preferred alternatives (Figure 2-28). Oceana provided the following text as a description of the alternative. Additional technical description is contained in Appendix C. Oceana subsequently revised this alternative. The revisions were considered by the Council and are described in the Final Preferred Alternative.

> *Draft Plain text description for draft EIS* *January 3, 2005*
>
> ***Comprehensive Collaborative Mitigation Alternative:***
>
> *The Comprehensive Collaborative Alternative seeks to maintain vibrant fisheries while protecting habitat and biodiversity. The Alternative focuses on reducing the impacts of bottom trawling on Essential Fish Habitat. According to the National Academy of*

Sciences (2002) bottom trawling reduces habitat complexity, causes shifts in benthic (bottom-dwelling) communities, and reduces productivity of benthic habitats. The Academy recommends three management measures to reduce the effects of bottom trawling: area closures, gear modifications, and effort reduction. The Alternative employs all three of these management measures, while maintaining commercial fishing opportunities, by limiting fishing to areas where trawling is currently taking place (freezing the existing bottom trawl "footprint"), closing specific areas of sensitive habitat to bottom trawling within the existing bottom trawl footprint, limiting roller gear size, and requiring ongoing research and monitoring.

Spatial Management

The spatial management measures of the Comprehensive Alternative define the areas that are open and closed to bottom trawling. The bottom trawl footprint was defined as those areas where three or more vessels fished with bottom trawl gear between 2000 and 2003. The period from 2000-2003 was selected to reflect current trawling activities, while recognizing that there is variability in where trawling occurs each year. The area within the bottom trawl footprint would remain open to bottom trawling, with the exception of the areas described below. In addition, this alternative does not supercede existing closures and other management measures within the bottom trawl footprint.

With the Comprehensive Alternative, within the bottom trawl footprint, specific areas of complex sensitive habitat would be closed to bottom trawling. Specific areas of complex sensitive habitat were identified using all available datasets and applying the following criteria:

- *Hard substrate, including rocky ridges and rocky slopes (PSFMC 2003)*
- *Habitat-forming invertebrates (Etnoyer and Morgan 2003)*
- *Submarine canyons and gullies (PSFMC 2003)*
- *Untrawlable areas (trawl hangs and abandoned trawl survey stations) (Zimmerman 2003)*
- *Seamounts (PSFMC 2003)*
- *Highest 20% habitat suitability for overfished groundfish species as defined by NOAA (PFMC 2004)*

All data was plotted in GIS and considered in the selection and placement of areas open and closed to bottom trawling, with consideration made to practicability and continued fishing opportunities. For a detailed description of the methodology used in the development see the complete description of this Alternative submitted to the PFMC (available at http://www.pcouncil.org/groundfish/gfefheis/oceana_alternative.pdf).

Figure 1: Spatial Management Summary

[Area of bottom trawl footprint]

minus

[Complex sensitive habitats]

minus

[Existing management closures]

equals

[Area open to bottom trawling]

The scientific justification for closure recommendations is based on the following:

Hard substrate

Hard substrates, which include rocky ridges and rocky slopes, are one of the least abundant benthic habitats, yet they are among the most important habitats for fishes (Hixon et al. 1991, Pacific EFH PDEIS 2005). Hard substrates are also the seafloor substrate most sensitive to bottom trawling (NAS 2002, Pacific EFH PDEIS 2005).

Habitat-forming invertebrates

Deep sea corals and sponges provide three dimensional structures that form habitat for commercial groundfish, shellfish, and other marine life (Husebo et al. 2002; Krieger and Wing 2002, Malecha et al. 2002, Heifetz 2002). Structure-forming invertebrates (or biogenic habitat) are sensitive to impacts from bottom trawl gear (NAS 2002, Anderson et al. 2003, Engel and Kvitik 1998, Krieger 2001, Malecha and Stone 2003, MacDonald et al. 1996, Kaiser et al. 2000, Mortensen et al. 2003, Van Santbrink and Bergman 1994).

An extensive database was used to determine "hotspots" where the presence of habitat-forming invertebrates was frequently recorded or large samples of these invertebrates occurred. The database comprised records from AFSC slope and shelf trawl surveys from 1977 to 2001, NWFSC slope and shelf trawl surveys from 2001 to 2003, and MCBI's database of deep sea coral records. MCBI's database includes coral records from the California Academy of Sciences, Smithsonian Institution, MBARI, and Scripps compiled from various research cruises and scientific collections (Etnoyer and Morgan 2003).

For a detailed description of the methodology used to utilize data on habitat-forming invertebrates, see the complete description of this Alternative submitted to the PFMC (http://www.pcouncil.org/groundfish/gfefheis/oceana_alternative.pdf).

Submarine canyons and gullies

Submarine canyons are known to be areas of enhanced productivity due to current upwelling zones (Freeland and Denman 1982). For this reason, canyons show enhanced concentrations of benthic invertebrates (Haedrich et al. 1980; Sarda et al. 1994; Vetter and Dayton 1999), plankton (Cartes et al. 1994; Macquart-Moulin and Patriti 1996), demersal fishes (Stefanescu et al. 1994), and whales (Kenney and Winn 1987; Schoenherr 1991) relative to surrounding areas on the slope and shelf. Brodeur (2001) found dense concentrations of Pacific ocean perch (Sebastes alutus) and krill associated with biogenic habitats in a Bering Sea submarine canyon, while areas with damaged biogenic structures had far fewer rockfish, and areas in the canyon without biogenic structure had no rockfish.

Untrawlable areas

The Zimmerman (2003) database includes all records from the NMFS West Coast Triennial Trawl Survey where major trawl net hangs were recorded. Since these areas are considered unsuitable for trawling, the assumption is that these records indicate areas of high structural complexity, such as boulders or rock outcrops (Zimmerman, pers. com.). Trawl hangs (or substrate/structure that induces a trawl hang) provide habitat for juvenile fish (Link and Demarest 2003).

Seamounts

Seamounts are sites of enriched biological activity relative to the surrounding waters (Mullineaux and Mills 1997, Dower and Perry 2001, Haney et al. 1995). Koslow et al. (2001) conducted a survey of Tasmanian seamounts where 30% of species identified were new to science and 30-60% were found nowhere else on earth. The rarity and uniqueness of seamount faunal communities provides strong scientific justification for a highly precautionary approach (de Forges et al. 2000, Stocks 2004, Probert et al. 1997).

Highest 20% habitat suitability for overfished groundfish species

Habitat suitability modeling performed in the Habitat Comprehensive Risk Assessment (PFMC 2004) identified areas of the highest suitability for overfished groundfish species. The proposed spatial management measures in this Alternative were selected to ensure protection of habitat important for overfished groundfish species.

Other management measures

In addition to the spatial management measures determining open and closed areas to bottom trawling the following measures would apply:

- *Set a maximum footrope size of eight inches on bottom trawl gear within open area*
- *Require Vessel Monitoring Systems (VMS) on all bottom trawl vessels with positions recorded every 5 minutes*
- *Increase onboard observer coverage on bottom trawl vessels to a level determined to be necessary by NOAA to estimate annual bycatch of habitat-forming invertebrates*
- *Establish a process for setting a limit on the bycatch of habitat-forming invertebrates*
- *Require ongoing research including comprehensive benthic mapping*

Tribal fisheries

This alternative does not apply to those Tribal fisheries with allocation rights within the customary and accustomed Tribal fishing areas given present level of participation and distribution of bottom trawl groundfish treaty fisheries, unless the Fisheries Service concludes that restrictions are necessary for conservation. The Fisheries Service should consult with the Tribes to implement conservation measures, when required, that would affect Tribal fisheries.

Conclusion

This Alternative considered the interrelatedness and spatial arrangement of complex sensitive habitat criteria in relation to areas prosecuted by bottom trawl fisheries to develop an approach to manage the effects of bottom trawling on habitat. The Alternative employed all available data to develop a comprehensive approach to protect Essential Fish Habitat, as required by law, for the Pacific Coast while maintaining vibrant commercial fisheries.

Alternative C.13: Close Ecologically Important Areas to Bottom-contacting Gear (Component of the Final Preferred Alternative)

This alternative, identified by the Council at their November 2004 meeting, is a variation on Alternative C.12. (Because Alternative C.12 was submitted by an outside party, pursuant to a stipulation between NMFS and the plaintiff, represented by Oceana, the Council decided not to modify the alternative by adding options, as is the case with some of the other alternatives. Therefore, this alternative and Alternative C.14, are variations on Alternative C.12, and are identified separately.) Under this alternative, the areas identified in Alternative C.12 (Figure 2-28) are closed to all bottom-contacting gear types because of their potential impact on EFH, defined as both fixed gear (longlines, pots, and traps) and bottom trawl. The open area component would also apply; for the same reason as discussed under Alternative C.4.2, this open area would be defined as waters shoreward of the 2,000 m depth contour not in closed areas.

Alternative C.14: Close Ecologically Important Areas to Fishing

This alternative, identified by the Council at their November 2004 meeting, is a second variation on Alternative, C.12. Under this alternative, the areas identified in Alternative C.12 (see Figure 2-28) are closed to all fishing to provide a full range of precautionary choices for minimizing adverse effects from fishing to EFH. The open area component would also apply; for the same reason as discussed under Alternative C.4.2, this open area would be defined as waters shoreward of the 2,000 m depth contour not in closed areas.

2.6 Research and Monitoring Alternatives

The Council is required by regulation to review the EFH provisions of their FMPs at least every five years (50 CFR 600.815(a)(10)). This requirement was established in the EFH final rule by NMFS to accommodate progress in our scientific understanding of marine habitat. The five-year review cycle is a mandatory checkpoint for the Council to consider new science and amend the FMP if necessary. Information about the location, function, and consequences of human activity on habitat underpins efforts to conserve EFH and address this review requirement. In fact, development of the Risk Assessment described in Appendix A brought to light a variety of data gaps, which have made it difficult to quantify adverse impacts to EFH resulting from human activities, including fishing. The action alternatives described in this section identify measures that the Council and NMFS could implement to increase scientific understanding of groundfish habitat and thereby improve the conservation and management of EFH. The alternatives are not exclusive and more than one may be a component of the final action that results from this EIS.

Alternative D.1: No Action

This section provides an overview of the status of habitat-related research and monitoring on the West Coast.

<u>Habitat and Associated Biological Research</u>

The Risk Assessment involved a data consolidation phase in which the best available ecological, environmental, and fisheries information was reviewed and incorporated into appropriate databases, in consultation with scientific advisory committees and agency scientists. Specific information assembled into a GIS and applied to the identification and description of EFH alternatives including West-coastwide distributions of:

- Benthic substratum types (including maps on data quality in some areas)
- Estuaries
- Canopy kelp
- Seagrasses
- Bathymetry
- Latitude

Also considered in identifying and describing EFH alternatives were data on:

- Presence/absence distribution of some structure-forming invertebrates
- A general description of pelagic habitats
- Associations among groundfish and benthic substratum types

The ultimate goal is to delineate EFH in terms of its contribution to rates of growth, reproduction, survival, and production of the diverse group of groundfishes on the West coast. Currently, our understanding of EFH for many of these groundfish species is based on the distribution of presence/absence data on late-juvenile and adult stages of the fishes and their associated habitats; data on habitat-specific densities is available for only a few species, and there is fewer data to evaluate habitat-specific productivity. Assessing attributes and functions of EFH remains especially difficult in deep-water marine environments because these assessments require advanced and expensive technology such as remotely operated vehicles, manned submersibles, and other types of remote sensing devices.

There is a critical need for comprehensive, detailed, and accurate information on benthic habitats and associated groundfish assemblages on spatial scales relevant to fishery management and habitat protection. Development of more efficient and effective visual and acoustic methods to survey deepwater benthic habitats and fishes is ongoing, especially in complex, diverse habitats that are difficult to assess with conventional survey tools. Additionally, core nursery grounds and spawning areas, both benthic and pelagic, need to be identified for fully-informed protection of these areas to be considered. There also is a critical need to understand the relationship between large climate events and abundance, growth, spawning success, and survival of groundfish species.

Currently there are several efforts underway to create maps of seafloor habitats on the West coast, including those used here to identify EFH alternatives. These efforts have been facilitated by the development of a unifying seafloor classification system for benthic habitats (Greene et al. 1999, 2003). While these efforts represent the first delineation of rocky and unconsolidated seafloor substrata, they are just first step in describing, quantifying, and understanding benthic habitats throughout the entire range of groundfish species on the West coast. These databases and maps currently are considered preliminary because of varying levels of data quality and verification (ground-truthing), as well as the limited spatial coverage of some of the information. Detailed mapping of groundfish habitat has been accomplished in relatively few important areas, such as offshore banks of the Southern California Bight, Monterey Bay, California, and Heceta Bank, Oregon, and is slowly being extended to other areas of the Coast. It is absolutely imperative that the databases and maps be revised and improved on a regular schedule as new information is collected, and that these valuable baseline habitat maps be maintained and made easily accessible to the greater marine resources community. These data are critical not only in the identification of EFH but in comparative risk assessment of anthropogenic impacts (e.g., fishing gears; pollution; dredging; etc.) to these habitats.

Settled juveniles and adults of many species of groundfishes, rockfishes in particular, are difficult (or impossible) to accurately appraise with traditional survey methodologies due to the close association

between many of these species and their rugged, rocky heterogeneous habitats. Consequently, alternative techniques, using laser line systems and direct observations along quantitative transects conducted from submersibles in various habitats, are being developed to improve assessments. This approach is especially critical when focusing on benthic habitats of extreme heterogeneity and biological assemblages of high diversity.

Identifying EFH for pelagic groundfish life history stages is a critical line of research that is largely absent in the EFH assessment of alternatives. New technologies, such as airborne LIDAR, are being developed to identify near-surface pelagic stages of some species. Coastwide collection and modeling of relevant information, such as the multi-decadal databases developed from CalCOFI surveys of fish eggs and larvae and from mid-water surveys of newly recruited groundfishes and associated physical oceanographic aspects of habitat (i.e. temperature and salinity from shipboard and satellite remote sensing), are ongoing efforts to better understand the relationship between the structure and function of pelagic habitats and the recruitment, survival, and productivity of managed fish species. Enhanced oceanographic monitoring systems are being developed to meet the need to understand species and climate/ocean interactions in modifying groundfish production.

Research on the distribution and function of structure-forming invertebrates, particularly as components of EFH for groundfish, is just beginning. Only since December 2003 did scientific and technical information on presence/absence distribution and habitat associations of some of these species become available for inclusion in this EIS. Ongoing research includes the systematics, distribution, and abundance of structure-forming invertebrates (particularly corals, sponges, anemones, sea pens, etc.) in deep water. A critical need is to understand the potential role of these species as groundfish EFH in continental shelf and slope ecosystems. Because these large invertebrates enhance the diversity and structural component of fish habitat and are vulnerable to impacts by at least some fisheries, they may signify HAPC.

Research on Anthropogenic Impacts to EFH

The evaluation of anthropogenic impacts to EFH in this EIS was based on sensitivity indices of various types of benthic habitats to disturbance or influence by various types of fishing gears, and on rates of recovery from such disturbances. These indices and rates were estimated from limited information, much of which derived from studies conducted outside our West coast region of interest.

Research on impacts of fishing to groundfish habitat should include objectives to improve our understanding of the ecological effects of fishing on the biodiversity and trophodynamics of ecosystems, the evaluation of gear impacts to marine benthic habitats on the shelf and slope, and the development of ways to reduce adverse impacts, including the use of marine protected areas, modified fishing gear, and bycatch information. To date, the best available science on fishing impacts to benthic habitats is limited to observations of modification to some physical components of habitats and associated changes in biodiversity. Understanding functional impacts (i.e. how physical modification of the ecosystem affects groundfish productivity) begins with the baseline characterization and cataloging of habitats described in this document.

Some critical research needs related to fishing impacts and groundfish populations include:

- estimating rates of impacts of specific fishing gears on the diverse habitat types found on the West coast;
- estimating the rates of habitat recovery from both chronic and acute disturbances;

- quantifying population and ecosystem effects resulting from fishing impacts;
- describing trophodynamic changes related to fishing impacts;
- evaluating the role of MPAs in management of fisheries and habitats; and
- evaluating the influence of MPAs on production, rebuilding, and long term sustainability of groundfish.

The alternatives to the status quo are focused primarily on actions within the authority of the Council and NMFS to monitor fishing-related impacts to EFH. NMFS conducts extensive fishery-related research relevant to groundfish and has a variety of methods to monitor these fisheries. Section 7.1 in the 2005-2006 groundfish harvest specifications FEIS (PFMC 2004) describes groundfish monitoring programs carried out by NMFS, the states, and tribes, and is hereby incorporated by reference. Current monitoring programs especially relevant to the alternatives described here include the limited entry trawl logbook program, the West Coast Groundfish Observer Program, and VMS covering limited entry trawl and fixed gear vessels. These programs are primarily intended to monitor discards and landings of groundfish and to enforce current harvest limits and area restrictions. There is no component specifically intended to monitor the effects of fishing on EFH.

Alternative D.2: Expanded Logbook Program (Component of the Final Preferred Alternative)

Currently, groundfish limited entry trawl vessels are required to record information on the time and location of fishing activities, along with estimates of catch composition, in a logbook. Some of these data are entered into the Pacific Fisheries Information Network (PacFIN) data system and may be accessed by managers. Information on fishing location, albeit limited because only tow set positions have been entered into the database, has proved invaluable to managers. Tow haul positions are now being incorporated into the database as well, to provide additional spatial information on fishing location. Knowing the spatial distribution of fishing effort is especially important to an evaluation of the effects of fishing on EFH. One of the most important data gaps hampering the full development of the fishing impacts model component of the comprehensive risk assessment has been the paucity of this kind of information. Under this alternative vessels in all commercial sectors, including recreational charter (for hire) boats, will participate in an expanded logbook program.

Option D.2.1: All fishing vessels maintain a logbook, recording information on fishing time, location, and catch composition similar to the current trawl logbook program.

Option D.2.2: A representative, random sample of all fishing vessels is required to maintain logbooks, gathering the information described above.

Alternative D.3: Expanded Vessel Monitoring System (Component of the Final Preferred Alternative)

Combining VMS data with logbook and observer data would likely result in a more complete picture of fishing activities, although information contained in observer data is not currently used in regard to monitoring or reviewing fishing location or effort. The key piece of information provided by VMS would be a higher resolution track line of a trawl or fixed gear set. In the past, PacFIN records only included trawl set positions, this limits the ability to determine precisely where fishing impacts have occurred.

This alternative will identify expansion of the VMS program to cover all West Coast groundfish commercial and recreational charter vessels as an important program objective to be implemented through tiered actions. There are various considerations in any such expansion, including how to phase in VMS over time and any thresholds or exemptions (for example, based on vessel length) for VMS requirements. This objective includes the use of VMS data to monitor and evaluate the effects of fishing on groundfish habitat.

Alternative D.4: Research Reserve System (Component of the Final Preferred Alternative)

Another key constraint to understanding the effects of fishing on habitat results from the lack of unaffected control sites that can be used in comparative studies. If fishing is restricted in specific areas to minimize fishing impacts on habitat, some of those areas could be used to measure the length of time needed for habitat features and function to recover. Over time these sites could also be compared with sites where fishing is ongoing in order to research the effects of fishing. This alternative will establish a system of research reserves within closed areas established as part of any of the fishing impact minimization alternatives. These research reserves will help to focus research efforts. By encouraging research in a discrete set of reserve areas, results can be more easily compared. A reserve system could include a representative sample of habitat types in order to allow comparison of the effects of fishing across these different types.

2.7 The Final Preferred Alternative

Table 2-2 lists the alternatives described in Sections 2.3 through 2.6, indicating which were identified as preliminary preferred, incorporated into the final preferred alternative, and whether they were modified when incorporated into the preferred alternative. Of the 21 alternatives identified as preliminary preferred (this count includes sub-options included in some alternatives), 13 were incorporated into the final preferred alternative, some with modifications. The Council also chose six alternatives not identified as preliminary preferred to include in their preferred alternative. The final preferred alternative is described below according to the four categories of alternatives used above.

2.7.1 EFH Identification and Description

EFH is identified as all waters and substrate in depths less than or equal to 3,500 m. and waters and substrate associated with seamounts in depths greater than 3,500 m. When adopting this component of the final preferred alternative, the Council also indicated that any areas they also designated as HAPCs but not already identified by the above criteria would be included in the EFH definition. No such areas resulted from the HAPC designations in this preferred alternative. This component of the final preferred alternative corresponds to Alternative A.2 with the modification identifying seamounts in depths greater than 3,500 m.

The 100% HSP area, all of which occurs in depths less than 3,500 m, constitutes a part of EFH as noted in the description of Alternative A.2.

This EFH identification is precautionary because it is based on the currently known maximum depth distribution of all life stages of FMU species. This precautionary approach is taken because uncertainty still exists about the relative value of different habitats to individual groundfish species/life stages, and thus the actual extent of groundfish EFH. For example, there were insufficient data to derive HSP values for all species/life stages. Furthermore, the data used to determine HSP values is subject to continued refinement. While recognizing these limitations, the 100% HSP area, all of which occurs in depths less than 3,500 m, is identified as a part of groundfish EFH, recognizing that the best scientific information demonstrates this area is particularly suitable groundfish habitat. While precautionary, groundfish EFH

still constitutes an area considerably smaller than the entire West Coast EEZ, the groundfish EFH identification under the No Action Alternative.

Figure 2-29 shows the extent of this EFH identification.

2.7.2 Habitat Areas of Particular Concern

2.7.2.1 HAPC Designations

The final preferred alternative includes designation of a wide range of habitat types as HAPC as well as a process for considering revisions to HAPC designations. The Council and NMFS chose this element of the final preferred alternative to highlight particular habitat types for added, precautionary emphasis during the consultation processes.

The following HAPC designations are included in the preferred alternative without modification from the DEIS except that the descriptions encompass the actual rather than mapped extent of these habitats:

Estuaries (Alternative B.2): The inland extent of the estuary HAPC is defined as MHHW, or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow. The seaward extent is an imaginary line closing the mouth of a river, bay, or sound; and to the seaward limit of wetland emergents, shrubs, or trees occurring beyond the lines closing rivers, bays, or sounds. This HAPC also includes those estuary-influenced offshore areas of continuously diluted seawater. This definition is based on Cowardin, et al. (1979).

Canopy kelp (Alternative B.3): The canopy kelp HAPC includes those waters, substrate, and other biogenic habitat associated with canopy-forming kelp species (e.g., *Macrocystis* spp. and *Nereocystis* sp.).

Seagrass (Alternative B.4): The seagrass HAPC includes those waters, substrate, and other biogenic features associated with eelgrass species (*Zostera* spp.), widgeongrass (*Ruppia maritima*), or surfgrass (*Phyllospadix* spp.).[11]

Rocky reefs (Alternative B.6): The rocky reefs HAPC includes those waters, substrates and other biogenic features associated with hard substrate (bedrock, boulders, cobble, etc.) to MHHW. A first approximation of its extent is provided by the substrate data in the groundfish EFH assessment GIS. However, at finer scales, through direct observation, it may be possible to further distinguish between hard and soft substrate in order to define the extent of this HAPC.

The following HAPC designations are based on the mapped extent delineated in the EFH GIS and represent modifications from the alternatives described in the DEIS:

Areas of interest (Alternative B.7):

- Areas incorporated from Alternative B.7 without modification: Thompson Seamount, Daisy Bank, President Jackson Seamount, Cordell Bank, Gumdrop Seamount, Pioneer Seamount, Guide

[11] The extent and effect of non-native species in seagrass HAPCs, such as *Zostera japonica*, may be considered in conservation recommendations NMFS makes to other federal and state agencies (see Section 7.5)

Seamount, Monterey Canyon, Taney Seamount, Davidson Seamount, San Juan Seamount, Cowcod Conservation Area East.

- Areas incorporated from Alternative B.7 with modification: Potato Bank, Cherry Bank, Hidden Ref/Kidney Bank in the Cowcod Conservation Area West.

- Areas in the preferred alternative that are not part of Alternative B.7: All waters and sea bottom in Washington state waters (0-3 nm); selected areas in the Channel Islands National Marine Sanctuary (Anacapa Island SMCA, Anacapa Island SMR, Carrington Point, Footprint, Gull Island, Harris Point, Judith Rock, Painted Cove, Richardson Rock, Santa Barbara, Scorpion, Skunk Point, South Point); any seamounts off the coast of California not already included in Alternative B.7.

The following areas are part of Alternative B.7 but were not incorporated into the preferred alternative: the northern portion of the northwest Olympic Coast National Marine Sanctuary, Grays Canyon, Astoria Canyon, Heceta Bank, Rogue Canyon, Eel River Canyon, Mendocino Canyon, Gorda Escarpment, Morro Ridge, and Monterey Bay.

The shoreward boundary of the Washington State waters HAPC is defined by MHHW while the seaward boundary is the extent of the three-mile territorial sea. The remaining area of interest HAPCs are defined by their mapped boundaries in the EFH assessment GIS. The coordinates defining these boundaries will be published in Appendix B to the groundfish FMP.

Oil production platforms (Alternative B.8): The preferred alternative designates the following 13 oil production platforms as HAPCs: Platform A, Platform B, Platform C, Edith, Gail, Grace, Gilda, Habitat, Hondo, Hermosa, Harvest, Hidalgo, and Irene. This is a modification of Alternative B.8, which includes all 27 extant platforms in waters off of Southern California. The HAPC area for these oil production platforms is defined by a circle around each platform whose center is the published location given by latitude-longitude coordinates (U.S. Department of the Interior, Minerals Management Service, OCS Pacific Region) with a radius 1.5 times the maximum published platform jacket dimension (U.S. Department of the Interior, Minerals Management Service, OCS Pacific Region).

Figure 2-30 shows the areas designated HAPCs under the final preferred alternative.

2.7.2.2 Process for Modifying Existing or Designating New HAPCs

This component of the final preferred alternative is a modification of Alternative B.9, process for designating new HAPCs. It has the same procedural components of Alternative B.9, but would also allow submission of proposals to modify or eliminate existing HAPCs. Furthermore, instead of the Habitat Committee, the Council identified a new standing committee, the Essential Fish Habitat Oversight Committee, that would participate in the review of HAPC proposals. Any such changes would require an FMP amendment as described for Alternative B.9

2.7.3 Measures to Minimize the Adverse Impacts of Fishing

The component of the final preferred alternative intended to minimize the adverse effects on fishing on groundfish EFH comprises management measures in three categories: (1) gear modifications, (2) closed areas, and (3) promotion of reductions in fishing effort.

2.7.3.1 Gear Modifications

For waters within 0-200 miles offshore coastwide, the following gear restrictions will apply:

- Prohibit bottom trawl roller gear with a footrope diameter greater than 19 inches on bottom trawl gear throughout the EEZ. This is a modification of Alternative C.9.1, which would have limited footrope diameter to 15 inches or less. The 19" restriction was chosen by the Council over 15" based on input from the fishing industry.
- Prohibit bottom trawl roller gear with a footrope diameter greater than eight inches eastward of a line approximating the 100-fathom depth contour. This would make the existing gear restriction, in place as a bycatch reduction measure, a permanent habitat protection measure. This is a modification of Alternative C.2.1, which would have prohibited large footrope trawl gear in depths less than 200 fathoms along with similar restriction on fixed gear. The 100-fathom contour was chosen over the 200-fathom contour in order to allow trawl fishermen to access important fishing grounds while still providing important habitat protection.
- Prohibit dredge gear. This corresponds to Alternative C.9.5.
- Prohibit beam trawl gear. This corresponds to Alternative C.9.6.

Restrictions in state waters will be implemented by state law, as appropriate. Although dependent on state regulation, the restrictions on dredge and beam trawl gear are not intended to apply in internal waters (Puget Sound, San Francisco Bay, etc.).

2.7.3.2 Closed Areas

The final preferred alternative contains two types of closed areas: a "trawl footprint" closure and ecologically important closed areas.

2.7.3.2.1 Footprint Closure

This component of the final preferred alternative is a modification of the trawl footprint closure described under Alternative C.4 and C-12. Under that alternative, areas that were not trawled from 2000 to 2003 would be permanently closed to bottom trawl. The final preferred alternative closes depths greater than 700 fathoms. The footprint area identified under Alternatives C.4 and C.12 covers 294,142sq. mi. while the footprint area under the final preferred alternative covers 246,350 sq. mi.

The 700 fm isobath is generally a more precautionary approximation of the historic extent of bottom trawling in the management area. It is intended to prevent the expansion of bottom trawling into areas where groundfish EFH has not been adversely affected by fishing. The closure encompasses the part of the EEZ deeper than 3,500 m, the isobath defining the deepest extent of groundfish EFH in the preferred alternative. By applying this closure to a part of the management area not identified as groundfish EFH, this measure is intended to be precautionary; there is limited information on the importance to groundfish habitats in all areas at depths greater than 700 fm. It is intended to prevent adverse effects from bottom trawling while over time more information is gathered about groundfish habitat within this area or the relationship between habitats in this area and groundfish EFH.

2.7.3.2.2 Ecologically Important Closed Areas

This component of the final preferred alternative is a modification of Alternative C.7, C.10, C.12, and C.13. It also includes a new procedural element that was not described in the DEIS that is similar to

Alternative B.9, but applicable to areas closed to bottom trawl. The selection of the specific areas included in the final preferred alternative occurred through a collaborative process involving Oceana; groundfish trawl fishermen, organized by the Fishermen's Marketing Association; the Fisheries Heritage Group, bringing together harbor managers, the Nature Conservancy, Environmental Defense, the Center for Future Oceans, and fisheries representatives; Council advisory bodies; and West Coast states. As noted above, Oceana developed Alternative C.12 and the Council incorporated it into the DEIS. During the public comment period Oceana worked to modify the proposal they had developed based on new information they had gathered. At the same time, the Fishermen's Marketing Association developed a proposal for areas to be closed to bottom trawl that represented areas similar to those identified by Oceana but excluding areas judged by fishermen to be important fishing grounds. The Fisheries Heritage Group engaged in a similar exercise on the Central California coast, identifying three areas between Monterey and Point Conception. All three groups submitted their proposals as part of public comment on the DEIS. During the June 2005 Council meeting, when the Council identified their preferred alternative, these groups worked with the Council's Groundfish Management Team and other state and federal officials to craft a joint proposal that best met their differing objectives. By combining the perspectives of these groups, the final preferred alternative is intended to be a practicable measure that balances the mandate to conserve EFH while taking into account the effects on fishing communities.

Most of the ecologically important closed areas are sited shoreward of 700 fathoms in the area not already closed to bottom trawl with the footprint closure and include areas closed to bottom trawl, all bottom-contacting gear types, or all fishing gear. Table 2-3 lists these areas by type, showing the area covered. Specific areas were chosen for closure to various gear types in order to minimize potential adverse impacts from fishing.

The overlap between the final preferred alternative (including the three areas proposed by the Fisheries Heritage Group) and the proposals submitted by Oceana and the Fishermen's Marketing Association is as follows:

Area unique to the final preferred alternative (i.e., not closed under the other proposals):	914 sq. mi.
Areas unique to the Oceana proposal:	33,696 sq. mi.
Area unique to the Fishermen's Marketing Association proposal:	131 sq. mi.
Area common to the final preferred alternative and the Oceana proposal:	258,207 sq. mi.
Area common to the final preferred alternative and the Fishermen's Marketing Association proposal:	241,617 sq. mi.
Area common to the Oceana proposal and the Fishermen's Marketing Association proposal:	241,659 sq. mi.
Area common to all three proposals:	241,221 sq. mi.

Figures 2-31 through 2-37 show the location of these closed areas.

2.7.3.3 Effort Reduction

The final preferred alternative incorporates the element of Alternative C.10 involving public-private partnerships under which private funds are used to purchase groundfish limited entry trawl licensees in conjunction with Council/NMFS action to close specific areas. Reduction of fishing effort and area closures are cited by NRC as a primary tool for minimizing adverse effects to EFH from fishing (NRC 2000). By proposing that the following language be added to the FMP by amendment:

> If consistent with the goals and objectives of this FMP, the Council may facilitate and encourage private purchases of groundfish limited entry permits and corresponding vessels that would result in reduced fleet capacity. As with the Federally-sponsored 2003 groundfish trawl buyout program, such private purchases would have to permanently foreclose the future use of subject permits and vessels in West Coast groundfish fisheries. Aside from any socioeconomic benefits, reducing fleet fishing capacity can mitigate adverse impacts of fishing to groundfish EFH to the degree that fishing activity with adverse consequences is reduced. Contracts for the purchase of groundfish limited entry permits and/or vessels may contain conditions, specifying that the execution of the contract is contingent on the implementation of other measures to mitigate the adverse impacts of fishing on groundfish EFH. At the same time, the Council will take into account impacts on the segment of the fishing industry and fishing communities that are not a party to such contracts, and also take into account related FMP objectives 13, 15, 16, and 17 (Section 2.1). Mitigation measures may be contingent on Council action or recommendations, and the Council will strive to conduct its decision-making in such a way as to facilitate the private negotiation of such contract conditions. If contingent mitigation measures include establishing new areas closed to bottom trawl, or the modification of the location and extent of existing areas, the habitat conservation framework described in Section 6.2.4 may be used to implement such areas by regulatory amendment, using the procedures described under 6.2 D.

2.7.4 Research and Monitoring

Elements of Alternatives D.2-D.4, addressing EFH-related research and monitoring were incorporated into the final preferred alternative, although these elements will not be implemented as part of the proposed action evaluated in this EIS. Rather, they are identified as programmatic elements, that will be included in the FMP amendment, either expressing priorities and objectives (expansion of the logbook program, research reserves) or identifying another process as the vehicle for implementation (expansion of VMS). In addition, section 2.9 contains a description of NMFS' current research plan related to EFH.

2.7.4.1 Expanded Logbook Program

Alternative D.2 would require vessels in all commercial sectors, including recreational charter (for hire) vessels, to participate in an expanded logbook program. The final preferred alternative would amend the groundfish FMP to include the following statement: "The Council supports expansion of the logbook program to cover other fishery sectors besides groundfish limited entry trawl, where practicable. The Council also supports entering more of the existing information gathered by means of logbooks, such as the haul-back position of trawl tows, into the data system."

2.7.4.2 Expanded Vessel Monitoring System

Alternative D.3 identifies expansion of the VMS program for West Coast groundfish fisheries to cover all commercial and recreational charter vessels as an important program objective to be implemented through tiered actions. Expansion of the program is being considered by the Council as part of a separate action, supported by an EA (NMFS NWR 2005), which was initiated because of the need to monitor vessel

activity with respect to existing Groundfish Conservation Areas (which include RCAs and CCAs). The Council will choose their preferred alternative for VMS expansion at their November 2005 meeting. Under that action the Council will consider expanding the VMS requirement to a range of trawl and nontrawl fisheries. The final preferred alternative for this EFH EIS identifies the requirement for VMS on all bottom trawl vessels as part of the range of alternatives included in the VMS EA referenced above. These fisheries include ridgeback prawn, California halibut, sea cucumber, and pink shrimp.

2.7.4.3 Research on the Impacts and Results of Closed Areas

Alternative D.4 would establish a system of research reserves within closed areas established as part of the fishing impact minimization alternatives. The final preferred alternative makes focusing research on the impacts results of closing areas to bottom trawl or bottom contact gear a Council priority. The groundfish FMP would be amended with the following language:

> The Council will support, through the work of its advisory bodies, such as the Habitat Committee, efforts to identify discrete sites within closed areas in order to focus research efforts. By encouraging research at identified sites, results can be more easily compared. Such a system or research sites should include a representative sample of habitat types in order to allow comparison of the effects of fishing across these different types.

2.8 Alternatives Eliminated From Further Detailed Study

Regulations guiding the development of EISs state "…for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated" (40 CFR 1502.14(a)). As discussed in Section 2.1, the alternatives evaluated in this EIS were developed over several meetings and formally adopted by the Council. This section briefly describes the modifications that occurred by Council action at their September and November meetings.

At their September, 2004 meeting, the Council forwarded all of the EFH and HAPC designation alternatives developed by the EFH EIS Oversight Committee for inclusion in the EIS. However, they recommended the alternatives be ordered by the total area that would be designated, which resulted in a renumbering of these alternatives. They also recommended adding an alternative describing a process for HAPC designation (Alternative B.9). They added Option C.2.3, which closes areas within 60 fathoms to fixed gear. (In the preliminary decision document used by the Council at the November 2004, meeting this option mistakenly characterized the large footrope trawl closure as applying to the whole EEZ rather than shoreward of 200 fm. The description has been subsequently corrected.) They also added options C.3.3 and C.3.4, which are based on different sensitivity and index values. They also made several modifications to the list of gear restrictions described in Alternative C.9 and eliminated two provisions applying to longline gear. These options were eliminated because they were considered not practicable. (In the preliminary documents the restrictions were listed as a set of options in order to emphasize the Council's flexibility in modifying this list. Because the Council chose this as a preliminary preferred alternative, references to options have been removed.) A description of the plaintiffs' alternative was not part of the description of alternatives reviewed by the Council at their September, 2004 meeting; the Council requested that it be included as an alternative once developed. The Council forwarded all of the research and monitoring alternatives for inclusion in the DEIS.

At their November 2004, meeting, while identifying their preliminary preferred alternatives, the Council also further modified some alternatives and eliminated others. They eliminated two EFH identification and description alternatives. One would have designated EFH based on HSP values only for assessed species. This alternative was deemed inconsistent with EFH regulations, which require designations to be based on all management unit species. The second eliminated alternative is similar to Alternative A.4,

except that it had slightly different HSP area percentages for the different management status categories (the top 100% HSP area for overfished species, the top 90% HSP area for precautionary zone species, and the top 70% HSP area for all other species). This alternative was eliminated because of its similarity to Alternative A.4. Reducing the number of alternatives allows more focused analysis while still providing a sufficient range of designation options and contrast between the different alternatives. The Council forwarded all of the HAPC designation alternatives for inclusion in the DEIS. They eliminated an impact minimization alternative, which would have closed 25% of representative habitat to fishing. (This alternative had two options, one focusing on habitat types and the other more specifically on biogenic habitat.) It was eliminated because of methodological difficulties involved in determining what specific areas would be closed to satisfy the 25% criterion. In addition, Alternatives C.7, C.10, C.12, C.13, and C.14, which close discrete areas to various forms of fishing, largely satisfy the objective of the eliminated alternative. Alternative C.9 was further modified by eliminating three gear restrictions, which would have required weak links on trawl tickler chains, phasing in aluminum trawl doors, and prohibiting stick gear and weights on line gear contacting the bottom. These options were eliminated because they are not practicable and/or enforceable. The Council also focused the set gillnet prohibition on waters deeper than 60 fm, based on options that also included a 30 fm and 80 fm closure line. Alternatives C.13 and C.14 were added in order to consider different types of fishing restrictions on the ecologically important areas identified in Alternative C.12.

2.9 NWFSC EFH Research Plan

The current research plan for the NW Fisheries Science Center (NWFSC) includes the continuation of coast-wide routine bottom trawl surveys in areas that are accessible to these methods, and the development of new survey methods for monitoring and mapping areas that are either not accessible to the usual research trawl gear or in which sampling should have minimal and non-extractive impacts. This initial mapping is important to establish the "baseline" condition of the closed areas at the onset of regulations and monitor the impacts of closures on the entire ecosystem. Continued mapping and monitoring of EFH areas is also needed to continue the time series of assessments of groundfish populations used to conduct stock assessments.

The NWFSC is already testing innovative non-extractive methods. Both AUVs and ROVs have been tested and used for mapping biological communities in coordination with multibeam sonar mapping of the surficial geology. These tests have highlighted the functionalities that should be added to existing AUV and ROV platforms to maximize their utility for EFH mapping. During these tests the Center has completed selected mapping of groundfish, invertebrates and geology of ecologically important closed areas for groundfish and HAPC sites. The sites mapped to date are Cherry Bank, Bandon High Spot, TNC/ED areas 1 and 2, and Daisy Bank. In addition, Heceta Bank and Astoria Canyon have been mapped during research conducted in 1998 and 2001, respectively, as well as a large deep-water area seaward of Heceta and Stonewall Banks that was mapped in sequence during 1998, 2002, and 2004. With existing resources, the NWFSC plans to continue non-extractive baseline mapping of additional areas for the next five years. It is estimated that three areas each year could be mapped for a total of 15 additional areas. This would only allow for mapping of about one half of the proposed ecologically important closed areas for groundfish and/or HAPC sites (not including estuaries, inland seas, seagrass beds, canopy kelp, and oil platforms).

As additional resources are available, more areas would be mapped and a plan for routine monitoring could be implemented. An estimated area of 34,200 sq km of ecologically important closed areas for West Coast Groundfish, and 36,200 sq km of groundfish HAPC and areas of interest & rocky reefs/banks are a high priority for mapping. It is estimated that this will require 104 days at sea for multibeam sonar mapping. Additional days at sea would be required for mapping of the biological communities. The estimated cost of mapping the surficial geology and the biology of these areas is estimated to be

$7,000,000. After the initial mapping was completed, a program of routine monitoring will be necessary to assess the recovery of the ecosystem after the cessation of fishing by bottom-contact gear. It is estimated that $1,000,000 a year would be required on a continuing basis to monitor the closed areas on a rotating basis. The area of the general groundfish EFH not already mapped is about 298,300 sq km. To provide only multibeam mapping information for this area the cost is estimated at $7,000,000. This initial mapping would be required to develop an estimate of the further mapping needs to obtain necessary biological information.

In addition to the mapping of these areas, the NWFSC plans on continuing their ongoing habitat research program to determine the association between habitat features and fish and other invertebrates, including structure-forming invertebrates such as sponges and cold water corals. Information on cold-water corals also will continue to be collected by the West Coast Groundfish Observer Program. These data will be used to add to the minimal information on the distribution of cold water corals.

Table 2-2: Summary of the Alternatives.

Alternative Name	Preliminary Preferred	Final Preferred	Modified	Figure Number
EFH Alternatives				
A.1 (No Action)				Figure 2-1
A.2 (Depths less than 3,500 m)	✓	✓	✓	Figure 2-2, Figure 2-29
A.3 (100% HSP Area)	✓			Figure 2-3, Figure 2-29
A.4 (HSP Based on Management Status)				Figure 2-4
A.5 (70% HSP Area)				Figure 2-5
A.6 (30% HSP Area)				Figure 2-6
HAPC Alternatives				
B.1 (No Action)				No Figure
B.2 (Estuaries)	✓	✓		Figure 2-7, Figure 2-30
B.3 (Canopy Kelp)	✓	✓		Figure 2-8, Figure 2-30
B.4 (Seagrass)	✓	✓		Figure 2-9, Figure 2-30
B.5 (Core Habitat)				Figure 2-10
B.6 (Rocky Reefs)	✓	✓		Figure 2-11, Figure 2-30
B.7 (Areas of Interest)		✓	✓	Figure 2-12, Figure 2-30
B.8 (Oil Production Platforms)		✓	✓	Figure 2-13, Figure 2-30
B.9 (Process for new HAPC designations)				No Figure
Minimize Adverse Fishing Impacts to EFH				
C.1 (No Action)				No Figure
C.2 (Depth-based gear restrictions)				
C.2.1 (Option 1)		✓	✓	Figure 2-15
C.2.2 (Option 2)				Figure 2-16
C.2.3 (Option 3)				Figure 2-17
C.3 (Close sensitive habitat)				
C.3.1 (Option 1)				Figure 2-18
C.3.2 (Option 2)				Figure 2-19

Alternative Name	Preliminary Preferred	Final Preferred	Modified	Figure Number
C.3.3 (Option 3)				Figure 2-20
C.3.4 (Option 4)				Figure 2-21
C.4 (Prohibit geographic expansion of fishing)				
C.4.1 (Option 1)	✓	✓	✓	Figure 2-22
C.4.2 (Option 2)	✓			Figure 2-23
C.5 (Prohibit a krill fishery)				No Figure
C.6 (Close hotspots)				Figure 2-24
C.7 (Close areas of interest)		✓	✓	Figure 2-25
C.8 (Zoning fishing activities)				
C.8.1 (Option 1)				Figure 2-26
C.8.2 (Option 2)				Figure 2-26
C.9 (Gear Restrictions)				
C.9.1 (Prohibit roller gear larger than 15")	✓	✓	✓	No Figure
C.9.2 (Prohibit the use of flat trawl doors)	✓			No Figure
C.9.3 (Limit the length of a single longline groundline to 3 nm)	✓			No Figure
C.9.4 (Employ habitat-friendly anchoring systems)	✓			No Figure
C.9.5 (Prohibit dredge gear)	✓	✓		No Figure
C.9.6 (Prohibit beam-trawl gear)	✓	✓		No Figure
C.9.7 (Prohibit set-gillnets in waters deeper than 60 fm)	✓			No Figure
C.9.8 (Prohibit dingle bar gear)	✓			No Figure
C.10 (Central California no-trawl zones)	✓	✓		Figure 2-27
C.11 (Relax gear endorsement requirements)	✓			No Figure
C.12 (Close ecologically important areas to bottom trawl	✓	✓	✓	Figure 2-28
C.13 (Close ecologically important areas to bottom-contacting gear	✓	✓	✓	Figure 2-28
C.14 (Close ecologically important areas to fishing)	✓			Figure 2-28
Research and Monitoring				
D.1 (No Action)				No Figure
D.2 (Expanded logbook program)		✓	✓	
D.2.1 (All fishing vessels)				No Figure
D.2.2 (Random sample)				No Figure

Alternative Name	Preliminary Preferred	Final Preferred	Modified	Figure Number
D.3 (Expanded VMS program)		✓	✓	No Figure
D.4 (Research reserve system)		✓	✓	No Figure

Table 2-3: Summary of Gear Restrictions by Area (added since Draft EIS)

Area Name	% of EEZ	Area (sq mi)
Closed to bottom trawl west of a line approximating the 700 fathom isobath*	77.45%	246,062.4
Closed to bottom trawl gear off of Washington		
Biogenic_1	0.15%	476.2
Biogenic_2	0.03%	90.3
Biogenic_3	0.02%	79.3
Grays Canyon	0.02%	63.4
Olympic_2	0.07%	211.4
Subtotal	0.29%	920.6
Closed to bottom trawl gear off of Oregon		
Astoria Canyon	0.22%	684.7
Bandon High Spot	0.02%	70.3
Daisy Bank / Nelson Island	0.01%	25.5
Deepwater off Coos Bay	0.07%	218.0
Heceta Bank	0.05%	163.3
Nehalem Bank / Shale Pile	0.02%	77.1
Newport Rockpile / Stonewall Bank	0.02%	66.2
Rogue Canyon	0.11%	341.7
Siletz Deepwater	0.07%	207.7
Subtotal	0.58%	1,854.4
Closed to all bottom contact gear off of Oregon		
President Jackson Seamount	0.12%	380.8
Thompson Seamount	0.05%	165.3
Subtotal	0.17%	546.1
Closed to bottom trawl gear off of California		
Biogenic Area 12	0.03%	99.2
Blunts Reef	0.01%	22.3
Catalina Island	0.14%	458.8
Cherry Bank	0.07%	217.1
Cordell Bank	0.05%	148.8
Cowcod Conservation Area East	0.05%	147.7
Delgada Canyon	0.00%	15.7
Eel River Canyon	0.11%	336.0
Farallon Islands / Fanny Shoal	0.02%	55.1
Half Moon Bay	0.02%	49.6
Hidden Reef / Kidney Bank	0.09%	297.9
Mendocino Ridge	0.23%	719.3
Monterey Bay / Canyon	0.26%	831.3
Point Arena Offshore	0.01%	34.0
Point Sur Deep	0.03%	84.4
Potato Bank	0.03%	110.7
TNC/ED Area 1	0.03%	105.2
TNC/ED Area 2	1.26%	3,991.8
TNC/ED Area 3	0.40%	1,265.7
Tolo Bank	0.01%	21.3
Subtotal	2.84%	9,011.8

Area Name	% of EEZ	Area (sq mi)
Closed to all bottom contact gear of California		
Anacapa Island SMCA	0.00%	9.6
Anacapa Island SMR	0.00%	15.3
Carrington Point	0.00%	12.7
Cordell Bank (within 50 fm isobath)	0.01%	26.4
Davidson Seamount	0.24%	775.5
Footprint	0.01%	26.9
Gull Island	0.01%	34.9
Harris Point	0.02%	50.1
Judith Rock	0.00%	4.6
Painted Cove	0.00%	1.8
Richardson Rock	0.02%	72.7
Santa Barbara	0.02%	56.8
Scorpion	0.01%	18.6
Skunk Point	0.00%	1.4
South Point	0.00%	15.0
Subtotal	0.35%	1122.3
TOTAL	81.69%	259,517.6