FINAL
ENVIRONMENTAL ASSESSMENT/ REGULATORY IMPACT REVIEW FOR AMENDMENT 11

to

THE PACIFIC COAST GROUNDFISH FISHERY MANAGEMENT PLAN

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OCTOBER 1998

This document is published by the Pacific Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award Number NA87FC0008.

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1.0 INTRODUCTION

The groundfish fisheries in the Exclusive Economic Zone (EEZ) offshore of Washington, Oregon, and California are managed by the Pacific coast groundfish fishery management plan (FMP). The FMP was prepared by the Pacific Fishery Management Council (Council) under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), and actions taken to amend the FMP or implement other regulations governing the groundfish fisheries must meet the requirements of Federal laws and regulations. In addition to the Magnuson-Stevens Act, the most important of these are the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), Executive Order (EO) 12866, and the Regulatory Flexibility Act (RFA). NEPA, EO 12866 and the RFA require a description of the purpose and need for the proposed action as well as a description of alternative actions which may address the problem.

1.1 Background

The Magnuson-Stevens Act, as revised in 1996, contains a number of provisions pertaining to the content of FMPs and a requirement that all FMPs be updated so as to be consistent with those provisions by October 11, 1998. In early 1997, the Council reviewed the current FMP and determined revisions are necessary to bring it back into compliance with new requirements. The Council also held a public scoping session to determine the scope of the amendment, identifying ten general issues to be addressed. In the course of the review and scoping sessions, potential inconsistencies with the following sections of the Magnuson-Stevens Act were identified.

Sec. 303. CONTENTS OF FISHERY MANAGEMENT PLANS

(a) Required Provisions - Any fishery management plan which is prepared by any Council, or by the Secretary, with respect to any fishery, shall--

(2) contain a description of the fishery, including, but not limited to, the number of vessels involved, the type and quantity of fishing gear used, the species of fish involved and their location, the cost likely to be incurred in management, actual and potential revenues from the fishery, any recreational interest in the fishery, and the nature and extent of foreign fishing and Indian treaty fishing rights, if any;

(3) assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from, the fishery, and include a summary of the information utilized in making such specification;

(5) specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, and charter fishing in the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, and the estimated processing capacity of, and the actual processing capacity utilized by, United States fish processors;

(7) describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), 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;

(10) specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery;

(11) establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority--

(A) minimize bycatch; and

(B) minimize the mortality of bycatch which cannot be avoided;

(13) include a description of the commercial, recreational, and charter fishing sectors which participate in the fishery and, to the extent practicable, quantify trends in landings of the managed fishery resource by the commercial, recreational, and charter fishing sectors; and

In addition, new National Standards were established and several definitions were revised; the definitions of optimum yield, overfished and overfishing are particularly significant.

The Magnuson-Stevens Act requires the Secretary of Commerce to establish advisory guidelines, based on the Magnuson-Stevens Act's "National Standards," to assist in this process. The final rule revising the national standard guidelines was published on May 1, 1998.

This document considers each issue separately, including a discussion of the purpose and need for each action and expected environmental consequences of the alternative solutions. In several cases the status quo, although listed as an alternative, is not viable if the FMP is to comply with the Magnuson-Stevens Act.

1.2 Issues Addressed in this Amendment and Environmental Assessment

Issue 1. Individual and Multispecies Optimum Yields (OYs).
Issue 2. Definition and Specification of Maximum Sustainable Yield (MSY), Acceptable Biological Catch (ABC), OY and Overfishing Control Rules, and Rebuilding Programs.
Issue 3. Definition, Description and Identification of EFH.
Issue 4. Bycatch Provisions.
Issue 5. Fishing Communities.
Issue 6. Clarify and Expand Council Authority to Require Groundfish Use Permits.
Issue 7. Scientific Research, and Utilization of Fish to Pay for Research.
Issue 8. Update Industry Descriptions and Other Sections.
Issue 9. FMP Objectives and Definitions.
Issue 10. General Editorial Cleanup.
Issue 11. Remove jack mackerel (*Trachurus symmetricus*) from the fishery management unit and include it in the Coastal Pelagic Species FMP.

This FMP is designed as a framework that provides the authority, goals, and procedures for the Council to recommend and the Secretary of Commerce (Secretary) to implement management measures for the Pacific Coast groundfish fishery. This amendment primarily addresses those goals and procedures. It also clarifies the Council's responsibilities under federal law. The primary intent is to bring the FMP into conformity with the Magnuson-Stevens Act as amended in 1996.

1.3 Council Decision Process and Public Hearings

At its June 1997 meeting, the Council conducted a session to determine the scope of the proposed FMP amendment and provided an extended opportunity for public advice on the issues that should be included in the amendment. The first draft of the amendment package was presented to the Council and its advisory entities at the November 1997. In March and April 1998, the Council's Groundfish Management Team, Groundfish Advisory Subpanel (GAP) and Scientific and Statistical Committee met jointly to review progress on the material, gain a better understanding of the issues, alternatives and implications, and to prepare recommendations to the Council. At the June 1998 meeting, the Council released the amendment package for public comment and scheduled public hearings in several locations: Seattle, Washington; Astoria, Oregon; Newport, Oregon; and Eureka, Monterey, and Long Beach, California. The Council took additional public comment at its September 1998 meeting prior to taking final action on the amendment package.

2.0 INDIVIDUAL AND MULTISPECIES OPTIMUM YIELDS

2.1 Purpose and Need for Action

Each year, the Council recommends groundfish harvest specifications (ABCs, harvest guidelines and allocations), but current annual specifications do not include OYs. Under the 1996 provisions of the Magnuson-Stevens Act, the OY for a management unit may not exceed its MSY. The current specification of OY makes such a comparison difficult or impossible, and the Council is considering changes that make it easier to compare them.

The original groundfish FMP established numerical OYs for five species[1] and a single non-numerical OY for the remainder of groundfish complex, which was defined as "all the fish that can be taken under the regulations, specifications, and management measures authorized by the FMP and promulgated by the Secretary." Originally, OY was for landed catch only, and discards were largely ignored. Amendment 4 expanded the single non-numerical OY to include the entire groundfish complex, eliminating individual species OYs and instead designating harvest guidelines and quotas as the numerical harvest specifications. Under this definition, OY is not a predetermined numerical value, but rather the harvest that results from regulations, specifications and management measures as they are changed in response to changes in the resource and the fishery. This definition may not meet the requirements of the Magnuson-Stevens Act and national standard guidelines. Specifically, the national standard guidelines state that "The amount of fish that constitutes OY should be expressed in terms of numbers or weight of fish. However, OY may be expressed as a formula that converts periodic stock assessments into target harvest levels; ... or as an amount of fish taken only in certain areas, in certain seasons, with particular gear, or by a specified amount of fishing effort." Also, "the annual harvest level obtained under an OY control rule must always be less than or equal to the harvest level that would be obtained under the MSY control rule." "In a mixed-stock fishery, specification of a fishery-wide OY may be accompanied by management measures establishing separate annual target harvest levels for the individual stocks. In such cases, the sum of the individual target levels should not exceed OY." Under the current non-numerical OY, it is difficult to relate the amount of fish that constitutes OY to MSY either quantitatively or qualitatively. However, it is possible to relate individual ABCs and harvest guidelines to the corresponding MSY values. In order to maintain the single OY, a single MSY value would have to be determined. To simplify and clarify harvest rules, the Council is considering establishing OYs for various stock units which may include either a single species or a group of species.

2.2 Alternatives Including Proposed Action

Status quo (no action). Maintain the single non-numerical OY for the entire groundfish fishery, with harvest guidelines for individual species and species groups.

Alternative 1 (multiple OYs). (ADOPTED BY THE COUNCIL) Amend the FMP to establish numerical OYs for individual species and species groups, and clarify that the Council will decide on a case-by-case basis whether to establish OYs for individual species and species groups. A non-numerical OY may be retained for some species. Minor technical revisions to the regulations will be required to replace the term "harvest guideline" by the term "optimum yield" in reference to the annual harvest specifications. (See the proposed FMP text, Chapter 4.)

Alternative 2 (minimal change). Maintain the single non-numerical OY but amend the FMP to clarify the use of harvest guidelines and "control rules to ensure harvest guidelines do not exceed ABCs." In addition, a single MSY would likely have to be identified. No new regulations or regulatory changes would be required.

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[1]This was increased to six species when jack mackerel was added to the fishery management unit.

2.3 Discussion of Alternatives

The Council has a long-established goal of managing by species assemblages in cases where several species are caught together during typical fishing operations. When the Pacific Coast Groundfish FMP was first developed and approved, all but five species were included in a single OY; those excluded were species that could be harvested selectively or that required special management attention: sablefish, Pacific whiting, Pacific ocean perch, shortbelly rockfish, and widow rockfish (jack mackerel was added shortly thereafter). The Council originally considered three major options for OY: 40 subunits/OYs, 18 subunits/OYs, and 7 OYs.

In a multispecies fishery, even the best applied fishing technology and regulatory procedures sometimes fail to control the species composition of the catch well enough to avoid serious under-harvest of some species as catches of others approach their ABC. Accordingly, it was necessary to specify a single OY for several species groupings. Also, in some cases it was beneficial to include one OY for two or more areas to establish realistic management subunits. The intent of broad groupings has been to minimize disruption of existing fishing practices, to maximize total sustainable production of grouped species which often are caught together in the multi-species fisheries, and to allow in-season fishing and management flexibility. Within the broadest grouping concept, management of each species within the group is important only if there are obvious impacts on the general productivity of the species complex. Under the FMP as it currently exists, care is taken to insure the health and conservation aspects of the resources by monitoring for established points of concern. Under this approach, catches of some species are expected to vary above and below the estimated ABC. This management regime has been flexible, but relies heavily on an effective system of monitoring for points of concern and responding to any conservation problems that arise. The system relies on mechanisms to adjust management measures both between seasons (on the basis of new assessments or new information) and within season (based on harvest projections and comparisons with previous years' data). Amendment 4 to the FMP eliminated the individual OY management approach, replacing it with harvest guidelines for species or species groups (i.e., management units) the Council finds need individual management attention. At that time, the Council considered using the term "OY" but had concerns it would imply mandatory closure of a fishery if OY were attained prior to the end of the fishing year. In addition, the public had grown accustomed to the distinction between the term "harvest guideline," which is defined as a flexible management target, and "quota," which is defined as an absolute limit.

The Council has been generally satisfied with its multispecies OY management approach. However, the 1996 amendments to the Magnuson-Stevens Act restrict the relationship between OY and MSY. The Council is concerned its current terminology may now be viewed as inconsistent with the Magnuson-Stevens Act. The Council's intention is to maintain the current management approach to the extent possible and make any necessary changes to terminology, while avoiding public confusion over the meaning and usage of terms. Thus, the alternatives under consideration are mainly semantic in nature.

Under Alternative 1, which the Council adopted as its final decision, the FMP will authorize establishment of numerical OYs for stock management units (individual species and species groups). The Council will decide on a case-by-case basis the species composition of stock management units. The Council will decide which stock management units would be managed with numerical OYs, with the understanding a non-numerical OY may be retained for some management units. It is likely in the short term the Council will recommend numerical OYs for each stock currently managed with a harvest guideline. In accordance with the national standard guidelines, OY would not exceed the ABC (or the sum of ABCs for a complex) unless the Council demonstrates the exception criteria stated in the national standard guidelines are met (see Issue 2, below). Under this alternative, it will be relatively easy to demonstrate the relationship between OY and MSY.

Under Alternative 2, the FMP would maintain the single non-numerical OY but would be amended to clarify the use of harvest guidelines and "control rules to ensure harvest guidelines do not exceed ABCs." Under this alternative, the Council would continue to establish harvest guidelines for various stocks as in the past,

and harvest guidelines would be the functional equivalents of numerical OYs. Because there would technically still be a single non-numerical OY, the Council would have to develop a way to demonstrate that OY does not exceed MSY. This would likely require identification of a single MSY or establishment of equivalent definitions of the terms "ABC" and "MSY," and for "harvest guideline" and "OY" for stock management units.

Under the national standard guidelines, MSY is to be specified for each stock in a mixed-stock fishery, and if this is not possible, then "MSY may be specified on the basis of one or more species as an indicator for the mixed stock as a whole or for the fishery as a whole."

Because productivity (growth, recruitment and mortality) of each species in a stock complex is likely to be different, there will be no single value of the fishing mortality rate that produces MSY (i.e., F_{msy}) that is appropriate for all species within the assemblage. Likewise, catchability (vulnerability) of each co-occurring species by fishing gear is likely to be different. Thus, fishing rates for co-occurring species are not going to be reduced by equal amounts if effort within the fishery is reduced. Consequently, it will be difficult if not impossible to obtain F_{msy} and the biomass that produces MSY (i.e., B_{msy}) for several species simultaneously. Depending on which stock (or stocks) within the mixed-stock complex serve as indicators for the complex as a whole, remaining stocks within the complex may be variously over- or under-exploited with respect to their individual MSY levels. If the indicator stock is more productive than other species within the mixed-stock complex, some stocks within the complex may not be able to withstand the same level of fishing effort associated with the MSY control rule for the indicator species, and a precautionary approach becomes warranted in the face of uncertainty about productivity of non-indicator stocks. Those stocks could be potentially at risk for protection under the Endangered Species Act (ESA) if the fishery continues to overfish those stocks, while maintaining productive indicator stocks at MSY levels.

The national standard guidelines allow exceptions to the requirement to prevent overfishing in the case of a mixed-stock complex. If one species in the complex is harvested at OY, overfishing of other components in the complex may occur if (1) long-term net benefits to the Nation will be obtained and (2) similar long-term net benefits cannot be obtained by modification of fleet behavior or gear characteristics or other operational characteristics to prevent overfishing and (3) the resulting fishing mortality rate will not cause any stock or ecologically significant unit to require protection under the ESA.

2.3 Environmental Consequences

2.3.1 Socioeconomic Impacts

No economic impacts are anticipated under any of the alternatives. However, there may be more or less confusion about the terminology under the various alternatives. It may be clearest to use the terminology used in the national standard guidelines. Any social impacts would likely be limited to any confusion related to inconsistent terminology. The Council intends to take appropriate action to revise the FMP so that it is consistent with the law and federal guidelines while minimizing confusion of management officials, fishers, and the general public. While any change in the definition or use of common terms can be disruptive in the short term, in the long term clear, consistent language generally contributes to better communication and understanding.

2.3.2 Biological Impacts

The alternatives under consideration, including the status quo, have no regulatory effect and are only descriptive in nature. There is no impact on groundfish populations, the ecosystem or the marine environment. The Council would likely set similar or identical harvest limits under all the alternatives, including the status quo.

3.0 DEFINITION AND SPECIFICATION OF MSY, ABC, OY AND OVERFISHING CONTROL RULES, AND REBUILDING PROGRAMS

3.1 Purpose and Need for Action

The Magnuson-Stevens Act and proposed national standard guidelines require the Groundfish FMP to (1) prevent overfishing, which is defined to mean preventing the fishing mortality rate (F) from exceeding the MSY fishing mortality rate (i.e., F_{msy}); (2) rebuild overfished stocks, defined to mean stocks whose abundance has fallen below the overfished threshold; and (3) adopt a precautionary approach. The national standard guidelines describe three features of a precautionary approach. First, "... OY should be set safely below limit reference points (note: 'limit reference point' refers to MSY or other established limit below MSY)." Second, a stock or stock complex that is below the size that would produce MSY should be harvested at a lower rate or level of fishing mortality than if the stock or stock complex were above the size that would produce MSY (i.e., B_{msy})." Third, "criteria used to set target catch levels should be explicitly risk averse, so that greater uncertainty regarding the status or productive capacity of a stock or stock complex corresponds to greater caution in setting target catch levels."

Currently, the FMP's definition of overfishing is inconsistent with (1) above; overfishing is defined as the fishing mortality rate that would reduce spawning potential to 20% of the unfished level (abbreviated as $F_{20\%}$), but MSY is typically based on the $F_{35\%}$ or $F_{40\%}$ level, which are both lower exploitation rates. The FMP is also inconsistent with (3) above because MSY is treated as a target, reduced harvest rates are not required for stocks below their MSY size, and a risk avers policy is not defined. Rather, the Council has taken an ad hoc approach to risk aversion.

3.2 Alternatives Including Proposed Action

Status quo (no change) Maintain the current definition of OY and provisions relating to overfishing, rebuilding. MSY is a target but not necessarily a limit (i.e. harvest guidelines are based on applying $F_{35\%}$ to current biomass but may be adjusted up or down). OY is non-numerical, defined as "all the fish caught in accordance with current regulations." Overfishing defined as $F_{20\%}$, and no overfished threshold identified.

Alternative 1. Under this alternative, MSY is a constant fishing mortality rate (F_{msy}) that is a limit but may also serve as a target. In other words, it is a fixed exploitation rate, where a constant fraction of the stock may be harvested each year. The default rate is $F_{40\%}$ for rockfish and $F_{35\%}$ for other species, both of which may be superseded based on better scientific information. The overfished threshold is set at 50% B_{msy} or 25% $B_{unfished}$ (or, if larger, the minimum biomass level that, if $F_{35\%}$ applied for ten years, would allow stock to return to B_{msy} or 40% of $B_{unfished}$).

OY may be equal to or less than MSY, based on the Council's best judgement. Precautionary and uncertainty adjustments may be made on a case-by-case basis. If a stock falls below the overfished threshold, a rebuilding plan will be developed.

Alternative 2. (ADOPTED BY THE COUNCIL) Under this alternative, MSY is constant fishing mortality rate that is a limit. In other words, it is a fixed exploitation rate, where a constant fraction of the stock may be harvested each year. The default rate is $F_{40\%}$ for rockfish and $F_{35\%}$ for other species, both of which may be superseded based on better scientific information. ABC is defined as the appropriate F times the current biomass estimate. The default overfished/rebuilding threshold is 25% $B_{unfished}$.

For stocks with biomass larger than the MSY biomass, OY may be equal to or less than ABC. A precautionary threshold will be established that is equivalent to the MSY biomass size or productivity; when B_{msy} is not known, the proxy will be 40% of estimated level unless scientific data and analysis support a different value. When a stock is believed to be below its MSY size or precautionary threshold, the default OY will be below ABC according to a default formula. The default OY may be reduced to account for uncertainty in stock status or abundance. Other adjustments (social, economic, etc.) to the default OY may be made, including subtraction of anticipated bycatch and any fish taken as

compensation for private vessels conducting scientific resource surveys. For stocks below their overfished/rebuilding threshold, a default interim rebuilding adjustment to OY will take effect until a formal rebuilding plan is developed. The Council may recommend an OY above the default OY or ABC in accordance with the national standard guidelines. (See proposed FMP text, Section 5)

Alternative 3. Under this alternative, MSY is constant fishing mortality rate that is a limit. In other words, it is a fixed exploitation rate, where a constant fraction of the stock may be harvested each year. The default rate is $F_{40\%}$ for rockfish and $F_{35\%}$ for other species, both of which may be superseded based on better scientific information. ABC is defined as the appropriate F times the current biomass estimate. The default overfished/rebuilding threshold is 25% of the estimated unfished stock biomass..

For stocks with biomass larger than the MSY biomass, OY may be equal to or less than ABC. A precautionary threshold will be established that is equivalent to the MSY biomass size or productivity; when B_{msy} is not known, the proxy will be 40% of estimated level unless scientific data and analysis support a different value. When a stock is believed to be below its MSY size or precautionary threshold, the default OY will be below ABC according to a default formula. The default OY will be further reduced to account for uncertainty in stock status or abundance by applying a reduced exploitation rate equivalent to three percent or five percent SPR (that means $F_{43\%}$ or $F_{45\%}$ for rockfish and $F_{38\%}$ or $F_{40\%}$ for other species, unless the default F has been superceded). Other adjustments (social, economic, etc.) to the default OY may be made, including subtraction of anticipated bycatch and any fish taken as compensation for private vessels conducting scientific resource surveys. For stocks below their overfished/rebuilding threshold, a default interim rebuilding adjustment to OY will take effect until a formal rebuilding plan is developed. The Council may recommend an OY above the default OY or ABC in accordance with the national standard guidelines.

Alternatives 2 and 3 have the following suboptions that would further define the OY rule.

Suboption A would reduce OY below ABC along a straight line between the "MSY" catch (i.e., applying $F_{35\%}$ at $B_{40\%}$) and zero catch at 5 percent of the unfished biomass (i.e., $B_{5\%}$). This same line would be used as the interim rebuilding plan if a stock falls below its overfished/rebuilding threshold ($B_{25\%}$). The point at which the line intersects the horizontal axis does not necessarily imply zero catch would be allowed, but rather is for determining the slope of the line. The abbreviated name for this is the "40-5" option.

Suboption B (ADOPTED BY THE COUNCIL) is more conservative, drawing a line between the "MSY" catch and zero catch at $B_{10\%}$. The greater amount of catch reduction applied below $B_{40\%}$ would foster quicker return to the MSY level. If a stock falls below its overfished/rebuilding threshold, this line would be used as the interim rebuilding plan until the Council develops a formal rebuilding plan. As in Suboption A, the point at which the line intersects the horizontal axis does not necessarily imply zero catch would be allowed, but rather is for determining the slope of the line. The abbreviated name for this is the "40-10" option.

Suboption C is a combination of Suboptions A and B. When a stock is in its "precautionary zone," OY will fall along the 40-5 line; if the stock drops below its $B_{25\%}$ level, the interim rebuilding plan would set catch along the line between $B_{25\%}$ and $B_{10\%}$. As in Suboptions A and B, the point at which the line intersects the horizontal axis does not necessarily imply zero catch would be allowed, but rather is for determining the slope of the line. The abbreviated name for this is the "40-5-10" option.

Figure 3.1 illustrates the three suboptions.

3.3 Environmental Consequences

3.3.1 Overview of Alternatives

Alternatives 1, 2, and 3 would revise the framework for establishing OY. They would replace the $F_{20\%}$ definition of overfishing with the MSY control rule appropriate to each stock; define overfishing as exceeding ABC or F_{msy} (B) as defined by this control rule. Alternatives 2 and 3 would establish $B_{40\%}$ as the default

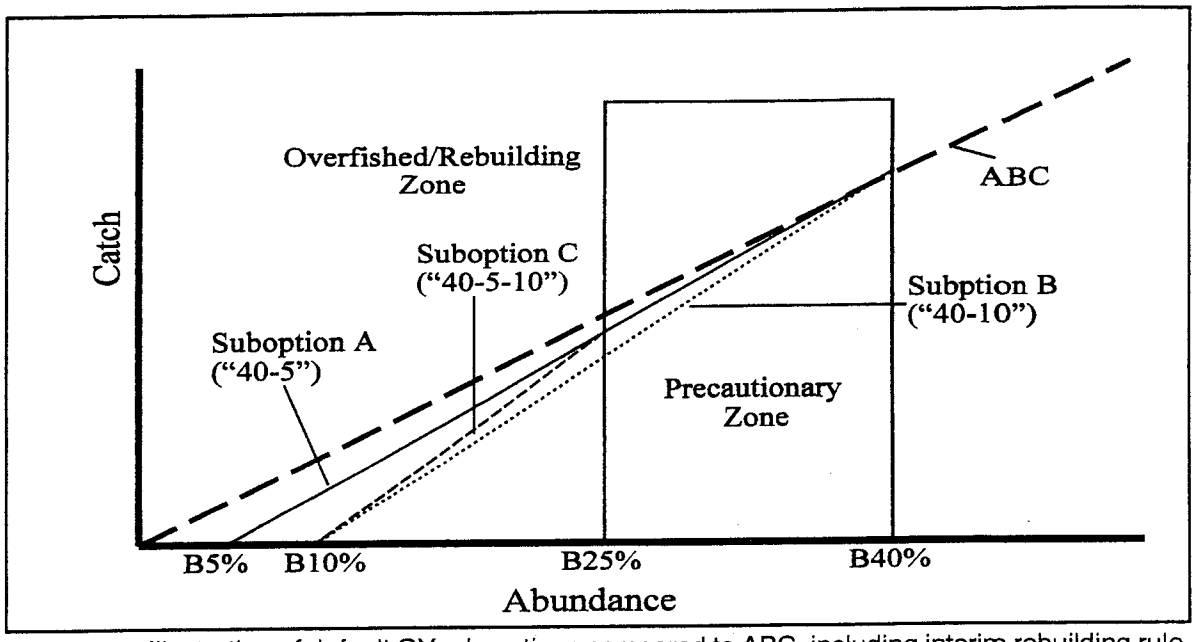

Figure 3-1. Illustration of default OY rule options compared to ABC, including interim rebuilding rule.

proxy value of B_{msy} (the precautionary threshold) and $B_{25\%}$ as the default overfished/rebuilding threshold. All default proxies may be superseded based on new scientific information that becomes available. Under Alternatives 2 and 3, when the stock is below the precautionary threshold, a default OY rule would set the harvest below ABC. This OY rule may be superseded or its results may be modified in cases where uncertainty concerning the stock assessment warrants more caution. Under Alternative 2, uncertainty adjustments will be considered case by case; under Alternative 3, uncertainty adjustments will be set by formula. Further adjustments to OY (up or down) are authorized if justified.

3.3.2 Overview of Physical and Biological Impacts

The environmental impacts generally associated with fishery management actions are effects resulting from (1) harvest of fish stocks which may result in changes in food availability to predators and scavengers, changes in the population structure of target fish stocks, and changes in the marine ecosystem community structure; (2) changes in the physical and biological structure of the marine environment as a result of fishing practices, e.g., effects of gear use and fish processing discards; and (3) entanglement/entrapment of non-target organisms in active or inactive fishing gear.

The alternatives considered here would establish policies for setting MSY, ABC, OY and overfishing levels in each future year based on estimates of stock size and other information available at the time. It is difficult to evaluate the long-term impacts of these alternatives quantitatively, especially for poorly understood stocks. This assessment focuses on short-term impacts, which were evaluated by considering how overfished classifications, ABC, and OYs would likely have changed in 1998 had a particular suboption been in place at the end of 1997.

3.3.3 Discussion of MSY Control Rule and Status Determination Criteria

The national standard guidelines state that an MSY control rule gives

> *"...fishing mortality rate as a continuous function of stock size, where the parameters of this function are constant and chosen so as to maximize the resulting long-term average yield."*

According to the national standard guidelines, the MSY control rule serves two important purposes: (1) It constitutes the maximum fishing mortality threshold, above which overfishing is considered to be occurring;

and (2) it determines the minimum stock size threshold, below which the stock is considered overfished. The groundfish FMP effectively establishes the MSY control rule as application of a constant fishing mortality rate (F), typically $F_{35\%}$. In 1997, based on a review by the Council's GMT, the default was modified for *Sebastes* rockfish which are now managed by application of $F_{40\%}$. None of the alternatives under consideration would substantially revise this approach to MSY; however, each alternative clarifies that in a data-rich situation the Council would calculate and apply the true F_{msy}; where less information is available, default proxies will be used until superseded based on improved scientific information. The groundfish FMP procedures call for applying the F_{msy} proxy to the current biomass best estimate to calculate the ABC. As the term is used here, this is the limit control rule for the current year, and exceeding ABC would constitute overfishing under each alternative except the status quo (unless the species is part of a mixed-stock complex, in which case the Council may choose to allow overfishing in accordance with the national standard guidelines.

This MSY does not achieve the maximum possible yield over the long term, but rather reflects a tradeoff between magnitude of yield and constancy of yield. According to Restrepo et. al,

> *In general, (constant F control rules) would be expected to result in a lower long-term average yield but a less variable yield than an MSY control rule in which fishing mortality was strongly related to stock size...*

Stock assessments prepared for West Coast groundfish species generally provide most or all of the following information: current biomass estimate, F_{msy} or proxy, translated into exploitation rate, estimate of MSY biomass (B_{msy}), and/or unfished biomass (based on average recruitment), and/or precautionary threshold, and a precision estimate (confidence interval) for current biomass estimate. In general, the quality of information available for West Coast groundfish can be described as data-moderate at best and data-poor in general.

It is likely that MSY and ABCs established under Alternatives 1, 2 and 3, would be identical or at least very similar.

3.3.4 Multispecies Considerations in Implementing MSY

Under the national standard guidelines, MSY is to be specified for each stock in a mixed-stock fishery, and if this is not possible, then "MSY may be specified on the basis of one or more species as an indicator for the mixed stock as a whole or for the fishery as a whole."

Because productivity (growth, recruitment and mortality) of each species in a stock complex is likely to be different, there will be no single value of F_{msy} that is appropriate for all species within the assemblage. Likewise, catchability (vulnerability) of each co-occurring species by the gear is likely to be different. Thus, fishing rates for co-occurring species will not be reduced by equal amounts if effort within the fishery is reduced. Consequently, it will be difficult if not impossible to obtain F_{msy} and B_{msy} for several species simultaneously. Depending on which stock (or stocks) within the mixed-stock complex serve as indicators for the complex as a whole, remaining stocks within the complex may be variously over- or under-exploited with respect to their individual MSY levels. If the indicator stock is more productive than other species within the mixed-stock complex, some stocks within the complex may not be able to withstand the same level of fishing effort associated with the MSY control rule for the indicator species, and a precautionary approach becomes warranted in the face of uncertainty about productivity of non-indicator stocks. Those stocks could potentially be at risk for protection under the ESA if the fishery continues to overfish those stocks, while maintaining productive indicator stocks at MSY levels.

The national standard guidelines allow exceptions to the requirement to prevent overfishing in the case of a mixed-stock complex. If one species in the complex is harvested at OY, overfishing of other components in the complex may occur if (1) long-term net benefits to the Nation will be obtained, (2) similar long-term net benefits cannot be obtained by modification of fleet behavior or gear characteristics or other operational characteristics to prevent overfishing, and (3) the resulting fishing mortality rate will not cause any stock or ecologically significant unit to require protection under the ESA.

It is not clear if and how the Council might deviate from the multi-species management approach established when the FMP was first implemented in the early 1980s. There is little biological and/or management information available for many species (e.g., *Sebastes* rockfish) and it is likely most species will continue to be grouped into a single management unit, or perhaps into two or three units. Setting appropriate harvest levels will be the subject of ongoing Council and scientific discussions.

3.3.5 Comparison of OY alternatives

It is not possible to make a precise comparison among these three options and the current management policies because of the flexibility inherent in status quo management and, to a lesser extent, in the alternatives presented. Under the status quo the Council has been free to set the total catch harvest guideline above or below the ABC given by the designated F_{msy} proxy (MSY control rule), and has chosen to do so on a number of occasions. The shortspine thornyhead harvest guideline has been set above the ABC in recent years, and in the fall of 1997 the Council set the harvest guidelines for widow rockfish, yellowtail rockfish, and sablefish below their ABCs as a precautionary measure. Additional precautionary adjustments on either an ad hoc (in Alternative 2) or a formal (in Alternative 3) basis are also allowed under the alternatives presented. Species which are harvested incidentally as part of a larger complex may have an OY higher than ABC if it can be demonstrated that the species will not continue to decline and the higher OY will provide greater long-term benefits to the Nation.

Alternative 1. Alternative 1 would make minimal change to the FMP by dropping the $F_{40\%}$ overfishing definition and stating that OY may equal but will not exceed ABC, and would establish overfished thresholds. Precautionary and uncertainty reductions to OY may be made case by case. This alternative may provide little guidance to the Council and public with respect to how to achieve the federal fishery management mandates and guidelines. To the extent the Council would continue to heed the best scientific advice and set harvest levels accordingly, stocks would receive the necessary protection from overfishing and tend to produce the maximum sustainable yield. Rather than incorporating specific criteria and guidelines in the FMP, Alternative 1 would maintain a very general framework for setting OYs, and the Council would likely rely on informal reference to the national standard guidelines when it develops its OY recommendations. For stocks falling below their overfished/rebuilding thresholds, this alternative provides little guidance about interim rebuilding plans. For stocks above B_{msy}, OYs set under Alternative 1 are likely to be the same as under Alternative 2.

Alternative 2. (Adopted by the Council) Some feeling for how the adoption of each OY default suboption would affect fishery management may be gained by comparing the total harvest targets established for the 1998 fishery under the current FMP with the harvest targets which would have been set using each of the OY control rules, given the same stock status and dynamics the Council assumed in developing its recommendations for the 1998 annual specifications. This comparison is shown in Table 3.1 for six groundfish stocks for which the requisite information could be obtained from recent stock assessment documents. The column labeled "1998 Target Total Catch" is the total catch harvest guideline for each species in 1998. For four of the six species (widow rockfish, yellowtail rockfish, canary rockfish, and Dover sole) the OY default suboptions produce results which are fairly close to what the Council actually recommended for 1998. The Council's precautionary adjustments for widow and yellowtail rockfish were slightly more conservative than any of the three default suboptions, while there was virtually no difference for canary rockfish and Dover sole. The large differences occur for the two stocks which appeared to be below their overfished thresholds, namely lingcod and sablefish. Since these stocks would require a rebuilding program to be implemented within one year of determining that they are overfished, the default OYs for these stocks would only be in place for one year before being replaced by the OYs of the rebuilding programs.

TABLE 3.1. Comparison of harvest targets (in metric tons) adopted for 1998 with proposed OY default options, assuming the stock assessment conclusions which guided the Council's decisions in setting 1998 ABCs and harvest guidelines.

Species	1998 ABC	'98 Target Total Catch	Suboption A OY	Suboption B OY	Suboption C OY	% of Unfished Biomass
Widow Rockfish	5,750	4,960[a/]	5,750	5,023	5,438	29[b/]
Yellowtail Rockfish	3,465	3,118[c/]	3,452	3,435	3,452	39
Canary Rockfish	1,045	1,045	995	929	995	30
Dover Sole	9,426	9,426	9,426	9,426	9,426	44
Lingcod[d/]	960	838[e/]	437	0	0	9[f/]

a/ Total catch target is below the ABC, because the Council made a precautionary adjustment to $F_{45\%}$ for setting the harvest guideline.
b/ Spawning output, rather than spawning biomass, is used due to increasing fecundity per body weight of larger female widow rockfish.
c/ Total catch target is below ABC, because the Council set the harvest guideline at 90% of the U.S. portion of the ABC.
d/ Uses pristine spawning stock to estimate unexploited spawning biomass.
e/ Total catch target is below ABC, because the Council made a precautionary adjustment to F40% for setting the harvest guideline.
f/ Below rebuilding threshold.

TABLE 3.2. Change in expected landings for selected species from status quo for OY default options, given the Council's assumptions in setting 1998 ABCs and harvest guidelines.

Species	Suboption A		Suboption B		Suboption C	
	mt	%	mt	%	mt	%
Widow rockfish	411	9.6	50	1.2	411	9.6
Yellowtail rockfish	281	10.7	264	10.1	281	10.7
Canary rockfish	-4	0.5	-9	1.0	-4	0.5
Dover sole	0	0	0	0	0	0
Lingcod*	-487	41.9	-838	100	-838	100

* Current information indicates overfished stock, which will require development of a rebuilding program.

For stocks above B_{msy} (or $B_{40\%}$), default OYs set under Alternative 2 would likely be the same as under Alternative 1 and larger than under Alternative 3. Below $B_{40\%}$, Alternative 2 could result in lower default OYs than Alternative 1; OYs would be greater than or equal to OYs set under Alternative 3. Alternative 2 would likely result in quicker rebuilding than Alternative 1 for stocks falling below the overfished threshold due to the interim rebuilding adjustment in each of the three suboptions. Rebuilding might be somewhat slower than Alternative 3.

Alternative 3. Alternative 3 is the same as Alternative 2 except the default OY would always be reduced to account for uncertainty under Alternative 3. Depending on the magnitude of the default uncertainty adjustment selected by the Council, for example three percent to five percent SPR, OYs would be expected to be roughly 15% to 25% below Alternative 2 in many cases. Such caution may be appropriate for stocks that are below their overfished/rebuilding threshold or whose status is extremely uncertain, environmental conditions are unfavorable, or essential habitat has been impacted. Implementation of reduced harvest rates would tend to rebuild stocks to MSY levels more quickly. Alternative 3 could be modified to apply the mandatory uncertainty adjustment only for stocks below B_{msy}. If this was done, Alternative 3 would be identical to Alternative 2 for healthy stocks.

For stocks determined to be above the MSY biomass level, harvest levels might be the same under all three alternatives. For stocks determined to be below B_{msy}, harvest levels would vary depending on the degree of separation between ABC and OY. Under the status quo and Alternative 1, the Council would recommend reduction from ABC on a case-by-case basis. Under Alternatives 2 and 3, a formula would determine the basic OY, although this value could be adjusted for specified reasons. Alternative 3 would likely result in the smallest OYs due to the mandatory uncertainty adjustment; all other things being equal, OYs could be as much as 15% to 25% lower under this alternative. However, it is more likely stocks would remain at or above B_{msy} (or return to B_{msy} more quickly) under Alternative 3 due to the more restrictive harvest levels that would likely be established. According to the draft "Technical Guidance on the Use of Precautionary Approaches to Implementing National Standard 1" by Restrepo et. al.,

> *The equilibrium consequences of fishing at the default 75% F_{MSY} were evaluated using the deterministic model of Mace (1994). The results of this exercise indicate that fishing at 75% F_{msy} would result in equilibrium yields of 94% MSY or higher, and equilibrium biomass levels between 125% and 131% B_{msy} -- a relatively small sacrifice in yield for a relatively large gain in biomass. Although it is likely that results would diverge for more complex models (e.g., those in which the ages of maturity and recruitment differed substantially, or those incorporating stochasticity), the calculations indicate that relatively small sacrifices in yields will result in relatively much larger gains in stock biomass. Increased biomass should in turn result in a number of benefits to the fishery, including increased CPUE, decreased costs of fishing, and decreased risk to the stock. Relative to fishing at F_{msy}, fishing at 75% F_{msy} will reduce the probability that a stock will decline to ½ B_{msy}.*
>
> *The deterministic simulation results presented ... should not be taken as being strictly applicable to every situation. Variability in the population dynamics parameters of a stock will affect the performance of fishing at 75% F_{msy}. As well, the evaluation only pertains to cases where F_{msy} can be reliably estimated. As such, the performance of the default target will depend on the robustness with which F_{msy} can be estimated or approximated.*

Thus, it is likely that Alternative 3 would have the highest likelihood of maintaining stocks at or above B_{msy} and preventing stocks from becoming overfished, followed by Alternative 2, Alternative 1 and the status quo. However, Alternative 3 may be more conservative than necessary and may be more likely to prevent achievement of MSY. Also, nothing under Alternative 3 would prevent the Council from reducing OY in cases where uncertainty is high.

3.3.6 Socioeconomic Summary

As stated earlier, it is difficult to anticipate the differences between impacts of the status quo and Alternatives 1 and 2, because the Council has typically set harvest guidelines consistent with the best scientific advice it receives. Alternative 1 would likely be identical or nearly identical to the status quo. This implies an intangible social benefit from continuity with previous policy and procedure. Under Alternative 1 the amount of public comment and debate at Council meetings regarding appropriate OY levels would be similar to the status quo, since this alternative provides substantial Council discretion. Compared to Alternatives 2 and 3, Alternative 1 appears likely to result in the highest harvest levels, which would provide the greatest possible gross revenue to the fishing fleet in the short term. If those short term harvest levels inadvertently exceed sustainable levels, or tend to maintain stocks at lower levels, the long term benefits may be less than the other alternatives.

The primary social effect of Alternative 2 in the short term might be intangible benefits from a clearer, more consistent policy for setting harvest levels. Under each of the suboptions, the Council, fishing industry and public can easily see how harvest levels will be determined in response to any given biomass estimate. Such a consistent policy would simplify the decision-making process while still providing the Council a degree of flexibility. Compared to Alternative 1, the nature of public comment and debate at Council meetings might focus more on the scientific credibility of biomass estimates rather than adjustments to OY, and on the uncertainty in the scientific information and analysis.

Actual harvest levels under Alternative 2 might not differ significantly from the status quo or Alternative 1, but any of the three suboptions under consideration would generally result in lower harvest levels than the most liberal case under Alternative 1 (for stocks below $B_{40\%}$). In this regard, Alternative 2 is likely to be more restrictive than Alternative 1.

Alternative 3 would place the most constraints on Council choice of OY, and would likely result in the lowest short-term harvest levels of the three alternatives. In the long term, this alternative could result in greater OY stability by maintaining stocks at higher population size. If densities and availability of fish is greater under this alternative, catch efficiency would likely increase. This could either improve or worsen the situation if the likelihood of vessels exceeding trip limits increases, or if bycatch rates of non-target groundfish increase. The point is that merely increasing stock size will not eliminate many of the problems currently facing the fishing industry, but healthier stocks will contribute to improvement.

The short-term gross revenue differences between the alternatives could be computed using the figures in Tables 3.1 and 3.2. Assuming the status quo and Alternative 1 would be the same as the 1998 Council harvest guidelines, and suboptions A, B and C indicate changes from status quo, one could multiply the values by the exvessel values for each of the species to determine differences in gross exvessel values.

3.3.7 Potential Helpful Analysis

To determine the long-term differences in biological impacts on the various groundfish stocks, one would have to model the populations and population changes based on a variety of assumptions. Among the assumptions would be accuracy of stock assessments, including any long term bias (i.e., chronic over- or underestimation), recruitment, virgin population size and structure, longevity, and selectivity of harvest gears. The analysis should investigate the likelihood that individual stocks would fall below the MSY biomass level and the overfished/rebuilding threshold and the long term total harvest that would be expected under each of the alternatives and suboptions.

4.0 DEFINITION, DESCRIPTION AND IDENTIFICATION OF ESSENTIAL FISH HABITAT

4.1 Purpose and Need for Action

The 1996 Magnuson-Stevens Act amendments emphasized the importance of habitat protection to healthy fisheries and strengthened the ability of NMFS and the Councils to protect and conserve habitat of finfish, mollusks, and crustaceans. This habitat is termed essential fish habitat (EFH), and is defined to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity". Each Council is required to amend its management plans by October 1998 to:

- Identify and describe EFH for species managed under a fishery management plan.
- Describe adverse impacts to that habitat from fishing activities.
- Describe adverse impacts to that habitat from non-fishing activities.
- Recommend conservation and enhancement measures necessary to help minimize impacts, protect, and restore that habitat.
- Include conservation and enhancement measures necessary to minimize to the extent practicable, adverse impacts from fishing on EFH.

Once the FMPs are amended with this EFH information, NMFS and the Councils can be more proactive in protecting habitat areas by alerting other federal and state agencies about areas of concern. Federal agencies engaging in activities that may adversely affect EFH must consult with NMFS regarding those activities. NMFS and the Council may make suggestions on how to mitigate any potential habitat damage.

The themes of sustainability and risk-averse management are prevalent throughout the Magnuson-Stevens Act, both in the management of fishing practices (e.g., reduction of bycatch and overfishing and consideration of ecological factors in determining OY) and in the protection of habitats (i.e., prevention of loss of habitats, including EFH). Management of fishing practices and habitat protection are both necessary to ensure long-term productivity of our Nation's fisheries. Mitigation of EFH losses and degradation will supplement the traditional management of marine fisheries. The Council and resource managers will be able to address a broader range of impacts that may be contributing to the reduction of the groundfish resources. Fishery resources are dependent on healthy ecosystems and actions that alter the ecological structure and/or functions within the system can disturb the health or integrity of an ecosystem. Excess disturbance, including over-harvesting of key components (e.g., managed species) can alter ecosystems and reduce their productive capacity. Even though traditional groundfish management and the FMP have been mostly based on yields of single-species or multi-species stocks, the Magnuson-Stevens Act encourages a broader, ecosystem approach.

Each Council must identify in its FMPs the habitats used by all life history stages of each managed species in their fishery management units. Habitats that are necessary to the species for spawning, breeding, feeding, or growth to maturity are described and identified as EFH. These habitats are to be described in narratives (text and tables) and identified geographically (in text and maps) in the FMP. Mapping of EFH is intended to improve the sharing of information with the public, affected parties, and Federal and state agencies to facilitate conservation and consultation. After describing and identifying EFH, Councils are to assess the potential adverse effects of all fishing-equipment types on EFH and must include management measures that minimize adverse effects, to the extent practicable, in FMPs. Councils are also directed to examine non-fishing sources of adverse impacts that may affect the quantity or quality of EFH and to consider actions to reduce or eliminate the effects. Councils should identify means to further the conservation and enhancement of EFH.

Regulations implementing EFH provisions establish procedures for implementing the coordination, consultation, and recommendation requirements of the Magnuson-Stevens Act. NMFS will coordinate with other Federal and state action agencies by providing them with descriptions and maps of EFH, as well as information on ways to conserve and enhance EFH. The regulations allow Federal agencies to use existing consultation/environmental review procedures or the procedures outlined in the regulation to fulfill their requirement to consult with NMFS on actions that may adversely affect EFH. Consultations may be conducted at a programmatic and/or project-specific level. In cases where effects from an action will be

minimal, both individually and cumulatively, a General Concurrence procedure has been developed to simplify the Federal consultation requirements. Consultation on Federal actions may be conducted under Abbreviated or Expanded Consultation, depending on the severity of the threat to EFH. When NMFS or a Council provides EFH conservation recommendations to a Federal agency, that agency must respond in writing within 30 days. If the action agency's decisions differ from NMFS' conservation recommendations, further review of the decision may be continued by the two agencies.

4.2 Alternatives Including Proposed Action

Status quo (no action). The FMP would not be amended to address Essential Fish Habitat (EFH). This alternative does not comply with the Magnuson-Stevens Act and the national standard guidelines.

Alternative 1. (ADOPTED BY THE COUNCIL) Amend the FMP to define and identify EFH, for the fishery management unit as a whole, as the entire Exclusive Economic Zone (EEZ) and marine coastal waters inshore of the EEZ. For simplicity, EFH is described as seven composite habitats. The management framework(s) would be revised to authorize regulations to reduce the impact of fishing on EFH. Available life history information and habitat descriptions (for each individual species covered by the FMP) will be compiled into a reference document and made available on request. Potential nonfishing effects are identified and described, along with recommendations and consultation procedures. No regulations are proposed at this time.

(See proposed FMP text, Sections 6.6.1-6.6.4 and 11.10)

Alternatives considered but not included.

The EFH Technical Team considered several alternative definitions of EFH prior to recommending the composite EFH approach. In particular, the team was concerned about including the entire EEZ in the EFH definition, and debated whether a more restrictive definition could be developed. One approach would be to identify EFH for each species and life stage as their respective areas of high density, when known. For west coast groundfish, the fisheries and most surveys primarily provide information on adult distributions and densities. Consequently, sufficient data for adults of several species are available to describe areas of high density, and EFH could be identified as these areas. However, even for these species, there are significant geographic and seasonal limitations in the density information. For example, most bottom trawl surveys which measure adult densities sampled only trawlable bottom from 50 meters to 350 meters deep during spring or summer. Nontrawlable substrates, depths outside this range, and other seasons have rarely been surveyed.

There is substantially less information for younger life stages of nearly all groundfish species; data are not available or insufficient to identify areas of high density. As a result, EFH would not be identified for these. Also, it is unlikely there will be sufficient data in the foreseeable future to identify EFH based on densities.

Reliance on areas of high density to identify EFH has additional limitations. Utilizing high densities alone to identify EFH would not ensure that adequate areas were protected as EFH. Areas of high density based on current information do not adequately address unpredictable annual differences in spatial distributions of a life stage, nor changes due to long-term shifts in oceanographic regimes. Also, all habitats occupied by a species contribute to production at some level, and observed densities do not necessarily reflect all habitat essential to maintain healthy stocks within the ecosystem. Although contributions from individual locations may be small, collectively they can account for a significant part of total production. A species' long-term productivity is based on both high and low levels of abundance and the entire distribution may be required during times of low abundance. For these reasons, the team did not believe this approach was justifiable or scientifically supportable.

4.3 Environmental Consequences

4.3.1 Overview of Physical and Biological Impacts

There are no immediate biological impacts anticipated from the proposed action. The status quo (no action) is not a valid alternative because federal legislation requires identification of EFH and potential threats to EFH. However, definition and identification of EFH do not in themselves impose environmental consequences.

The long-term implications of the alternatives are more difficult to anticipate, because associated with the EFH policy is a mechanism to impose gear restrictions, area closures and harvest limits to protect EFH. The effects of any such measures would be analyzed when they are proposed.

There is little information on the effects of fishing gears on the habitat of Pacific coast groundfish, although there are numerous theories and a great deal of speculation about the effects of various fishing gears on structural habitat. If essential habitat has been degraded by fishing activities or would be by future fishing activities, and if that degradation affects productivity of any fish stock, and if that relationship can be established, then adoption of Alternative 1 could have a substantial beneficial affect on the long term productivity of that stock. Currently it is debatable whether any or all fishing effects on habitat are destructive to groundfish. For example, some people believe productivity may be enhanced by trawl gear turning over surface sediments when dragged over soft (mud, sand, etc.) sea floor. Others are concerned there may be negative effects from activities that tend to smooth the sea floor by flattening rock piles, overturning boulders, etc. It is clear that on-bottom trawl fishing activities remove large numbers of non-groundfish organisms (starfish, sea pens, brittle stars, etc.) and that many of these organisms die. This affects the population dynamics of those species and any ecosystem equilibrium that may have developed.

The available information on the effects of fishing gear on marine fish habitat comes from research that has been concentrated in heavily fished areas off the east coast of Canada and the United States, and in the North Sea. There are substantial differences in sea floor topography, other physical features, and biological characteristics between those regions and the Pacific coast of the United States. In addition, most research in those areas focused on trawl and dredge gears, with little information on the effects of non-mobile (fixed) gears. There is ongoing debate about the applicability of that research to the Pacific coast environment, however information from those areas will be used by the Council as appropriate. Pacific coast trawl adaptations, such as tire roller gear for improving gear performance in rocky areas, have only recently been explored outside of tropical habitats. Habitat protection will be considered as a tool in groundfish stock restoration.

A marine ecosystem in a "virgin" or unfished state would support a specific number and complexity of fish species. As a marine area is fished, the qualities of the ecosystem change in relation to the number of fish of each species removed from the ecosystem and the effects of fishing gear on the habitat(s) of species using that area. After a number of years of fishing, the habitat quality and nature of that marine ecosystem might be significantly different from the virgin ecosystem. Habitat modified by fishing pressure would support a different set of fish species from those supported by virgin habitat for that same area. In general, marine habitats that have been less altered by fishing and other activities are more complex in structure and more productive in lower level organisms such as worms and crustaceans than highly altered habitats. However, if alteration increases the complexity of the habitat, complexity and productivity of the ecosystem could theoretically be increased. Marine habitats with greater complexity at lower trophic levels and with greater structural complexity tend to support a more complex mix of fish species in greater abundances than altered habitats. In some cases, however, activities that add nutrients to the system can increase total productivity but reduce complexity. Thus, productivity alone should not be used as a measure of environmental integrity.

Marine habitat complexity can be altered by the scraping, shearing, and crushing effects of fishing gear. Physical effects of trawling include plowing and scraping the sea floor, and resuspension of sediment. Plowing and scraping effects depend on towing speed, substrate type, strength of tides and currents, and gear configuration. It has been found that otter doors tend to penetrate the substrate 1 cm to 30 cm; 1 cm

on sand and rock substrates, and 30 cm in some mud substrates. Another factor that will cause variation in the depth of the troughs made by the otter doors, is the size (weight) of the doors, i.e. the heavier the doors the deeper the trough. These benthic troughs can last as little as a few hours or days in mud and sand sediments, over which there is strong tide or current action, or they can last much longer, from between a few months to over five years, in seabeds with a mud or sandy-mud substrate at depths greater than 100 m, with weak or no current flow.

Another aspect of plowing and scraping is the alteration done by the footrope; different types of footropes will cause more or less alteration. Footropes that are designed to roll over the sea floor, cause little physical alteration, other than smoothing the substrate and minor compression. However, since a trawler may re-trawl the same area several times, these minor compressions can cause a "packing" of the substrate. Further compression of the substrate can occur as the net becomes full and is dragged along the bottom. Trawl gear used off the Pacific coast is often modified with a "roller gear" footrope, where rubber tires are packed together along the footrope, allowing the base of the net to bounce along the bottom, or to drag over obstructions without snagging the net. Development of roller gear has allowed trawlers to work in formerly inaccessible, rocky areas. New research in the Gulf of Alaska on the impacts of roller gear on bottom habitat may soon provide documentation on the effects of roller gear on bottom habitat.

Similarly, longline gear has been seen to shear marine plants, corals, and sessile organisms from the bottom. Observations of halibut longline gear made by NMFS scientists during submersible dives off Southeast Alaska provide some information: "Setline gear often lies slack on the sea-floor and meanders considerably along the bottom. During the retrieval process the line sweeps the bottom for considerable distances before lifting off the bottom. It snags on whatever objects are in its path, including rocks and corals. Smaller rocks are upended, hard corals are broken, and soft corals appear unaffected by the passing line. Invertebrates and other light weight objects are dislodged and pass over or under the line. Fish, notably halibut, frequently moved the groundline numerous feet along the bottom and up into the water column during escape runs disturbing objects in their path. This line motion was noted for distances of 50 feet or more on either side of the hooked fish." Further observations by scientist divers monitoring longline gear off Alaska noted that longlines swept the sea floor, entangling scallops and corals, bringing those animals to the surface during line retrieval.

Although there has been no research conducted on pot gear effects on habitat along the Pacific coast, pot gear may damage demersal plants and animals as it settles, and longlined pots may drag through and damage bottom fauna during gear retrieval. Similarly, anchoring the pot lines or the ends of the longlines may have crushing or dragging effects. In addition to direct bottom habitat alteration, fishing gear that is lost at sea and left to "ghost fish" can cause changes to habitat. Pacific coast groundfish regulations include trap gear restrictions that require trap construction with biodegradable escape panels, so that traps will no longer ghost fish after the escape panels have degraded. Depending on the number of pots that are lost each year and where they are fished, lost pots may alter marine habitat simply by providing a different type of relief than the natural habitat.

Beyond bottom habitat, fishing activities can impact the water column. Although there are presumably few, if any, direct effects from mid-water trawling on EFH, this fishery may alter species complexity in the water column. The at-sea fishery for Pacific whiting off the Pacific coast north of 42° N latitude processes fish at sea. There may be negative effects from the offal and processing slurry discard associated with these fisheries. Prolonged offal discards from some large-scale fisheries have redistributed prey food away from mid-water and bottom feeding organisms to surface-feeding organisms, usually resulting in scavenger and seabird population increases. Conversely, large offal discards in low-current environments, when not preyed upon by surface scavengers, can also collect and decompose on the ocean floor, creating anoxic bottom conditions. Pacific coast marine habitat is generally characterized by strong current and tide conditions, but there may be either undersea canyons affected by at-sea discard, or bays and estuaries affected by discard from shoreside processing plants. As with bottom trawling off the Pacific coast, little is known about the environmental effects of mid-water trawling and processing discards on habitat conditions.

One type of management authorized by the Alternative 1 is establishment of Marine Protected Areas (MPAs). Council members have specifically asked that these be investigated as potential management and/or EFH protection measures. There are examples of areas completely closed to fishing that have become havens for breeding populations or nursery areas for some species, especially sedentary species. The direct effects on EFH that would result from elimination of fishing impacts are difficult to predict, but to the extent that habitat has been degraded by fishing and that it can "heal" in the absence of such activities, EFH within the MPA boundaries would be improved. In establishing any MPAs, the Council would involve scientists, fishers, agency personnel, and the general public in a long term process of evaluation, education and debate.

4.3.2 Socioeconomic Summary

There are no immediate socioeconomic impacts anticipated from the proposed action. The status quo (no action) is not a valid alternative because federal legislation requires identification of EFH and potential threats to EFH. Definition and identification of EFH do not in itself impose environmental consequences.

The long-term social and economic implications of the alternatives are more difficult to anticipate, because associated with the EFH policy is a mechanism to impose gear restrictions, area closures and harvest limits to protect EFH. The effects of any such measures would be analyzed when they are proposed. Any restrictions on gear that is determined to negatively affect EFH would likely impose short-term costs on the fishers using that gear. Fishers using gear and techniques that do not negatively affect EFH would tend to benefit from improved catch rates as habitat and stocks "heal."

4.4 Additional Council Action Related to EFH Protection

Prior to its adoption of Alternative 1, the Council received a great deal of written and oral testimony about EFH, and much of the testimony strongly recommended the Council implement specific regulations to reduce fishing impacts on EFH. However, there is virtually no information connecting fishing gear or activities to destruction of groundfish EFH. Likewise, there is little or no information relating specifically to methods to reduce or mitigate any effects of fishing on EFH. The Council endorsed the concept of gathering such information and establishing gear performance standards. In particular, the Council committed to activating a committee to evaluate current gear regulations with the intent that the committee should investigate gear performance standards and specific gear configurations and/or fishing methods to reduce potential impacts on EFH. Such measures could include prohibitions on materials that protect fishing gear from damage by EFH, on the assumption that EFH is more likely to be damaged by gear that is relatively invulnerable to damage by contact with EFH. For example, the footrope of a trawl can snag and/or become entangled with structures on the ocean floor unless material is attached to the footrope to reduce snagging or otherwise protect it from damage. Typically, the footrope may be strung through rubber discs or tires that enable it to pass over rough bottom terrain such as rock piles and boulders. The EFH appendix to the FMP describes this and other potential effects of fishing gear on bottom habitat. The Council's committee will be instructed to consider such issues when it reviews the legal gear definitions.

In addition, the Council received testimony in support of reserves or refuges closed to some or all fishing activities. This issue is extremely controversial on the west coast at this time. Although many fishers may support the concept of setting aside harvest refuges, no one wants to be restricted from fishing productive areas near their own ports. The Council will continue to consider this concept both for protection of EFH and to reduce the likelihood of overfishing vulnerable groundfish stocks.

5.0 BYCATCH PROVISIONS

National Standard 9 states that "Conservation and management measures shall, to the extent practicable: (1) Minimize bycatch; and (2) To the extent bycatch cannot be avoided, minimize the mortality of such bycatch." The national standard guidelines explain that this standard requires the Council to consider the bycatch effects of existing and planned conservation and management measures. Bycatch is defined to mean fish that are harvested in a fishery, but that are not sold or kept for personal use. Bycatch includes the discard of whole fish at sea or elsewhere, including economic discards and regulatory discards, and fishing mortality due to an encounter with fishing gear that does not result in capture of fish (i.e., unobserved fishing mortality). The national standard guidelines state that "fish that are bycatch and cannot be avoided must, to the extent practicable, be returned to the sea alive. Any proposed conservation and management measure that does not give priority to avoiding the capture of bycatch species must be supported by appropriate analyses. The national standard guidelines state the Council must "Promote development of a database on bycatch and bycatch mortality in the fishery to the extent practicable." The Council must review and, where necessary, improve the data collection methods, data sources, and applications of data for each fishery to determine the amount, type, disposition, and other characteristics of bycatch and bycatch mortality in each fishery. The Council must "For each management measure, assess the effects on the amount and type of bycatch and bycatch mortality in the fishery." The Council must "Select measures that, to the extent practicable, will minimize bycatch and bycatch mortality." The Council also must monitor selected management measures.

5.1 Purpose and Need for Action

Federal legislation mandates that bycatch be avoided to the extent practicable, and similarly that bycatch mortality be avoided. The Council is required to consider the bycatch effects of its proposed regulations. Currently the FMP authorizes implementation of management measures to reduce bycatch of non-groundfish species in certain limited circumstances. There are no specific measures to collect bycatch information, monitor management measures for bycatch effects, or objectives to minimize bycatch and bycatch mortality. Currently the FMP (Section 6.2.4) authorizes implementation of measures "to control groundfish fishing to share conservation burdens identified under overfishing definitions adopted by the Council, the ESA, or other applicable laws, while minimizing disruption of the groundfish fishery." This provision, although intended "to reduce bycatch or other direct mortality of any species," is limited to situations where information is presented to substantiate the conservation concern for a particular species. "The intention of the measures may be to share conservation burdens while minimizing disruption of the groundfish fishery, but under no circumstances may the intention be simply to provide more fish to a different user group or to achieve other allocation objectives." National Standard 9 does not include or imply such limitations, but rather establishes a broad mandate to minimize bycatch and bycatch mortality. Thus it is likely the FMP is not in compliance with the Magnuson-Stevens Act.

5.2 Alternatives Including Proposed Action

Status quo (no action). There will be no changes to the FMP related to bycatch. (This alternative is not viable.)

Alternative 1. (ADOPTED BY THE COUNCIL) Establish a bycatch management objective, a standardized reporting methodology, and procedures for implementing bycatch reduction measures, and promote bycatch data collection efforts. (See proposed FMP, Sections 2.1, 6.2.2, 6.2.3, and 6.3.2) No regulations are proposed at this time.

Under this alternative, the "points of concern" and socioeconomic framework procedures would be amended to add three provisions. First, if estimated bycatch of a species or species group increases substantially above previous estimates, a "point of concern" occurs, triggering an evaluation of whether a resource conservation issue exists. Second, the Council will evaluate, to the extent possible, the effects of proposed management measures on bycatch. Third, there would be clear authorization that management measures may be implemented to reduce anticipated bycatch of either groundfish or nongroundfish species.

5.3 Environmental Consequences

5.3.1 Overview of Physical and Biological Impacts

Under the Magnuson-Stevens Act nearly all species of marine animals (except birds and mammals) are considered to be "fish." Thus, the term bycatch applies to the incidental capture and discard of not just finfish but many other non-target species such as crustaceans, starfish, corals, sea urchins, etc. When the Council addressed bycatch issues in recent years, the focus was on prohibited species (Pacific salmon and halibut) and also groundfish (those species and amounts which must be discarded according to current regulations).

Neither the status quo nor proposed action would result in an immediate change in the federal regulations. The proposed action would amend current policies and procedures relating to bycatch in the West Coast groundfish fisheries. These policies in themselves do not impose environmental consequences, and there are no immediate biological impacts anticipated from either the status quo or alternative. The long term implications of the alternatives are difficult to anticipate, because associated with the bycatch reduction policy is a mechanism to impose gear restrictions, area closures, harvest limits and other measures to reduce bycatch. The effects of any such measures would be analyzed when they are proposed.

There is little information on the biological effects of bycatch on Pacific coast groundfish and other species. The most critical concern has been related to salmon stocks listed as threatened or endangered under the ESA. In response to concerns expressed by the Council, NMFS and public, the participants in the fisheries for Pacific whiting adopted voluntary standards for avoiding bycatch of salmon, particularly chinook salmon. The Council endorsed this voluntary standard of 0.05 chinook salmon per metric ton of whiting caught. NMFS has also endorsed this voluntary bycatch standard and included it in biological opinions which concluded the groundfish fisheries do not threaten the long term health of salmon stocks.

Bycatch of Pacific halibut in the groundfish fishery is generally considered not to be a biological threat but more of a social and economic impact. Pacific halibut quotas off Washington, Oregon, and California take estimates of bycatch into account.

Estimates of groundfish bycatch are typically deducted from allowable harvests set each year. These estimates were developed based on various data sources, most of which came from research conducted prior to about 1987. The groundfish fisheries have changed substantially since then, with several additional species subject to trip limits and all trip limits substantially smaller than during the research periods. To the extent these bycatch estimates are accurate, there should be little threat to the groundfish stocks. However, if the estimates are too low, and actual groundfish harvest levels are in excess of sustainable levels, groundfish stocks would decline.

The proposed action includes establishment of procedures to implement bycatch reduction regulations, such as gear restrictions, harvest specifications, seasons and area closures. Therefore, in the long term it is expected that bycatch will decline and any negative biological effects would be reduced. Also, the proposed management objective to reduce bycatch may help educate fishers and the public to the national and Council policy to reduce bycatch and bycatch mortality.

Accurate reporting of total fishing mortality (i.e., number or pounds of fish actually killed) is an important aspect of fishery management. Currently there is very little bycatch information, and the GMT has continually stressed the need for an onboard observer program or other methods to accurately assess total bycatch. An observer program could greatly improve estimates of groundfish bycatch and prohibited species, but estimates of bycatch of other species would probably require specific research. Other methods of collecting groundfish and prohibited species bycatch information (e.g., logbooks) could be effective if participants recognized the value and need and were willing to provide this information.

Full implementation of a bycatch reduction program would result in one or more of the following: a greater proportion of the groundfish catch being retained and delivered to shore; a reduction in the number of nongroundfish finfish being killed; a reduction in mortality of other non-target animals; a more accurate assessment of total mortality of all species harvested incidentally in groundfish fisheries.

5.3.2 Socioeconomic Summary

There are no immediate socioeconomic impacts anticipated from either of the alternatives. The proposed policies and procedures in themselves do not impose consequences. However, the Council is mandated to consider the bycatch effects of its current and future regulations, and this may result in social and/or economic impacts in the future. The long term implications of the alternatives are difficult to anticipate, because associated with the bycatch reduction policy is a mechanism to impose gear restrictions, area closures, harvest limits and other measures to reduce bycatch. The social and economic effects of any such measures would be analyzed when they are proposed.

The term "regulatory bycatch" is used to refer to the species and amounts of groundfish that fishers would retain if allowed but that they must discard in accordance with regulations (that is, so they stay within the specified landing limits). There are at least two ways to reduce such regulatory bycatch. One way this type of bycatch can be reduced is by revising the regulations and allowing fishers to retain and sell all the fish they catch. Several important benefits could be expected from this approach. Conscientious fishers would not face the emotional strain about killing good fish and throwing them away rather than keeping and selling them. The fish could provide food, fishers could increase their revenues, and the public perception of waste could be reduced. A second way would be to reduce target fisheries in order to reduce impact on non-target species. This would likely reduce the harvest of associated species, reduce the amount of fish available as food, and reduce fishers' revenues.

The current policy of maintaining a year-round groundfish fishery is based on the assumption that catch by individual vessels can be held within specified limits. The harvesting sectors are currently overcapitalized, and trip limits for most species have been reduced to the lowest levels ever. There is a widespread assumption (based on some data and substantial anecdotal information) that the rate of groundfish bycatch (i.e., regulatory discard) increases as trip limits are reduced. However, no quantitative relationship between the two is available.

In the long term, the Council may consider providing incentives for vessels that maintain low bycatch rates. Such incentives would require mechanisms to verify bycatch rates, either through an on-board observer program or other way. Individual quotas (either directed fishing quotas or bycatch limits) could contribute to bycatch reduction. Other more general measures could also be applied. However, measures that decrease efficiency impose economic costs on the industry and may even increase bycatch.

5.3.3 Summary of Impacts

To the extent that better information becomes available from adoption of Alternative 1, and to the extent that management measures and public awareness result in reduced bycatch, benefits to the groundfish resource and other components of the marine ecosystem would be expected. Additional costs to groundfish harvesters would be likely if harvest efficiency of target stocks is reduced in order to reduce bycatch. No regulations are proposed at this time, so any costs and benefits would be delayed until such regulations are implemented. Costs and benefits would be investigated during the implementation process.

5.4 Additional Council Action Related to Bycatch Reduction

As for EFH protection, the Council received a great deal of written and oral testimony about bycatch reduction, and much of the testimony strongly recommended the Council to take immediate action to evaluate current bycatch levels in the groundfish fisheries, monitor changes in bycatch levels, and implement bycatch reduction measures. In particular, there was considerable support for an observer program to monitor bycatch, and much of the comment called for immediate implementation of an observer program. On several occasions since 1990, the Council has initiated development of an observer program

but has been unable to resolve funding limitations. Recently, the Council established a new committee and directed it to evaluate methods to determine total catch of groundfish, including the widespread or occasional use of observers, logbooks, etc., and possible funding sources.

In addition, the Council committed to activating a committee to evaluate current gear regulations with the intent that the committee should investigate gear performance standards and specific gear configurations to reduce the likelihood that a vessel would catch more than the specified vessel trip limit. Council members noted that vessels typically use the same size nets that were used when groundfish trip limits were much larger. One idea under consideration is to reduce (potential and actual) bycatch by limiting the physical capacity of the gear so that large amounts of fish cannot be caught. This could include smaller nets or nets of different design, limitations on the number of hooks, or other capacity limitations. Such measures could also reduce fishing effects on EFH, as noted in Issue 3, but could exacerbate EFH impacts if not carefully evaluated. The Council's committee will meet in late 1998 or early 1999 and will be instructed to consider such issues when it reviews the legal gear definitions.

6.0 FISHING COMMUNITIES

6.1 Purpose and Need for Action

Amendments to the Magnuson-Stevens Act in 1996 established National Standard 8 which states that "Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (1) provide for the sustained participation of such communities, and (2) to the extent practicable, minimize adverse economic impacts on such communities." The FMP does not specifically address fishing communities and potential impacts on such communities, and may not be in compliance with the Magnuson-Stevens Act and national standard guidelines.

6.2 Alternatives Including Proposed Action

Status quo (no action). The FMP would not be amended to address impacts on fishing communities. The Council is preparing a baseline description of fishing communities for inclusion in the SAFE document or a separate report.

Alternative 1. (ADOPTED BY THE COUNCIL) Establish a management objective relating to maintenance of fishing communities and amend the framework procedures to consider impacts of management measures on fishing communities. The Council is preparing a baseline description of fishing communities for inclusion in the SAFE document or a separate report. Indian fishing communities will be included in this description, to the extent possible. No regulations are proposed at this time.

Under Alternative 1, a new FMP objective 17 would be established (See FMP Section 2.1). The "points of concern" and socioeconomic framework procedures would be amended to require the Council to describe the anticipated impacts of proposed management measures on fishing communities. (See FMP Sections 6.2.2 and 6.2.3).

6.3 Environmental Consequences

There are no immediate biological or socioeconomic impacts anticipated from the status quo or proposed action. At this time, nothing prevents the Council from complying with the Magnuson-Stevens Act and national standard guidelines voluntarily; the current FMP frameworks authorize the Council to consider any relevant factors in making management decisions, and impacts on fishing communities would be a relevant factor. The underlying principle of the FMP is protection of the groundfish fishery resource which, in the long term, would provide protection to the communities that rely on that resource. However, Alternative 1 would make a clear statement to the public and fishing industry of its intent to consider the effects of management decisions on the broader fishing public. By establishing a new FMP objective and modifying the management framework, the Council would be laying the groundwork for closer consideration of fishing communities. In order to accomplish this, better information on fishing communities must be readily available. Therefore, the Council is preparing a baseline description of fishing communities, including the commercial, private recreational and charter sectors. These policies and procedures in themselves do not impose environmental consequences. However, availability of information about fishing communities will provide tangible and intangible social benefits. Better information typically leads to better-informed decisions, and an improved understanding of the needs of fishing communities should contribute to their economic well-being. The intention of National Standard 8 is to improve the social and economic conditions of fishing communities by requiring the Council and NMFS to consider their special needs prior to taking management actions that could impose costs or reduce benefits.

7.0 CLARIFY AND EXPAND COUNCIL AUTHORITY TO REQUIRE GROUNDFISH USE PERMITS

7.1 Purpose and Need for Action

Section 303 (b) of the Magnuson-Stevens Act lists discretionary provisions of FMPs. According to this section, any FMP may "(1) require a permit to be obtained from, and fees to be paid to, the Secretary, with respect to (A) any fishing vessel of the United States fishing, or wishing to fish, in the EEZ... (B) the operator of any such vessel; or (C) any United States fish processor who first receives fish that are subject to the plan." During the session held by the Council in June 1997 to determine the scope of the FMP amendment, public testimony supported including an a provision to clarify the FMP authority to require a permit for groundfish processors and other groundfish users. Among the concerns expressed were the potential for inaccurate records of participation in the various commercial fishing sectors and processing sector, the potential for unreliable catch and landings statistics, and the possible need to restrict entry into an industry that is already severely overcapitalized. The primary concern related to the processing sector, including commercial fish buyers. Over the past few years, the Council has discussed the issue of a general groundfish use permit, including as a way to determine total participation in the fishery and as a potential effort control measure.

7.2 Alternatives Including Proposed Action

Status quo (no action). The current permit discussion and provisions would remain unchanged.

Alternative 1. (ADOPTED BY THE COUNCIL) Amend the FMP to clarify the authority to require permits for all groundfish users, including groundfish processors, and conditions for obtaining permits. The process for establishing federal permits would also be identified. No regulations are proposed at this time.

Under Alternative 1, Section 6.5.1.1 of the FMP would be amended as follows to clarify that permits may be required for any commercial harvest of groundfish and for groundfish processors, including those entities that purchase and/or take delivery of live fish.

"Federal permits may be required for any fishing vessel fishing, or wishing to fish, for groundfish in the EEZ, the operator of any such vessel, and any groundfish processor who first takes delivery of any groundfish. This includes any individuals or facilities (including vessels) that process groundfish or purchase live groundfish. In determining whether to require a harvesting or processing permit, and in establishing the terms and conditions for issuing a permit, the Council may consider any relevant factors including whether a permit:

1. Will enhance the collection of biological, economic or social data
2. Will provide better enforcement of laws and regulations, including those designed to ensure conservation and management and those designed to protect consumer health and safety.
3. Will help achieve the goals and objectives of the FMP.
4. Will help prevent or reduce overcapacity in the fishery.
5. May be transferred, and under what conditions.

Separate permits or endorsements may be required for harvesting and processing, or for vessels or facilities based on size, type of fishing gear used, species harvested or processed, or such other factors that may be appropriate. The permits and endorsements are also subject to sanctions, including revocation, as provided by section 308 of the Magnuson-Stevens Act.

In establishing a permit requirement, the Council will follow the full-rulemaking procedures in Section 6.2."

7.3 Environmental Consequences

No immediate social, economic or biological consequences are anticipated from either the status quo or Alternative 1. Alternative 1 would amend the FMP to clarify the federal authority to require groundfish processors to acquire permits including individuals who prepare or provide fish directly for retail sale, and to indicate that qualification criteria may be established for obtaining and transferring permits, should they be required. Alternative 1 would also clarify the procedure the Council would follow in establishing a permit requirement for groundfish processors, and criteria they will consider in determining the need for such permits. No regulation is proposed at this time, and therefore any potential impacts would be delayed until some future time. The biological, social and economic impacts of a processor permit requirement would be evaluated during the process of implementing a regulation.

Throughout the early consideration of this issue, public comment was minimal but universally in favor of Alternative 1. However, in mid-1998 the issue became somewhat controversial, apparently due to fears that larger fish processing firms might be laying the groundwork to eliminate smaller competitors and potential future competitors. The opposition appeared to come from vessel operators who would like to maintain the option of selling directly to retail markets, restaurants and perhaps the public at the dock; such opportunities are viewed as important ways to increase revenues from the same or smaller amount of fish. These vessel operators are concerned that trip limits have continued to be reduced, and will probably be even smaller in the future as more conservative management is put into effect. In order to maintain economic viability, they are trying to get more value from every fish, in some cases including sale of live fish or filleting fish on board for dockside sale or delivery to local restaurants. They are concerned about potential restrictions on these activities will cause them economic hardship.

On the other hand, the Council has heard in public testimony that many sales of live fish go unreported and that establishment of a federal processing permit could be a useful enforcement tool to improve landings statistics and compliance with various fishing restrictions. The threat of having their permit revoked could provide incentive for some operators to pay more attention and comply better with regulations.

8.0 SCIENTIFIC RESEARCH, AND UTILIZATION OF FISH TO PAY FOR RESEARCH

The Sustainable Fisheries Act (SFA) added two provisions to allow NMFS to contract with fishing vessels to do resource surveys, and to pay for these surveys through sale of fish taken during the survey, and possibly during a later voyage. Section 303 (Content of Fishery Management Plans) contains discretionary provisions which include at section 303(b)(11) that a Council could "reserve a portion of the allowable biological catch of the fishery for use in scientific research." Section 402 (Information Collection) includes the following provisions:

> "402 (e) RESOURCE ASSESSMENTS.--
>
> (1) The Secretary may use the private sector to provide vessels, equipment, and services necessary to survey the fishery resources of the United States when the arrangement will yield statistically reliable results.
>
> (2) The Secretary, in consultation with the appropriate Council and the fishing industry --
>
> (A) may structure competitive solicitations under paragraph (1) so as to compensate a contractor for a fishery resources survey by allowing the contractor to retain for sale fish harvested during the survey voyage;
>
> (B) in the case of a survey during which the quantity or quality of fish harvested is not expected to be adequately compensatory, may structure those solicitations so as to provide that compensation by permitting the contractor to harvest on a subsequent voyage and retain for sale a portion of the allowable catch of the surveyed fishery; and
>
> (C) may permit fish harvested during such survey to count toward a vessel's catch history under a fishery management plan if such survey was conducted in a manner that precluded a vessel's participation in a fishery that counted under the plan for purposes of determining catch history.
>
> (3) The Secretary shall undertake efforts to expand annual fishery resource assessments in all regions of the Nation."

Scientific research surveys are routinely conducted from chartered fishing vessels, chartered university vessels, and dedicated NOAA vessels. In a scientific research survey, all samples (fish) are collected according to a specified research plan. NMFS distinguishes survey activities by a scientific research vessel from commercial fishing activities according to a process of acknowledging scientific research as described at 50 C.F.R. 600.745(a). NMFS frequently uses this mechanism to conduct research from chartered fishing vessels and, in some cases, some of the scientific catch has been sold by the vessel to reduce wastage and to defray some of the costs of the charter.

The new provisions of the SFA provide the authority to go beyond simply allowing sale of fish caught during the course of the scientific research. However, any additional harvest to be taken on a subsequent voyage as payment for the resource survey would not be scientific research itself, and would be authorized by an Exempted Fishing Permit. (Existing regulations at 50 C.F.R. 600.745(b) would be amended to cover this.)

8.1 Purpose and Need for Action

In recent years, substantial public concern has been expressed regarding uncertainty in the scientific information in groundfish stock assessments and the conclusions based on those assessments. The fishing industry, environmental groups, and NMFS have actively explored various ways to expand and improve scientific data used in management of the groundfish fishery, and to involve the fishing industry in conducting that research. Part of this effort involves finding more creative means of funding the research, which involves compensating a fishing vessel with fish for its participation in gathering scientific information. The Magnuson-Stevens Act now provides NMFS and the Council greater flexibility to utilize private vessels to participate in groundfish surveys. To provide for compensation for these vessels, the Council would "reserve a portion of the allowable biological catch of the fishery for use in scientific research," which requires amendment to the FMP. The amendment would establish a procedure for developing a recommendation to NMFS regarding how much fish should be set aside to fund research. Because the exact amounts and species of fish used as compensation will not be known until the research and subsequent fishing have been completed, it would be most appropriate to wait and subtract the actual amounts, rather than subtracting anticipated amounts. Over time, the amounts should stabilize from year

to year, minimizing fluctuation in OYs from this source of adjustment. The term "fish-for-research" has been adopted by the Council and the fishing industry to refer primarily to compensation of a vessel that is chartered by NMFS to conduct scientific surveys. The vessel then becomes a "scientific research vessel" as defined at 50 CFR 600.10 and it may not conduct commercial fishing on the same trip.

These provisions have been implemented temporarily through an emergency rule in order to include compensation with fish in contracts NMFS awarded to commercial fishing vessels to conduct research during the summer of 1998. In accordance with the emergency rule, the compensation amounts harvested in 1998 will be deducted from the 1999 ABCs in determining OYs and/or harvest guidelines. The FMP amendment specifies this approach will be followed in subsequent years as well.

Compensation for a fishery resource survey. The Magnuson-Stevens Act authorizes the Secretary, in consultation with the Council and the interested public, to structure competitive solicitations by which a vessel's owner may compete for a contract with NMFS to conduct fishery resource surveys. Fishery resource surveys generally are conducted from chartered fishing vessels, chartered university vessels, and dedicated NOAA vessels. In a fishery resource survey, all samples (fish) are collected according to a specified research plan or protocol. NMFS distinguishes survey activities by a scientific research vessel from commercial fishing activities according to a process of acknowledging scientific research described at 50 CFR 600.745(a). NMFS frequently uses this mechanism to conduct research from chartered fishing vessels, and in some cases, some of the research catch has been sold by the vessel to reduce waste and to defray some of the costs of the charter.

The new provisions of the Magnuson-Stevens Act provide the authority to go beyond allowing sale of fish caught during the course of the fishery resource survey. However, any additional harvest taken on a subsequent, commercial trip as payment for the survey would not be considered scientific research. Such "compensation fishing" would be authorized by an exempted fishing permit (a "compensation EFP") which would enable the vessel to exceed trip limits (or to be exempt from other specified management restrictions) so that the compensation amount could be achieved.

The compensation EFP would include terms and conditions that would limit the authorized activities. Conditions for disposition of bycatch or any excess catch, for reporting the value of the amount landed, and other appropriate terms and conditions will be specified in the EFP. Compensation fishing must take place during the period specified in the EFP, and must be conducted according to the terms and conditions of the EFP. Under this amendment, the Council anticipates that compensation fishing will occur no later than the end of September in the year after the research occurred. The compensation EFP also may require the vessel owner or operator to keep separate records of compensation fishing conducted after the survey is completed, and to submit them to NMFS within a specified period of time after the compensation fishing is completed. NMFS and the States of Washington, Oregon, and California will modify their catch reporting systems, if necessary, so that fish taken under the compensation EFP are counted separately from commercial landings.

Research EFP with a compensation clause. NMFS also intends to conduct smaller-scale cooperative research projects on vessels while they are operating in the commercial fishery. This type of activity would not be considered scientific research under 50 CFR 600.745(a) because it is not from a scientific research vessel, even though the vessels are gathering scientific information. In those cases, NMFS could issue EFPs to fishing vessels under 50 CFR 600.745(b). The EFP would require the vessel to conduct specific activities, and allow it to retain and sell a limited amount of fish above the amount it could take under its regular trip limit. After the scientific information has been obtained, the EFP could authorize the vessel to sell the fish that were in the scientific sample; this would be a standard EFP, issued for the purpose of conducting research, under the procedures at 50 CFR 600.745(b). All fish taken under a research EFP would be counted towards achievement of the current year's OY/harvest guideline in contrast with fish taken under the compensation EFP which are deducted from the following year's ABCs prior to establishing OYs.

In some circumstances, NMFS may want to allow the commercial vessel to harvest slightly more fish than necessary for the research. The extra fish would compensate the vessel for the extra work involved in collecting the scientific samples, may encourage vessels to participate, and would utilize more of the total

catch if surplus to the amount needed for the scientific samples. NMFS could propose the amount of fish that would be used as compensation, or the EFP applicant could propose an amount in the EFP application. In these cases, when NMFS announces receipt of the EFP application and requests comments as required under 50 CFR 600.745(b), NMFS would also announce a window period during which vessels would have an opportunity to submit EFP applications. NMFS would consider the qualified applications, issue EFPs to all of them, select participation by lottery, issue EFPs to the first applicants, or use other impartial selection methods. NMFS contemplates two ways of issuing research EFPs. The EFPs could be issued to individuals implementing a protocol approved by NMFS. This issuance would follow the process described above. Or, NMFS could issue the EFP to a NMFS element, or a state or other federal research agency, and the research agency's proposal would include an impartial way of selecting fishing vessel participants that will receive individual EFPs under the umbrella EFP held by the research agency. The analysis below emphasizes the use of compensation fishing in the context of chartering vessels to conduct scientific research surveys, because the issues and impacts are of a greater magnitude than those involved in a research EFP with a compensation clause.

8.2 Alternatives Including Proposed Action

Status quo (no action). No provision would be established to authorize a portion of OYs or harvest guidelines to be set aside for compensation of industry research activities. Vessels may not be compensated with fish for conducting research. They either would be paid in dollars, would volunteer their services, or would not participate.

Alternative 1. Fish-For-Research (ADOPTED BY THE COUNCIL) - Amend the FMP to authorize the use of fish as compensation for private vessels conducting research and establish procedures to identify the species and subtract research catches from the Acceptable Biological Catch in setting the harvest guideline or OY. Promulgate regulations to authorize: (1) allocation of to be fish used as compensation for vessels conducting resource surveys according to a NMFS-approved protocol; (2) compensation of vessels with fish for gathering scientific information; (3) issuance of EFPs that authorize a vessel to exceed trip limits (or waive other management measures) so that the vessel has the opportunity to harvest the compensation fish. (See FMP section 5.4.)

Suboption 1A: Deduct the compensation fish from the current year's fishery.
Suboption 1B: (ADOPTED BY THE COUNCIL) Deduct the compensation fish from the next year's fishery. (See FMP section 5.3.2.)

If alternative 1 is approved and implemented, and compensation with fish is approved in 1999, for example, then those fish would be deducted from the year 2000 ABCs before the OYs, harvest guidelines, or quotas are set.

Process--Compensating a scientific research vessel: The process incorporates three procedures: (1) Selection of commercial vessels to be used to conduct the resource survey; (2) issuance of compensation EFPs to provide for compensation with fish; and, (3) adjustment of the ABC to account for the compensation fish used.

Proposal. At a Council meeting, NMFS will advise the Council of upcoming resource surveys that would be conducted with groundfish as whole or partial compensation. For each proposal, NMFS will present: (I) the maximum number of vessels expected or needed to conduct the survey; (ii) an estimate of the species and amount of compensation fish likely to be needed to compensate the vessel for conducting the survey; (iii) when the fish would be taken, and (iv) when the fish would be deducted from the ABC before determining the harvest guideline or quota. This is, in effect, equivalent to NMFS presenting an EFP application to the Council for the compensation amounts. Compensation fish should be similar to surveyed species, but there may be reasons to provide payment with healthier or more abundant stocks, or more easily targeted species. For example, NMFS may decline to pay a vessel with species that are, or are expected to be, over fished, that are subject to overfishing, or that are unavoidably caught with species that are overfished or subject to overfishing.

Competitive bids. NMFS will initiate a competitive solicitation (request for proposal, or RFP) to select vessels to conduct resource surveys. The RFP will be published in the Commerce Business Daily and will include guidelines that will be used in evaluating the bids. Bids will be evaluated on a technical basis, also taking into account cost and past performance. Vessels will bid to conduct the scientific research for a specified total dollar amount of compensation, or in metric tons of particular species. The announcement in the Commerce Business Daily serves as official notification to the public, and takes the place of notification in the Federal Register that would be required under 50 CFR 600.745(b) for a standard EFP without a compensation clause.

Consultation. NMFS will consult with the Council regarding the amounts and types of groundfish species to be used to support the surveys. If the Council approves NMFS' proposal, NMFS may proceed with awarding the contracts, taking into account any modifications requested by the Council. If the Council does not approve the proposal to use fish as compensation to pay for resource surveys, NMFS will not use fish as compensation.

Awarding the contract. NMFS concludes its contract negotiations following normal procurement procedures. The vessel's contract will include any conditions and limits on compensation fishing, including a requirement to carry on board: (I) a letter of research acknowledgment (signed by the RA, Director, or designee) while conducting any scientific fishing, and (ii) the compensation EFP while conducting compensation fishing, and for a period of at least 15 days after the end of any applicable cumulative trip limit period in which compensation fishing occurred. In general, NMFS would prefer to compensate a vessel with similar species to those taken for the scientific research. However, NMFS may decline to compensate a vessel with certain species, particularly stocks that are (or are expected to be) overfished, subject to overfishing, or have bycatch that are overfished (or are expected to be) or are subject to overfishing. NMFS may also want to take into account other factors in determining compensation species and amounts, among them: expected discards, incidental catches of other species, etc.

Retention of research catch. All fishing on a scientific research cruise is conducted according to scientific protocol, and is considered research. However, some fish caught while conducting research may be retained and sold as compensation for the vessel's participation. Retention of this research catch for sale will be at the discretion of the chief scientist on board, who will consult with the vessel captain. Collection of research catch and samples is highest priority and may interfere with the ability to retain market-quality fish.

Issuance of the compensation EFP. Upon successful completion of the scientific research, and determination of the amount and/or value of the research catch that was retained as payment for conducting the research, NMFS will issue a "compensation EFP" to the vessel if it has not been fully compensated with the amount (or value) of fish specified in its contract with NMFS. The compensation EFP will allow the vessel an opportunity to exceed current commercial fishing limits by the total amount of compensation fish specified in the research contract minus the value of the fish caught and sold as compensation from the resource survey. The compensation EFP also may exempt the vessel from other specified management measures.

Accounting for compensation fish. Because the species and amounts of fish used as compensation will not be determined until the contract is awarded, it may not be possible to deduct the amount of compensation fish from the ABC or harvest guideline in the year that the fish are caught. Even if this could be done, it would cause great confusion with the many allocations and limits that were set before the compensation amount were known. NMFS therefore proposes that the compensation fish be deducted from the ABC the year after the fish are harvested. During the annual specification process (50 CFR 660.321(b)), NMFS will announce the total amount of fish caught during the year as compensation for conducting a resource survey, which then will be deducted from the following year's ABCs before setting the OYs, harvest guidelines, or quotas.

Example of Compensation with Fish: Examples of compensation for participation in the annual slope survey are attached in the appendix (Tables 1-3). NMFS will stay within the total amounts approved by

the Council, but is not limited to using the methods, amounts, values, species, or ratio of fish to dollars in these examples. The final determination of compensation will come out of the normal Federal procurement process, which involves negotiation between the government and the prospective participant.

Process--Research EFP with a compensation clause. The EFP procedures at 50 CFR 600.745 for issuing a standard EFP apply. Each proposed project will be evaluated by NMFS and the Council according to strict scientific standards. If the project is acceptable, and if retention and sale of extra fish is more than a minimal amount, NMFS would announce a window period during which vessels would have an opportunity to submit EFP applications and to propose the amount of fish they think appropriate as compensation. The window period, if any, would be announced in the *Federal Register*, and could be included in the announcement of receipt of an EFP application and request for comments required under 50 CFR 600.745(b). After consulting with the Council, NMFS would consider the qualified applications, issue EFPs to all of them, select participation by lottery, issue EFPs to the first applicants, or use other impartial selection methods. Nothing precludes a State or research institution from applying for a research EFP with a compensation clause, as could NMFS, or any other legal vessel owner. The analysis below emphasizes the use of compensation fishing in the context of chartering vessels to conduct scientific research surveys, because the issues and impacts are of a greater magnitude than those involved in a research EFP with a compensation clause.

8.3 Environmental Consequences

This proposal affects scientific research, and gathering scientific information, on groundfish and incidental catch 0-200 nautical miles off Washington, Oregon, and California, and possibly beyond, if part of the scientific protocol.

8.3.1. Biological Impacts

The FMP governs over 80 species of groundfish, many which are caught in multispecies fisheries and which are managed by cumulative trip limits. Compensation fish would include only those species managed with trip limits or other management restrictions; the industry would find no benefit in being paid with species that they already can take with few or no restrictions. Currently, species under direct management in the FMP are: Dover sole, shortspine thornyheads, longspine thornyheads, trawl-caught sablefish (DTS complex), nontrawl sablefish, lingcod, Pacific whiting, Pacific ocean perch, widow rockfish, and the Sebastes complex of rockfish which includes yellowtail rockfish, canary rockfish, bocaccio, and other rockfish species. For purposes of this EA/RIR, the analysis emphasizes the DTS complex, as it is the most valuable component of the groundfish fishery and would have the greatest potential impact on the fishing industry.

Biological impacts of Alternative 1. The biological impacts of using fish as compensation are expected to be neutral in the short-term and positive in the long-term. In the short-term, the amount of fish used as compensation is intended to be within the ABC and therefore is within current acceptable biological levels. However, if discards are larger than the amount estimated in the ABC, retaining fish (as compensation) that otherwise would have been discarded would benefit the resource by enabling this catch to be landed and recorded, and counted against the ABC.

In general, the Council and NMFS would be likely to compensate a vessel with similar species to those taken for the scientific research. However, NMFS may take into account other factors, including, but not limited to, expected level of discards, incidental species, suitability or availability of classes of vessels, etc. NMFS may decline to compensate a vessel with certain species, particularly stocks that are (or are expected to be) overfished, subject to overfishing, or have bycatch of species that are overfished (or are expected to be) or are subject to overfishing. In the long-term, the additional information that is gathered under this provision will provide more and better data for use in stock assessments, which will result in better management of the stock and reduced likelihood of overfishing. Neither of the suboptions (to deduct the compensation fish from the current year's fishery, or the next year's fishery) is expected to result in a biological impact; the amounts taken as compensation are expected to be relatively small (generally less than five percent of the current year's ABC) and would not result in harvest above ABC.

Biological impacts of the status quo. NMFS will continue conducting stock assessments and gathering information under Federal fiscal constraints. However, NMFS and other scientists will have less information on which to base stock assessments. If information is lacking or inconclusive, the Council and NMFS are obligated to manage conservatively to reduce the risk of overfishing.

8.3.2 Socioeconomic Summary

8.3.2.1 Description of the Fishery

As of February 1998, the West Coast groundfish fishery included approximately 506 limited entry vessels (280 trawl and 226 fixed gear), and an unknown, but larger number of recreational and open access vessels. The open access fleet alone has been estimated to include 2,000 vessels. However, not all these vessels operated in 1996, the most recent year for which fairly complete information is available. A review of 1996 commercial landings records and other information determined that 478 limited entry vessels (including 10 large catcher/processor vessels operating in the offshore whiting fishery) and 1,792 open access vessels landed groundfish taken off Washington, Oregon, and California. The exvessel value of the 1996 landed catch was approximately $81.4 million, with an additional $10 million added by the at-sea whiting sector. The 1997 value, excluding the portion of the Pacific whiting catch processed at sea, was approximately $79 million to $81 million. The at-sea sector of the whiting fishery added approximately $19 million 1997, bringing the total value to roughly $98 million.

8.3.2.2 Examples of Past and Current Participation - Use of private vessels to conduct scientific research.

Slope survey. In 1988, NMFS initiated annual surveys of groundfish on the continental slope off Washington, Oregon, and California (slope surveys). Except for 1997 when the whole coast was surveyed, these surveys have covered only about one-third of the coast each year. Survey areas were "stepped" north or south each year such that, over about a three-year period, the whole coast was covered. The absence of a comprehensive annual coastwide slope survey is considered a major deficiency. Usually, a single, large NOAA research vessel (R/V MILLER FREEMAN) has been used to conduct the survey. However, the MILLER FREEMAN will be in dry-dock for several months beginning in 1998, leaving no comparable vessel to conduct the survey. Only one private vessel, in 1989, has participated in this survey.

The 1998 slope survey was expected to be the first of a new annual survey series, using different gear on a different class of (smaller) vessel, and covering the entire coast at a different time of year than prior slope surveys. NMFS anticipates that the MILLER FREEMAN will be available in future years so that the difference among the vessels can be calibrated. Coverage of the entire coast under the new slope survey requires more than 90 sea days. Federal funds, although increased recently, are not adequate to outfit and charter enough vessels (probably six) for enough days to complete the new survey. Compensation with fish would make up the shortfall.

Triennial shelf survey. The triennial survey is a survey of the species on the continental shelf, so its area of coverage is inshore of most of the area covered by the slope survey, although there is some overlap. It is conducted every three years by two chartered vessels, typically not the same ones from one survey to the next. The June-September 1998 triennial survey was not affected by the 1998 emergency rule, but future surveys would likely fall under the provisions of the FMP amendment.

Other surveys. Nothing precludes use of nontrawl vessels from conducting appropriate resource surveys, and being compensated with fish, if such research is approved by NMFS, and the vessels are appropriate to the research, qualified, and receive the contract.

8.3.2.3 Bycatch

As compensation fishing would occur as commercial harvest within the ABC, bycatch is expected to be no greater under Option 1 than under the status quo.

8.3.3 Economic and Social Impacts -- Regulatory Impact Review: Economic Implications of the Alternatives

To fulfill the requirements of the EO 12866 and the Regulatory Flexibility Act, this regulatory impact review assesses the economic impacts of the alternatives. The amount of compensation fish (as a percentage of the ABC) will depend on the value of a species and the cost of the survey. The cost of each survey is relatively fixed, no matter what the abundance and value of the species surveyed. The contract cost for an extensive survey such as the current NMFS triennial trawl survey would be about $450,000, requiring two vessels for 60 days each. This $450,000 is slightly less than 0.5% of the $90 million exvessel value of the entire groundfish fishery in 1996, and about 0.46% of the $98 million value in 1997. Excluding the at-sea whiting value, the cost of the survey would still be less than 0.6% of the 1997 fishery value. This same survey would cost the equivalent of less than one percent of the combined exvessel value of the 1996 Dover sole, thornyhead, and sablefish fisheries ($47 million) and about one percent of the $45 million value of 1997. The contract cost of a less extensive survey, such as one of the nearshore flatfish resources (Petrale sole, English sole, rex sole, etc.), would be about $175,000. This is the equivalent of about 2.5% of the roughly $7 million value of this fishery.

The value of the entire groundfish fishery is not fully available as compensation fish. Only those groundfish species for which there is a constraining trip limit or season will be desirable targets as compensation, because a vessel is not limited in its catch of other groundfish species. At the current time, the most important groundfish species limited by trip limits (other than the DTS complex) are widow rockfish, Pacific ocean perch, the Sebastes complex (including yellowtail rockfish, canary rockfish and bocaccio), lingcod, and, during part of the year, Pacific whiting. Of these, Pacific ocean perch, bocaccio and lingcod are considered overfished and will likely not be available as compensation species except in restricted cases. For example, a small amount of Pacific ocean perch might be provided so the vessel could access a larger amount of other species. The fact that depressed stocks such as Pacific ocean perch cannot afford an allocation of compensation fish, while many healthy stocks (such as English sole) have no trip limits or allocations, limits the range of species that could be considered as payment. However, these considerations do not diminish the utility of using fish as compensation. In order to provide enough economic incentive to attract qualified vessels to participate, the Council and NMFS may have to deviate from the practice of using the same or similar species as compensation.

As noted above, some survey cruises may extend over 2-3 months, and vessels engaged in such extended surveys would likely not have adequate opportunity to take their commercial trip limits during that time. The contract and EFP may address the possibility of allowing the take of a cumulative landing limit outside the normal period as one of the activities that might be provided as compensation for conducting the research. For example, a vessel that could not take its July-August trip limit could be authorized to take that amount, along with the regular trip limit, during the subsequent 12 months. Additional fish would likely be involved also as part of the contract payment.

To the extent that a vessel may retain trip limit overages as compensation fish for prior research, total fleet discards, and waste, will be reduced.

The amount of compensation fish awarded to a survey vessel would be deducted from the subsequent year's ABC. If compensation fish comprise a large proportion of an OY/harvest guideline, the Council might be forced to reduce trip and/or bag limits for that species or species associated with it in a multispecies complex. Such factors would be taken into when the Council decides the species and amounts to reserve for compensation fishing. However, the amounts used as compensation are expected to be less than 5 percent of an ABC, well within the range of uncertainty associated with ABCs, inseason catch monitoring, and trip limit derivations. Therefore, it is not likely that awarding fish for compensation would result in smaller trip limits or additional or earlier restrictions, although potentially this could occur.

Because the amount of fish used for compensation would be subtracted "off the top" of the ABC, the loss of compensation fish would be shared among all sectors and vessels (commercial, recreational, and tribal) in the fishery.

Use of compensation fish would reduce the Federal outlay of capital, although it would increase the Federal workload by adding new EFP procedures and potentially complicating the determination of acceptable charter offers for resource surveys.

Use of fish as compensation for conducting resource surveys should increase the participation and interest by members of the fishing industry, many of whom have been skeptical of NMFS's data and survey procedures. Resource survey cooperation between industry and government would provide scientists with valuable guidance from veteran fishers, and would provide participating fishers with first-hand insight into scientific sampling procedures and a more comprehensive (coastwide) view of fish distribution and abundance.

A survey vessel would receive an extra financial benefit under this proposed process; however, the recipient and level of the benefit would be determined through a competitive process.

Using fish as compensation would enable more data to be gathered than would otherwise be possible. More abundant data should lead to better stock assessments and a more accurate long-term prognosis for a sustainable fishery, and thus contribute to stability in the fishing industry and in the resources upon which the industry depends.

Suboption 2A. The amount of compensation fish are deducted from the ABC in the year the fish are caught. OYs (previously called harvest guidelines) and allocations for the year are set by or near January 1; there is no simple or expedient way to take compensation fish "off the top" during the season, as this would change any associated the allocations. Although there could be some argument that the compensation fish should be deducted from the allocation for the class of participating vessels (for example, only from the limited entry trawl fishery), NMFS believes that all vessels should contribute to the compensation allocation, as all potentially will benefit in the long run.

Suboption 2B **(adopted by the Council)**. The compensation fish for a scientific research vessel are deducted from the subsequent year's ABC. If compensation fish comprise a large proportion of a harvest guideline or quota, then it could potentially lower the trip or bag limits for that species, or result in earlier or other constraints on the fishery. However, the amounts used as compensation are expected to be less than five percent of an ABC, well within the range of uncertainty associated with ABCs, inseason catch monitoring, and trip limit derivations. Therefore, it is not likely that compensation fish would lower the trip limits or result in additional or earlier restrictions, although potentially this could occur, especially if the ABC is much lower the year the compensation fish are deducted. By subtracting the compensation amount "off the top" of the ABC, the loss of compensation fish is shared among all sectors and vessels (commercial, recreational, and tribal), in the fishery.

The value of the entire shore-based groundfish fishery in 1996 was $81.4 million. The estimated cost of the 1998 slope survey ($270,000) was about one-third of one percent (0.33%) of the $81.4 million total value of groundfish landed shoreside. Therefore, the average loss of value per vessel of compensating the survey vessels entirely with fish would also be well less than one percent. If fish account for only half the research vessels' compensation, the average cost per vessel would be about 0.17% of the fleet-wide average value of groundfish landed, assuming the same relative values in 1998 and 1999 as in 1996.

Specifically, less than 200 mt of groundfish (primarily the DTS complex) are expected to be used as compensation for survey work in 1998; this is less than one percent of the sum of the 1998 ABCs for these species (Table 8.1), and a much smaller percent of the total of the ABCs for all groundfish available for harvest in 1998. If the ABCs are similar in 1999, the amount deducted from the 1999 ABCs (fish caught in 1998 and used as compensation) would be a similar proportion.

Using the example for the 1998 slope survey in Table 8.1 (in which the charter vessel cost of the slope survey was expected to be funded half with fish), the compensation fish are valued at $135,000, which, divided among the 468 shore-based limited entry vessels that landed groundfish in 1996, is equivalent to approximately $275 per vessel. (If the entire survey was funded with fish-for research, the average cost would have doubled to less than $600 per shore-based limited entry vessel.) If the open access fleet of

about 1,792 vessels is included so that the cost is spread among the entire fleet that landed groundfish shoreside in 1996, the average impact would be considerably less, about $60 per vessel. The cost of the compensation fishery would be estimated at $128,000 for the limited entry fleet and about $7,000 for the open access fleet, assuming average proportions of landings of approximately 95% for limited entry and 5% for open access.

TABLE 8.1. Derivation of impacts on the shore-based groundfish fishery, assuming 50% compensation with fish.

Groundfish vessels	Cost of survey in fish	Number of vessels landing groundfish in 1996	Average cost per vessel
Limited entry only (including ten catcher/processors and assuming no impact on open access fleet)	$135,000	478	$282.43
Limited entry (excluding 10 catcher/processors)	$128,000	468	$273.50
Open access	$7,000	1,792	$3.91
Total	$135,000	2260	$59.73

8.3.3.1 Harvest and Revenue Implications of the Alternatives

Compensation fish would be within the ABC and therefore the harvest implications are the same under the status quo and option 1. Participation will provide an extra financial benefit to those vessels conducting the resource surveys, but the recipient, and the level of the benefit will be determined through a competitive process. The loss of revenue to the rest of the fleet (due to the compensation allocation) should be relatively minor on an individual vessel basis.

Using fish as compensation will enable more data to be gathered than would otherwise be possible under the status quo. This should lead to better stock assessments and a better long-term prognosis for a sustainable fishery and thus contribute to stability in the fishing industry. If the Council and NMFS do not have adequate information, they must manage in a risk-averse manner in order to prevent overfishing.

To the extent that fish are kept as compensation that otherwise would be discarded under the status quo, payment with fish supports full-utilization and improves accountability of total catch.

The slope survey, which is estimated to cost about $270,000 in 1998, represents about one third of one percent of the $81.4 million in revenue generated from all shorebased groundfish landings in 1996; the triennial shelf survey, estimated to cost about $450,000, represents about one-half of one percent of the $81.4 million.

8.3.3.2 Regulatory Flexibility Act Analysis.

The RFA asks that NMFS determine whether more than 20% of the fleet would experience a significant economic impact (more than five percent decline in revenue) from the proposed action. Potentially the entire groundfish fleet could be affected by an allocation that results in lowered trip limits. However, the relative impacts to individual vessels of diverting less than five percent of a species ABC to as compensation fish depends on the species mix landed by individual vessels and their success in landing trip limits. This varies from vessel to vessel and from year to year. The groundfish fishery is noteworthy for being a multispecies fishery. Most active vessels, if not all, do not rely on a single species or complex, or even only on groundfish.

Assuming continuation of the current management framework of two-month cumulative trip limits, reducing an OY/harvest guideline to account for compensation fish could translate into slightly lower cumulative limits.

(This is not necessarily so since the amounts involved are within the range of uncertainty in inseason monitoring.) Moreover, only vessels that regularly or occasionally take the full trip limits would be affected by this action. These are likely to be the most successful vessels, and thus earning the most from groundfish. Since their total incomes are greater than the fleet average, the percentage impact for them should be very small.

For the 1998 slope survey--impact on vessels that achieved the cumulative DTS limits (Table 8.1). If only the limited entry vessels that landed a DTS limit are examined, there are 198, with the average number of cumulative limits achieved being 7.9 (out of a possible 24). The minimum total revenue (from all fishing) in this group is $30,000, where five percent is $1,500. The smallest revenue for any permit with two or three periods of limit attainment was $82,000, where five percent is $4,100. If the $128,000 cost were distributed in proportion to number of limit-periods, the maximum impact on any permit would be 0.63% (which would double if the if the slope charter costs were paid entirely with fish).

Also a factor is that the denominator for calculating the percentage impact should be total fishing revenue, not only groundfish revenue (see Table 8.2). Fishing off the west coast is a multispecies endeavor, and the majority of groundfish vessels also harvest other species. The following discussion considers the cost of the compensation fishery to those vessels that landed groundfish in 1996, and considers revenue earned from fishing for groundfish as well as other species. We assume that the $285 average cost per limited entry vessel would be lowered as much as five percent to ten percent if the open access fishery is considered (using the approximate ratio of limited entry and open access allocations). This leaves the average cost per limited entry vessel to approximately $275, and the average cost to an open access vessel at around $10.

In the limited entry fleet, a $275 cost would represent more than more than five percent of the total fishing revenue for seven permits in 1996, about one percent of the active permits that year. Even if the cost were doubled (e.g. the entire slope survey were funded with compensation fish), no more than two percent of the active limited entry vessels would be affected by more than five percent of total fishing revenue.

In the open access fleet, the number of vessels whose total income would be diminished by more than five percent as a result of a $10 loss would be less than eight percent of the fleet. These vessels clearly are not those successfully achieving the majority of the available trip limits. As with the limited entry fleet, the actual loss associated with these low-production vessels is likely to be smaller than the average loss across all participants, which would suggest this is the upper end of potential impacts.

TABLE 8.2. Total 1996 revenue of all species (groundfish and other fish) for limited entry and open access.

1996	No. vessels	Value from groundfish ($)	Value from other fish ($)	Total revenue--all species ($)
Open Access	1,792	9,475,839	53,979,546	63,455,385
Limited Entry *(excl. catcher/ processors)*	468	68,432,919	27,030,699	95,463,618
Total	2,260	77,908,758	81,010,245	158,919,003

Source: Dr. J. Hastie, NMFS

Moreover, five percent of an ABC is within the range of uncertainty in inseason catch monitoring and the setting of trip limit amounts, and the compensation allocation most likely will be less than 5% of any of the DTS species' ABCs (see Table 8.1). Therefore, it is very unlikely that the implementation of the recommended action would result in a 5% reduction in revenue for more than 20% of any sector in the groundfish fishery.

8.3.3.3 Other Impacts

Compensation fishing should increase the participation and interest by the fishing industry, many who have been skeptical of data and survey procedures. This industry/government cooperative association will provide valuable guidance from veteran fishers to scientists, and will provide the industry participants with

first-hand insight into scientific sampling procedures and perhaps a more comprehensive view of the distribution and abundance of various species over a wider geographic range than they might otherwise see.

Use of compensation fish reduces the Federal outlay of capital, although it increases the Federal workload by adding additional EFP procedures and complicating the determination of acceptable charter bids for research surveys. In addition, the Council workload will be increased due to review of additional EFP applications and in complicating determination of OYs, harvest guidelines, and/or quotas.

8.3.3.4 Benefit and Cost Considerations

The benefits and costs of these alternatives cannot be quantified other than to indicate that Federal dollars will stretch farther if they can be supplemented with fish; more vessels may be hired and/or more extensive research may be conducted, than under the status quo. Individual contract recipients may benefit, particularly if they are able to delay compensation fishing and sell their catch at a time when market conditions may be more favorable (for example, when trip limits are greatly restricted and local supplies of fish are reduced). The "loss" of the "compensation" fish by the rest of the fishery will be spread among a much larger number of vessels and likely would be small on the individual vessel level. (If the $135,000 value of compensation fish for the 1998 survey were spread equally among all vessels in the groundfish fishery that landed shoreside in 1996, the average cost would be $60 per vessel ($135,000/2260 vessels).) The average "loss" of fish for compensating charter vessels in the 1998 slope survey (if the charter vessels are paid half with fish and half in dollars) is about $275 per shorebased limited entry vessel. This is about one third of one percent of the average groundfish revenue generated per vessel in the shore-based limited entry fleet.

8.4 Summary of Impacts

Biological impacts. There are no biological impacts expected from the process of issuing compensation EFPs and subtracting compensation amounts from the ABC. Compensation with fish is intended to improve the quantity and quality of data used in stock assessments, and therein to provide information necessary to managers to minimize the risk of overfishing the resource. Thus, in the long-term, a positive biological impact is expected.

The amount of salmon taken under any of the options is expected to be within the range considered in the Biological Opinion prepared for the groundfish fishery.

Socio-economic impacts. Although compensation fishing will provide an extra financial benefit to those vessels that are selected to participate, it is not likely that compensation fish would result in reduced trip limits or other restrictions, although potentially this could occur. All vessels share proportionately in the "cost" of compensation fishing because it will be deducted from the ABCs before the OYs, harvest guidelines and any allocations are derived. Better data should lead to better stock assessments, and ultimately more economic stability in the fishery. Use of compensation fish reduces the Federal outlay of capital, although it increases the Federal workload by adding more complicated contract negotiations and issuance of additional EFPs. This process also will provide for more cooperation and understanding between the fishing industry and government scientists and managers.

8.5 Consistency with FMP Goals and Objectives

The FMP currently is silent on compensating survey vessels with fish because this was not authorized by the Magnuson-Stevens Act until October 11, 1996. The Council believes this amendment is consistent with the provisions in the Magnuson-Stevens Act and essentially similar to the emergency rule. This action would be consistent with the overall goal of the FMP to base management decisions on sound scientific information, thereby preventing overfishing, maintaining optimum utilization, and achieving the maximum sustainable yield. In addition, the action is consistent with Objective 10 to reduce waste of fish, by enabling vessels that conducted research charters to land compensation fish when they are commercial fishing after the research is completed. The compensation fish are likely to be fish that otherwise would be discarded because they exceed trip limits.

9.0 UPDATE INDUSTRY DESCRIPTIONS AND OTHER SECTIONS

9.1 Purpose and Need for Action

SEC. 303 (a) (2) of the Magnuson-Stevens Act (Required provisions of FMPs) states that an FMP must "contain a description of the fishery, including, but not limited to, the number of vessels involved, the type and quantity of fishing gear used, the species of fish involved and their location, the cost likely to be incurred in management, actual and potential revenues from the fishery, any recreational interest in the fishery, and the nature and extent of foreign fishing and Indian treaty fishing rights, if any." The current descriptions in the FMP have not been updated since Amendment 4 in 1989. The industry has evolved since that time and litigation has further clarified related to Indian treaty fishing rights. The Council is considering updating these descriptions.

9.2 Alternatives Including Proposed Action

Status quo (no action). Current industry descriptions would remain.

Alternative 1. Update summary descriptions of private recreational and charter sectors, and nature and extent of Indian treaty fishing rights as drafted by NOAA General Counsel. Most of the information on fishing communities and details on the fishing industry will be included in a comprehensive source document separate from the FMP. No regulations are proposed at this time.

Alternative 2. (ADOPTED BY THE COUNCIL) Update summary descriptions of private recreational and charter sectors, and nature and extent of Indian treaty fishing rights as recommended by the Groundfish Advisory Subpanel. Most of the information on fishing communities and details on the commercial sector will be included in a comprehensive source document separate from the FMP. No regulations are proposed at this time.

9.3 Description of the Alternatives

9.3.1 Description of Status quo

Under the status quo, the commercial and recreational sector descriptions would remain unchanged, as would the description of tribal fishing rights and activities. In particular, the following two sections would remain.

"11.3.3 Recreational Harvesting Sector

Groundfish are caught for recreation by anglers who fish from piers, jetties, beaches, banks, party or charter passenger vessels, and private or rental boats. Take by recreational fisheries is substantial for some species (e.g., bocaccio and lingcod). However, data for recreational fisheries are inaccurate and often misleading and not appropriate for management of the fishery. Improvement in sampling and data collection from the recreational fishery are essential for management of this fishery."

"11.7.6 Indian Treaty Rights

Treaties with a number of Pacific Northwest Indian tribes secure to certain treaty tribes certain rights to take fish at their usual and accustomed fishing grounds.

The tribes which presently have been found to have such fishing grounds in areas which are embraced by this FMP are:

Makah Tribe: Marine waters extending from the Strait of Juan de Fuca "out into the ocean to an area known as Swiftsure and then south along the Pacific Coast to an area intermediate to Ozette Village and the Quileute Reservation." [384 F. Supp. at 312, 364 (W.D. Wash., 1974)]

Quileute and Hoh Tribes: Tidewater and saltwater areas adjacent to the coastal area that includes the Hoh, Quillayute, Queets, and Quinault Rivers and Lake Ozette. [384 F. Supp. at 359, 372].

Quinault Tribe: "Ocean fisheries . . . in waters adjacent to their territory" which for fishing purposes includes the area from the Clearwater-Queets River system to Grays Harbor. [384 F. Supp. at 374].

The Council knows of only one active tribal fishery for species covered by the FMP (that of the Makah Tribe for sablefish). At some time in the future the FMP may have to consider amending the FMP to address these and other tribal fisheries that might develop. "

9.3.2 Description of Alternative 1

Under Alternative 1, Section 11.3.3 would be amended to reference a general community description source document in preparation and expected early in 1999. In addition, section 11.7.6 would be revised with a description of Indian fishing rights and activities prepared by NOAA General Counsel, in consultation with tribal and State attorneys.

11.3.3 Recreational Harvesting Sectors

Recreational fishing on the West Coast includes fishing from piers, jetties, beaches, banks, private recreational vessels, and commercial vessels that take passengers (i.e., charters). Recreational fishing is managed primarily by the three states, although the Council sets recreational bag limits for fishing in federal waters. Federal management has focused on lingcod and rockfish landings in all three states, with specific attention on bocaccio rockfish in California and black rockfish in Washington and Oregon. Efforts are currently underway to improve statistics relating to recreational groundfish catch and landings, numbers of participants in marine recreational fisheries, and communities that rely on marine recreational fishing industries.

Summaries of various groundfish species caught by the private recreational and charter sectors are included in the annual SAFE document prepared each year in conjunction with setting annual harvest levels. Additional information on the recreational fishing sectors will be available in a community description document expected to be available early in 1999.

"11.7.6 Indian Treaty Rights

Treaties between the U.S. Government and a number of Pacific Northwest Indian tribes reserve to these tribes the right of taking fish at usual and accustomed grounds and stations (U & A) in common with other citizens of the United States. See *U.S. v. Washington*, 384 F. Supp. 312, 349 - 350 (W.D. Wash. 1974).

NMFS has determined the tribes that have U & A in the area managed by this FMP are 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 363. The Hoh and Quileute tribes, and the Quinault Indian Nation are successors in interest to some of the tribes that signed the Treaty with the Quinaeilt, et al., July 1, 1855, 12 Stat. 971. See 384 F. Supp. at 359 (Hoh); 371 (Quileute); 374 (Quinault).

The fishing right is generally described as the opportunity to take a fair share of the fish, which has been interpreted as up to 50 percent of the harvestable surplus of fish in the U & A. *Washington v. Washington State Comm'l Pass Fishing Vessel Ass'n*, 443 U.S. 658, 685-687 (1979). *U.S. v. Washington,* 459 F. Supp. 1020, 1065 (1978). *Makah v. Brown,* No. C85-160R, and *United States v. Washington*, Civil No. 9213 - Phase I, Subproceeding No. 92-1 (W.D. Wash., Order on Five Motions Relating to Treaty Halibut Fishing, at 6, Dec. 29, 1993). *U.S. v. Washington*, 873 F. Supp. 1422, 1445 & n. 30 (W.D. Wash. 1994); 135 F. 3d 618, 639, 640 (9th Cir. 1998)(This 9th Circuit decision may be further appealed to the Supreme Court).

The treaty fishing rights have been, and are being, interpreted in the ongoing case of *U.S. v. Washington.* A subproceeding (96-2) is currently pending regarding whiting.

The Treaty Right

This FMP has generally acknowledged that certain treaty Indian tribes have secured rights to harvest fish from their U & A. In 1995, NMFS and NOAA General Counsel advised the Council that the Federal Government recognizes that Washington coastal treaty Indian tribes, by virtue of their treaties with the United States, have harvest rights to Pacific coast groundfish.

This recognition of treaty rights to groundfish has been challenged with the assertion that tribes only have treaty rights to those species of fish that they harvested at treaty times, and they may only exercise these rights to nonanadromous fish after they have presented *prima facie* evidence of the treaty right. However, in the shellfish subproceeding of *U.S. v. Washington*, (subproceeding 89-3) the court found:

> The fact that some species were not taken before treaty time - either because they were inaccessible or the Indians chose not to take them - does not mean that their *right* to take such fish was limited * * * Because the "right of taking fish" must be read as a reservation of the Indians' pre-existing rights, and because the right to take *any* species, without limit, pre-existed the Stevens Treaties, the Court must read the "right of taking fish" without any species limitation. [emphasis in original]

873 F. Supp. 1422 at 1430; 135 F.3d 618, 631 (9th Cir. 1998) (This issue may be further appealed to the Supreme Court.)

In the pending whiting subproceeding, the judge concluded that the rulings in the shellfish subproceeding "should remain the binding law of the case until the Ninth Circuit decides the appeal of that decision now pending before it." *U.S. v. Washington*, Civil No. 9213 Phase I, Subproceeding No. 96-2 (W.D. Wash., Order Granting Makah's Motion for Partial Summary Judgment and Denying Oregon's Cross Motion for Summary Judgment and Washington's Motion for Stay, November 4, 1996). As quoted above, the court of appeals did uphold the district court on this issue. Therefore, the federal government has determined that the tribes have treaty rights to groundfish which must be accommodated.

The U & A

The Makah U & A has been found to extend from the Strait of Juan de Fuca "out into the ocean to an area known as Swiftsure and then south along the Pacific Coast to an area intermediate to Ozette Village and the Quileute Reservation." 384 F. Supp. 312 at 364 (W.D. Wash. 1974). A western boundary has also been determined by the court at about 40 miles offshore at longitude 125 degrees W. 730 F.2d. 1314 at 1318 (9th Cir. 1984).

The court described the Hoh U & A as follows: "In treaty times the usual and accustomed fishing places of the Quileute and Hoh Indians included the entire Hoh river system and the Quillayute, Dickey, Bogachiel, Calawah, Soleduck, Queets and Quinault river systems." 384 F. Supp 312 at 359.

The court's findings for the Quileute tribe are as follows: "Before, during and after treaty times, the usual and accustomed fishing places of the Quileute and Hoh Indians included the Hoh River from the mouth to its uppermost reaches, its tributary creeks, and Quileute River and its tributary creeks, Dickey River, Soleduck River, Bogechiel River, Calewah River, Lake Dickey, Pleasant Lake, Lake Ozette, and the adjacent tidewater and salt-water areas." 384 F. Supp. 312 at 372.

The Quinault Indian Nation's U & A are described to include waters adjacent to their territory, which for fishing purposes include the area from the Clearwater-Queets River system to Grays Harbor. 384 F. Supp. 312 at 374.

The court has not specified a western boundary for the Hoh, Quileute or Quinault. In 1986, NMFS published in its halibut regulations specific coordinates for tribal fishing in the ocean, which included western boundaries. In 1987, NMFS included these same areas in the ocean salmon regulations. The boundaries have not changed in these regulations since then. In 1996 when NMFS first published regulations governing Pacific Coast treaty Indian groundfish fishing in the Exclusive Economic Zone, it established the previously-

described areas as the U & A for the four tribes. NMFS specified that the boundaries of a tribe's fishing area may be revised as ordered by a Federal court. These U & A are as follows:

1. *Makah* - That portion of the FMA north of 48 02'15" N. lat. (Norwegian Memorial) and east of 125 44'00" W. long.

2. *Quileute* - That portion of the FMA between 48 07'36" N. lat. (Sand Point) and 47 31'42" N. lat. (Queets River) and east of 125 44'00" W. long.

3. *Hoh* - That portion of the FMA between 47 54'18" N. lat (Quillayute River) and 47 21'00" (Quinault River) and east of 125 44'00" W. long.

4. *Quinault* - That portion of the FMA between 47 40'06" N. lat. (Destruction Island) and 46 53'18" N. lat. (Point Chehalis) and east of 125 44'00" W. long.

Over the years, NMFS received comments objecting to portions of these areas. In addition, there are some intertribal disagreements regarding boundaries of U & A, and disagreements between the state and some tribes. NMFS has indicated it has not received definitive information that would cause it to change the federal interpretation of U & A in Federal waters. The boundaries can all be litigated in *U.S. v. Washington*, and NMFS indicated in its implementing regulations that the areas in the rules will be changed consistent with any relevant court rulings. In the shellfish subproceeding in *U.S. v. Washington*, the court found "that, as a matter of treaty interpretation, the Tribes' usual and accustomed grounds and stations cannot vary with the species of fish." 873 F.Supp. 1422 at 1431 (W.D. Wash. 1994); 135 F.3d 618, 632 (9th Cir. 1998). (This 9th Circuit decision may be further appealed to the Supreme Court.) This provides support to the NMFS approach of using the same ocean U & A for all species of fish.

The Quantification of the Right

The exact quantification of a treaty right to groundfish is a difficult issue. With the exception of halibut and herring, most of the legal and technical precedents are based on the biology, harvest, and conservation requirements for Pacific salmon, which are very different from those for groundfish. Those requirements also vary among species of groundfish covered by this plan. Quantification is also complicated by data limitations for each species. Nonetheless, the federal government must use the best information available to provide the appropriate amount of groundfish to the tribes. The parties to the whiting subproceeding in *U.S. v. Washington* will be working, through settlement negotiations or litigation, to determine the appropriate quantification for whiting. This work could help in determining the appropriate quantification for other groundfish species.

Conclusion

Regulations have been and will be promulgated under this FMP to implement Indian treaty fishing rights, since treaty fishing rights are other applicable law with which management measures must comply. Any court decisions that refine or clarify treaty rights will be complied with in the implementation of this FMP.

The rights will be implemented either through specific allocations to tribes which will be managed by the tribes, through federal regulations that will apply specifically to the tribes, or in other ways that accommodate treaty fishing rights and are not inconsistent with this FMP."

9.3.3 Description of Alternative 2

Under Alternative 2, Section 11.3.3 would be amended to reference a general community description source document in preparation and expected early in 1999 (as in Alternative 1). In addition, section 11.7.6 would be revised with a brief description of treaty rights.

"11.3.3 Recreational Harvesting Sectors

Recreational fishing on the West Coast includes fishing from piers, jetties, beaches, banks, private recreational vessels, and commercial vessels that take passengers (i.e., charters). Recreational fishing is managed primarily by the three states, although the Council sets recreational bag limits for fishing in federal waters. Federal management has focused on lingcod and rockfish landings in all three states, with specific attention on bocaccio rockfish in California and black rockfish in Washington and Oregon. Efforts are currently underway to improve statistics relating to recreational groundfish catch and landings, numbers of participants in marine recreational fisheries, and communities that rely on marine recreational fishing industries.

Summaries of various groundfish species caught by the private recreational and charter sectors are included in the annual SAFE document prepared each year in conjunction with setting annual harvest levels. Additional information on the recreational fishing sectors will be available in a community description document expected to be available early in 1999.

11.7.6 INDIAN TREATY RIGHTS

Treaties with a number of Pacific Northwest Indian tribes reserve to those tribes the right of taking fish at usual and accustomed grounds and stations (U & A) in common with other citizens of the United States.

NMFS has determined the tribes that have U & A in the area managed by this FMP are the Makah, Hoh, and Quileute tribes, and the Quinault Indian Nation. Several tribal fisheries exist for species covered by the FMP. The federal government has accommodated these fisheries through a regulatory process. Until such time as tribal treaty rights are finally adjudicated or the regulatory process is modified or repealed, the Council will continue to operate under that regulatory process to provide recommendations to the Secretary on levels of tribal harvest."

9.4 Environmental Consequences

This revision to the FMP has no regulatory effect and is only descriptive in nature. There is no impact on groundfish populations, the ecosystem or the marine environment. However, public and GAP comments at Council meetings opposed Alternative 1 due to the description of Indian treaty groundfish fishing rights, stating the description represents opinion that could change upon further court review and interpretation. They believed that any detailed description of treaty groundfish fishing rights should be postponed until final court action has occurred. Alternative 3, which was drafted by members of the Council's GAP to address those concerns, was ultimately endorsed by the Council.

10.0 FMP OBJECTIVES AND DEFINITIONS

10.1 Purpose and Need for Action

Section 3 of the Magnuson-Stevens Act, as revised in 1996, provides several new definitions of terms and revised definitions used in the legislation. Several terms used in the FMP are no longer consistent, and a number of terms are not defined. Also, in Section 301, several National Standards were revised or added. The Council intends that the FMP definitions conform with the legislation, and FMP objectives clearly reflect the spirit of the National Standards. Without such changes, the FMP would likely not comply with the Magnuson-Stevens Act and national standard guidelines.

10.2 Alternatives Including Proposed Action

Status quo (no action). Current definitions and FMP objectives would remain unchanged.

Alternative 1. (ADOPTED BY THE COUNCIL) Revise the FMP objectives and definitions in response to recent amendments to the Magnuson-Stevens Act and national standard guidelines. No changes to current regulations are proposed at this time. (See FMP sections 2.1 and 2.2.)

Under Alternative 1, the following objectives would be revised or added to Section 2.1 in the FMP under the appropriate heading of conservation, utilization, or social factors. Other objectives would be renumbered accordingly. Replaced text is ~~crossed out~~; new text is shown in **bold.**

Conservation

Proposed Objective 5. **Describe and identify EFH, adverse impacts on EFH and other actions to conserve and enhance EFH, and adopt management measures that minimize, to the extent practicable, adverse impacts from fishing on EFH.**

Utilization

Proposed replacement Objective 10. Strive to reduce the economic incentives and regulatory measures that lead to wastage of fish. **Also, develop management measures that minimize bycatch to the extent practicable and, to the extent that bycatch cannot be avoided, minimize the mortality of such bycatch. In addition, promote and support monitoring programs to improve estimates of total fishing-related mortality and bycatch, as well as those to improve other information necessary to determine the extent to which it is practicable to reduce bycatch and bycatch mortality.**

Social Factors

Proposed Objective 16. Avoid unnecessary adverse impacts on small entities.

Proposed Objective 17. Consider the importance of groundfish resources to fishing communities, provide for the sustained participation of fishing communities, and minimize adverse economic impacts on fishing communities to the extent practicable.

Proposed Objective 18. Promote the safety of human life at sea.

The following definitions would be added to Section 2.2 of the FMP. Replaced text is ~~crossed out~~; new text is shown in **bold.**

Bycatch means fish which are harvested in a fishery, but which are not sold or kept for personal use or donated to a charitable organization, and includes economic discards and regulatory discards.

Charter fishing means fishing from a vessel carrying a passenger for hire (as defined in section 2101(21a) of title 46, United States Code) who is engaged in recreational fishing.

Economic discards means fish which are the target of a fishery, but which are not retained, because they are of an undesirable size, sex, or quality, or for other economic reasons.

Essential fish habitat means those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.

Fishing community means a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economy needs, and includes fishing vessel owners, operators, ~~and~~ crew, and recreational fishers and United States fish processors that are based in such community.

Individual fishing quota means a federal permit under a limited access system to harvest a quantity of fish, expressed by a unit or units representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by a person.

MSY stock size means the largest long-term average size of the stock or stock complex, measured in terms of spawning biomass or other appropriate units, that would be achieved under an MSY control rule in which the fishing mortality rate is constant. The proxy typically used in this FMP is 40% of the estimated unfished biomass, although other values based on the best scientific information are also authorized.

Optimum yield means the amount of fish which will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine **ecosystems**, is prescribed as such on the basis of the maximum sustainable yield from the fishery, as **reduced** by any relevant economic, social, or ecological factor; and in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

Overfishing means fishing at a rate or level that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis. More specifically, overfishing is defined as exceeding a maximum allowable fishing mortality rate. For any groundfish stock or stock complex, the maximum allowable mortality rate will be set at a level not to exceed the corresponding maximum sustainable yield rate (F_{msy}) or its proxy (e.g., $F_{35\%}$).

Overfished describes any stock or stock complex whose size is sufficiently small that a change in management practices is required to achieve an appropriate level and rate of rebuilding. The term generally describes any stock or stock complex determined to be below it overfished/ rebuilding threshold. The default proxy is generally 25% of its estimated unfished biomass; however, other scientifically valid values are also authorized.

Processing or to process means the preparation or packaging of groundfish to render it suitable for human consumption, retail sale, industrial uses or long-term storage, including but not limited to cooking, canning, smoking, salting, drying, filleting, freezing, or rendering into meal or oil, but does not mean heading and gutting unless additional preparation is done.

Processor means a person, vessel, or facility that (1) engages in processing; or (2) receives live groundfish directly from a fishing vessel for retail sale without further processing.

Recreational fishing means fishing for sport or pleasure, but not for sale.

Regulatory discards are fish harvested in a fishery which fishermen are required by regulation to discard whenever caught, or are required by regulation to retain but not sell.

10.3 Environmental Consequences

This revision to the FMP has no regulatory effect and is only descriptive in nature. There is no impact on groundfish populations, the ecosystem or the marine environment. FMP objectives relating to EFH and bycatch may result in regulatory changes in the future, however, which would be intended to reduce the impacts of fishing activities on the groundfish resources and marine environment. The environmental, social and economic impacts of any such regulations would be evaluated if and when regulations are proposed.

11.0 GENERAL EDITORIAL CLEANUP

11.1 Purpose and Need for Action

The most recent comprehensive FMP amendment was completed in 1990, and several amendments to the Magnuson-Stevens Act have been passed in the interim. In addition, the groundfish management program has evolved over the years, and certain terms, names and Council processes have changed. This issue of the groundfish FMP amendment is intended to update the FMP document to reflect current word usage and procedures. For example, in past years the NMFS Regional Administer was referred to as the "Regional Director." In addition, numerous reference to FMP "Amendment 4" occur throughout the FMP document. However, the Council did not authorize a complete and comprehensive update of the FMP document. Therefore, certain information will remain dated, such as fishery catch statistics (the FMP currently includes data only through 1987 or 1988). More recent information is provided in the annual Stock Assessment and Fishery Evaluation (SAFE) documents.

11.2 Alternatives Including Proposed Action

Status quo. No action. Under this alternative, outdated references would remain in the FMP document.

Alternative 1. (ADOPTED BY THE COUNCIL) Make editorial changes throughout the FMP document. No regulations are proposed at this time.

11.3 Environmental Consequences

This revision to the FMP has no regulatory effect and is only descriptive in nature. There is no impact on groundfish populations, the ecosystem or the marine environment. Editorial revisions to the FMP text are intended to make the document more readable and up to date.

12.0 REMOVE JACK MACKEREL FROM THE FISHERY MANAGEMENT UNIT

12.1 Purpose and Need for Action

The Council has approved an amendment to the FMP for Northern Anchovy that would rename the FMP as the Coastal Pelagic Species (CPS) FMP and would add three species to that fishery management unit. Jack mackerel (*Trachurus symmetricus*), which has been included in the groundfish FMP fishery management unit since the early 1980s, would be removed from the groundfish FMP and moved to the CPS FMP when that amendment is implemented. The Council expects that regulations implementing the CPS FMP will modify both plans with a single action. If NMFS fails to approve the CPS FMP, jack mackerel will remain in the groundfish FMP.

12.2 Alternatives Including Proposed Action

Status quo. No action. Under this alternative, jack mackerel would remain in the FMP document.

Alternative 1. (ADOPTED BY THE COUNCIL) Jack mackerel would be removed from the groundfish fishery management unit and added to the CPS fishery management unit.

12.3 Environmental Consequences

The social and environmental consequences of removing jack mackerel from the groundfish FMP, which are expected to be minimal, are addressed in the analysis for Amendment 8 to the Northern Anchovy/CPS FMP. The species will continue to be managed to achieve the optimum yield, prevent overfishing, and achieve the maximum benefit to the Nation.

13.0 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

This assessment has been prepared according to 40 CFR 1501.3, 1508.27, and 1508.9 and National Oceanic and Atmospheric Administration (NOAA) Administrative Order 216-6 in order to determine whether an Environmental Impact Statement is required for any major action that will have a significant impact on the quality of the human environment. An EIS is not required if the EA concludes that there is no significant impact.

The need for action, alternatives, and impacts are covered in Sections 2-12 of this document. Aside from technical changes to definitions that may be necessary, the only anticipated regulatory change is described in Section 8.

The implementation of proposed changes to the groundfish FMP would not be a major action having significant impact on the quality of the marine or human environment of the West Coast. Mitigating measures related to such changes would be unnecessary. No unavoidable, adverse impacts on protected species, wetlands, or the marine environment would be expected to result from the recommended action. However, such effects may result from failure to take the proposed action.

Section 1508.27 of the CEQ Regulations lists ten specific points to be considered in determining whether or not impacts are significant. These ten points cover the five criteria for non-significance listed in Section 6.11 of NOAA Administrative Order 216-6.

Beneficial and Adverse Impacts

Over the short term there will be some adverse economic impacts resulting from the reductions in harvest levels, however, over the long terms benefits are expected to be greater than would have occurred if higher harvest levels had been maintained.

None of the alternatives would jeopardize the productive capability of the target resource species or any related stocks. In general, the Council's actions are directed at preventing overfishing and maintaining optimum yield. The Council relies on the best scientific information available, which typically comes from stock assessment documents prepared each year by various authors and the advice of its GMT and SSC. Short-term harvest reductions may result in some shift of effort onto other species. Vessels may seek to make-up any short-term reduction in revenue with effort increases in other fisheries. These effort shifts are expected to be monitored and controlled either as part of the management program for groundfish or other state and federal management programs for the species to which effort is redirected.

Public Health or Safety

The proposed actions are not expected to adversely impact public health or safety.

Unique Characteristics

The proposed actions are not expected to have any significant adverse impact on unique characteristics of the area such as historic or cultural resources, park lands, wetlands, or ecologically critical areas.

Controversial Effects

The proposed actions are not expected to involve significant controversial issues for the broader public. Among participants in the fleet, the reductions in biomass indicated by recent stock assessments are being challenged by some fishery participants; harvest reductions that are likely to result from the new harvest policy are likely to will exacerbate this situation. On the other hand, a different sector of the public has supported more conservative management and adoption of specific timelines for improving bycatch data and imposing fishing restrictions to reduce bycatch and fishing effects on EFH.

Uncertainty or Unique/Unknown Risks

The proposed actions would not be expected to have any significant effects on the human environment that are highly uncertain or involve unique or unknown risks.

Precedent/Principle Setting

The proposed actions are not expected to have any significant effects in establishing a precedent and do not include actions which would represent a decision in principle about a future consideration.

Relationship/Cumulative Impact

The proposed actions are not expected to have any significant cumulative impacts that could have a substantial adverse effect on the fishery resources or any related resource.

Historical/Cultural Impacts

The proposed actions are not expected to have any significant effects on historical sites listed in the National Register of Historic Places and will not result in any significant impacts on significant scientific, cultural, or historic resources.

Interaction with Existing Laws for Habitat Protection

The proposed actions are not expected to have any significant interaction which might threaten a violation of Federal, state, or local law or requirements imposed for the protection of the environment. The proposed action has no direct effect on ocean or coastal habitat, but the recommended FMP provisions are intended to strengthen the Council's role in habitat protection.

13.1 Other Applicable Law

13.1.1 Endangered Species Act (ESA)

NMFS issued Biological Opinions under the ESA on August 10, 1990, November 26, 1991, August 28, 1992, September 27, 1993, and May 14, 1996 pertaining to the impacts of the groundfish fishery on Snake River spring/summer chinook, Snake River fall chinook, and Sacramento River winter chinook. The opinions concluded that implementation of the FMP for the Pacific Coast Groundfish Fishery is not expected to jeopardize the continued existence of any endangered or threatened species under the jurisdiction of NMFS, or result in the destruction or adverse modification of critical habitat. Each alternative is within the scope of these consultations. Because the impacts of this action fall within the scope of the impacts considered in these Biological Opinions, NMFS has determined that additional consultations are not required for this action. In addition, coho salmon south of Cape Blanco, Oregon, have been listed as threatened (northern California/southern Oregon) and endangered (central California) under the ESA; steelhead have been listed as threatened (Snake River Basin/central California/south-central California) and endangered (upper Columbia River/southern California) under the ESA. None of the alternatives, including the status quo, will affect coho salmon or steelhead.

13.1.2 National Environmental Policy Act (NEPA)

NMFS initially has determined that implementation of any of the alternatives for this issue would not significantly affect the quality of the human environment, and therefore preparation of an environmental impact statement is not required by Section 102(C) of NEPA or its implementing regulations.

13.1.3 Executive Order 12866 (EO 12866)

Based on the above analysis, the proposed rule has been determined to be "not significant" for purposes of EO 12866.

13.1.4 Regulatory Flexibility Act (RFA)

The RIR also is designed to determine whether the proposed rule has a "significant economic impact on a substantial number of small entities" under the RFA. The purpose of the RFA is to relieve small businesses, small organizations, and small governmental entities from burdensome regulations and record keeping requirements. If the proposed action meets both the "significant" and "substantial" criteria, preparation of an Initial Regulatory Flexibility Analysis (IRFA) is required.

Only one immediate regulatory change is anticipated from the proposed amendment to the groundfish FMP, relating to implementation of a program which authorizes the use of groundfish as compensation to vessels participating in scientific research (see Section 8 above). (Minor changes to definitions would also result from the proposed action, but these are considered to be insignificant.) The category of small businesses potentially affected by the proposed regulation is virtually the entire groundfish fishery (excluding the catcher/processor fleet of ten vessels that operates only in the offshore whiting fishery). The impacts of the proposed action on groundfish vessels have been discussed above in section 8, particularly 8.1.2.3. An IRFA is conducted to make a preliminary determination as to whether the proposed action would have a "significant economic impact on a substantial number of small entities." In addition, the IRFA provides an estimate of the number of small businesses affected, a description of the small businesses affected, and a discussion of the nature and size of the impacts.

Section 8 describes the vessels that participate in the groundfish fishery. For the purposes of the RFA, all fishing vessels that operate in the Pacific groundfish fishery are considered "small entities," with the exception of the 10 catcher/processors in the Pacific whiting fishery. Shore-based groundfish processors also may be considered "small entities." Motherships operating in the whiting fishery are not small businesses, and do not harvest groundfish. (The Small Business Administration defines a small business in the commercial fishing activity as a firm with receipts of up to $2 million annually (thus eliminating at-sea processing vessels) and a processor with fewer than 500 employees. The average at-sea processor during 1991 earned $33 million in revenues from pollock, whiting, cod and other species and so does not meet the definition of a "small entity.") Therefore, all but 10 vessels operating in the groundfish fishery off Washington, Oregon, and California are considered small businesses, and these 2,260 vessels (478 limited entry + 1,792 open access - 10 catcher/processors) are considered the universe for purposes of this analysis under the RFA.

The proposed rule implementing the "fish for research" provisions of the amendment could affect a maximum of 2,270 vessels. Of these, approximately 2,260 (almost 100%) are considered small entities. The rule is expected to have several different types of impacts. For vessels that obtain contracts to conduct research in exchange for fish, this rule would provide increased opportunity for profit. This rule is also expected to lead to the availability of increased scientific data on the status of the fishery. The availability of this data will enhance the ability of the agency to manage the fishery and is likely to lead to long-term benefits for all participants.

There is also the small possibility that this rule could result in negative economic impacts on some fishery participants. The fish that are awarded as compensation would be deducted from next year's ABC. The amounts likely to be diverted for compensation would be so small as to be within the range of accuracy expected for inseason monitoring of OYs, harvest guidelines and quotas, and most likely would not change the size of trip limits or their date of achievement. However, there is a remote possibility that some trip limits would be reduced, or reduced earlier, as a result of the small compensation allocation for survey vessels. For example, if surveys were funded entirely by compensating vessels with Dover sole, thornyheads and sablefish, resulting in reduction in those trip limits, those trawl vessels that routinely achieve their Dover sole, thornyheads, and trawl-caught sablefish complex limits could experience some degree of economic loss. NMFS estimates that approximately 208 limited entry vessels achieved these limits during at least one

trip-limit period between July 1996 - June 1997. Thus, 9% (208 vessels/2270 vessels) of the affected small entities could hypothetically experience some economic loss as a result of this rule.

Substantial number of small entities. Under the FMP's license limitation (limited entry) program, approximately 468 vessels landed groundfish shoreside in 1996, and approximately 1,792 vessels operated in the open access fishery, for a total of 2,260 small businesses. An undetermined number also participate in recreational fisheries. In general NMFS has indicated that a "substantial number" of small entities to be more than 20% of those small entities engaged in the fishery. In this case, all vessels participating in the shoreside groundfish fishery potentially could be affected by the proposed rule, depending on the compensation species and amounts and the vessels' success in achieving current trip limits. Therefore, the preferred option, if adopted and implemented, potentially could affect a substantial number of small entities.

Significant economic impacts. Economic impacts on small business entities are considered to be "significant" if the proposed action would result in any of the following: (a) reduction in annual gross revenues by more than 5%; (b) increase in total costs of production by more than 5% as a result of an increase in compliance costs; (c) compliance costs as a percent of sales for small entities are at least 10% higher than compliance costs as a percent of sales for large entities; (d) capital cost of compliance represent a significant portion of capital available to small entities, considering internal cash flow and external financing capabilities; or, (e) as a rule of thumb, 2% of small business entities being forced to cease business operations. The proposed rule would result in no additional compliance costs, and therefore items (b), (c), and (d) are not at issue. Item (e) is not relevant as this action would not force any business to cease operations. Only (a) appears potentially relevant to this issue.

Section 8 presents the potential impacts which are used in making determinations under the RFA. Some small businesses could experience slightly reduced income because the amount available for harvest is reduced by the compensation fish; however, the amounts of fish likely to be diverted for compensation are so small as to be within the range of accuracy expected for inseason monitoring of harvest guidelines and quotas. In other words, the amounts are small enough that they most likely will not change the size of trip limits or their date of achievement. Only vessels that routinely achieve the DTS limits would be impacted negatively by the compensation allocation for the 1998 slope survey, and only if trip limits were lowered, or lowered earlier, as a result of the small compensation allocation for research vessels.

In the following analysis, the $135,000 value of the 1998 compensation fish is divided in approximate proportion to the catch for the limited entry and open access fisheries: $121,000-128,000 (90% to 95%) for the limited entry vessels and $7,000 to $14,000 (five percent to ten percent) for the open access vessels. Only limited entry vessels are used in this analysis because it is unlikely that trip limits for open access vessels will be reduced as a result of the small compensation allocation valued at $7,000 to $14,000, and averaging $4 to $10 per open access vessel.

NMFS estimates that approximately 208 limited entry vessels achieved at least one DTS species trip limit between July 1996 through June 1997. Thus, nine percent (208 DTS vessels/2260 groundfish vessels that are small businesses) of the affected small entities could hypothetically experience some economic loss as a result of this rule if all compensation fish were of these species. If the entire $128,000 cost of the compensation fish for the limited entry fleet were "lost" by the 208 vessels described above, then the average cost to each of these 208 vessels would be $615. (If the entire $135,000 cost is divided among these 208 vessels, the average cost would be $650.) The average annual fishing revenue for limited entry vessels in 1996 was $204,000. Thus, the average cost per vessel of spreading the $128,000 cost among 208 vessels would be 0.3% ($615 divided by $204,000). NMFS notes that the smallest 12-month revenue for any of these 208 vessels was $15,000, five percent of which is $750, which is higher than the $615 to $650 average cost of the compensation fish for these 208 vessels. As the vessel revenue increases, which it does for the remaining 207 vessels, the relative impact of the cost of compensation fish becomes smaller, and remains less than five percent.

From a slightly different perspective, if the $128,000 cost to the limited entry fleet associated with using fish as compensation were distributed among the limited entry vessels in proportion to the number of periods

in which they attained a limit for any species in the DTS complex (during July 1996 through June 1997), then the largest reduction in annual revenue for any vessel would be 0.5%.

The Council does not anticipate reducing trip limits in the open access fishery as a result of the scientific research regulations associated with this amendment. With respect to the economic impact of 1998 research compensation on the open access sector, the $7,000 expected total value of compensation fish is so small relative to the number of open access participants (1,792 vessels) that any effects on individual revenue would be undetectable.

If impacts are examined with respect to the average cost to the entire fleet of 2,260 small businesses that harvested groundfish in 1996 (not only those vessels reaching the cumulative limits for Dover sole, thornyheads, and sablefish), the impact is even smaller. In the limited entry fleet, an average $275 annual cost (Table 13.1) would represent more than more than five percent of the total fishing revenue for seven permits in 1996, about one percent of the active permits that year. (Even if the cost were doubled, e.g. the entire slope survey were funded with compensation fish, no more than two percent of the active limited entry vessels would be affected by more than five percent.) In the open access fleet, the number of vessels whose total revenue would be diminished by more than five percent as a result of a $10 annual loss (Table 13.1) would be less than eight percent of the fleet. These vessels clearly are not those successfully achieving the majority of the available trip limits. As with the limited entry fleet, the actual loss associated with these low-production vessels is likely to be smaller than the average loss across all participants, which would suggest this is the upper end of potential impacts. Landings by these vessels are so low that it is clear current trip limits are not being achieved, and a reduction in trip limits due to using fish as compensation is not likely to affect them.

TABLE 13.1. Average impact on small businesses of compensating survey vessels half with fish.

Vessels (Excluding Catcher/ Processors)	Average Vessel Revenue, All Species, in 1996	Value of Compensation Fish	Number Small Businesses that Landed Groundfish in 1996	Average Cost per Vessel of the Rule ($)	Approx. Number of Vessels with a Potential Impact Greater than 5% of Total Revenue	Percent of Vessels with an Impact Greater than 5% of Total Revenue
Limited entry	$203,982	$121,000-128,000	468	$258 -275	1 (using $275)	0.2%
Open access	$35,410	$7,000-14,000	1,792	$4 - 10	140 (using $10)	8%
Total small businesses	$70,318	$135,000	2260	$60	141	6%

Any negative impact is mitigated by other small businesses receiving the benefit of the "lost" revenue by being compensated with fish for conducting scientific research. The compensation fish are sold through normal channels. Most likely, the vessels receiving compensation fish would experience a potentially significant benefit, which is paid for (with fish) by the entire industry.

Conclusion. From the foregoing discussion, it is determined that the proposed compensation process, and any likely compensation allocation developed under this process, would not result in a reduction in annual gross revenues by more than five percent for 20% or more of the small businesses affected by this action. Therefore, this amendment and its proposed implementing rule are determined not to have a significant economic impact on a substantial number of small entities.

13.1.5 Paperwork Reduction Act (PRA)

This amendment does not require additional reporting requirements. The proposed rule contains a collection-of-information requirement subject to the PRA, which already has been approved by the Office of Management and Budget (OMB # 0648-0203).

13.1.6 Coastal Zone Management Act (CZMA)

Any of the alternatives considered would be implemented in a manner that is consistent to the maximum extent practicable with applicable State coastal zone management programs. NMFS has corresponded with the responsible State agencies under Section 307 of the CZMA to obtain their concurrence in this finding.

13.1.7 Executive Order 12612 (EO 12612)

This rule does not contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under EO 12612.

13.2 Coordination and Consultation

Using fish as compensation, and subtracting compensation fish from the next year's ABC were discussed and endorsed by the Council at it's the November 1997 meeting in Portland, Oregon.

Finding of no Significant Impact

For the reasons discussed in this document, neither implementation of the proposed actions nor the status quo would significantly affect the quality of the human environment, and the preparation of an environmental impact statement on the final action is not required by Section 102 (2)(C) of NEPA or its implementing regulations.

_____

Assistant Administrator for Fisheries Date

14.0 LIST OF PREPARERS

This document was prepared by the Council staff with contributions from NMFS scientists and managers, in consultation with NOAA General Counsel, Northwest Region:

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APPENDIX A. EXAMPLE - 1998 SLOPE SURVEY

TABLE A-1. Compensation calculations--50% payment with fish, sale of scientific samples. (Example only: NMFS may use other methods, amounts, values, species, or ratios of fish to dollars.)

	Per Vessel	6 Vessels to Conduct Survey
Total Daily Compensation in $ (From Bid)	$3000/day	18,000.00
Days Conducting Research	15 days	15 days
Total Compensation Owed (In Fish + $)	$45,000	270,000.00
Ratio of Fish to Dollars	1:1	1:1
Cash Payment	$22,500	135,000.00
Receipts from Sales of Survey Fish (In $)	$7,500	45,000.00
Balance Owed in Compensation Fish (In $)	$15,000	90,000.00

Compensation Fish: Slope Species (DTS Complex):	Species Mix (Proportion Based on Current Trip Limit)[a/]	Exvessel Value per Pound[b/]	EFP Compensation Amount (In Pounds)[a/]	Value per Vessel of EFP Fish	Total Metric Tons of Compensation Fish for the Survey (6 Vessels)	1998 ABC (mt)	% ABC Used as Compensation
Sablefish	13.5%	$1.28	1,582.03	2,025.00	**4.31**	5,200	0.1%
Dover sole	49.0%	$0.20	36,750.00	7,350.00	**100.02**	9,426	0.01
Longspine thornyheads	27.0%	$0.75	5,400.00	4,050.00	**14.70**	4,102	0.00
Shortspine thornyheads	10.5%	$1.00	1,575.00	1,575.00	**4.29**	1,000	0.00
Total amount -- compensation EFP[c/]	100.0%	--	45,307	$15,000	**123.3**	21,726	0.01

a/ Proportion based on current trip limit.
b/ Based on Fishermen's Marketing Association price; could also use Pacific Information Network (PacFIN) data from Pacific States Marine Fisheries Commission.
c/ Excludes any of the scientific sample that is sold.

EXAMPLE - 1998 SLOPE SURVEY

TABLE A-2. Compensation calculations--50% payment with fish, no sale of scientific samples. (Example only: NMFS may use other methods, amounts, values, species, or ratios of fish to dollars.)

	Per Vessel	6 Vessels to Conduct Survey
Total Daily Compensation in $ (From Bid)	$3000/day	$18,000/day
Days Conducting Research	15 days	15 days
Total Compensation Owed (In Fish + $)	$45,000	270,000.00
Ratio of Fish to Dollars	1:1	1:1
Cash Payment	$22,500	135,000.00
Receipts from Sales of Survey Fish (In $)	$0	0.00
Balance Owed in Compensation Fish (In $)	$22,500	135,000.00

Compensation Fish: Slope Species (DTS Complex):	Species Mix (Proportion Based on Current Trip Limit)[a/]	Exvessel Value per Pound[b/]	EFP Compensation Amount (In Pounds)[a/]	Value per Vessel of EFP Fish	Total Metric Tons of Compensation Fish for the Survey (6 Vessels)	1998 ABC (mt)	% ABC Used as Compensation
Sablefish	13.5%	$1.28	2,369	3,032.32	**6.45**	5,200	**0.00**
Dover Sole	49.0%	$0.20	54,730	10,946.00	**148.95**	9,426	**0.02**
Longspine Thornyheads	27.0%	$0.75	8,108	6,081.00	**22.07**	4,102	**0.01**
Shortspine Thornyheads	10.5%	$1.00	2,432	2,432.00	**6.62**	1,000	**0.01**
Total Amount -- Compensation EFP	100.0%	--	67,639	$22,491	**184.1**	21,726	**0.01**

a/ Proportion based on current trip limit.
b/ Based on Fishermen's Marketing Association price; could also use PacFIN data.

EXAMPLE -- 1998 SLOPE SURVEY

TABLE A-3. Compensation calculations--payment entirely with fish, no sale of scientific sample. (Example only: NMFS may use other methods, amounts, values, species, or ratios of fish to dollars.)

	Per Vessel	6 Vessels to Conduct Survey
Total Daily Compensation in $ (From Bid)	$3000/day	$18,000/day
Days Conducting Research	15 Days	15 Days
Total Compensation Owed (In Fish + $)	$45,000	$270,000
Ratio of Fish to Dollars	All Fish	All Fish
Cash Payment	$45,000	0.00
Receipts from Sales of Survey Fish (In $)	$0	0.00
Balance Owed in Compensation Fish (In $)	45,000.00	270,000.00

Compensation Fish: Slope Species (DTS Complex):	Species Mix (Proportion Based on Current Trip Limit)[a/]	Exvessel Value per Pound[b/]	EFP Compensation Amount (in pounds)[a/]	Value per Vessel of EFP Fish	Total Metric Tons of Compensation Fish for the Survey (6 Vessels)	1998 ABC (mt)	% of ABC Used as Compensation
Sablefish	13.5%	$1.28	4,746.09	6,075.00	**12.92**	**5,200**	**0.00**
Dover Sole	49.0%	$0.20	110,250.00	22,050.00	**300.05**	**9,426**	**0.03**
Longspine Thornyheads	27.0%	$0.75	16,200.00	12,150.00	**44.09**	**4,102**	**0.01**
Shortspine Thornyheads	10.5%	$1.00	4,725.00	4,725.00	**12.86**	**1,000**	**0.01**
Total Amount -- Compensation EFP	100.0%	--	135,921	$45,000	**369.9**	**21,726**	**0.02**

a/ Proportion based on current trip limit.
b/ Based on Fishermen's Marketing Association price; could also use PacFIN data.

APPENDIX B
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2.0 GOALS AND OBJECTIVES (New text in bold).

2.1 Goals and Objectives for Managing the Pacific Coast Groundfish Fishery

The Council is committed to developing long-range plans for managing the Washington, Oregon, and California groundfish fisheries that will promote a stable planning environment for the seafood industry, including marine recreation interests, and will maintain the health of the resource and environment. In developing allocation and harvesting systems, the Council will give consideration to maximizing economic benefits to the United States, consistent with resource stewardship responsibilities for the continuing welfare of the living marine resources. Thus, management must be flexible enough to meet changing social and economic needs of the fishery as well as to address fluctuations in the marine resources supporting the fishery. The following goals have been established in order of priority for managing the West Coast groundfish fisheries, to be considered in conjunction with the national standards of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

Management Goals.

Goal 1 - Conservation. Prevent overfishing by managing for appropriate harvest levels and prevent any net loss of the habitat of living marine resources.

Goal 2 - Economics. Maximize the value of the groundfish resource as a whole.

Goal 3 - Utilization. Achieve the maximum biological yield of the overall groundfish fishery, promote year-round availability of quality seafood to the consumer, and promote recreational fishing opportunities.

Objectives. To accomplish these management goals, a number of objectives will be considered and followed as closely as practicable:

Conservation.

Objective 1. Maintain an information flow on the status of the fishery and the fishery resource which allows for informed management decisions as the fishery occurs.

Objective 2. Adopt harvest specifications and management measures consistent with resource stewardship responsibilities for each groundfish species or species group.

Objective 3. For species or species groups which are below the level necessary to produce maximum sustainable yield (MSY), consider rebuilding the stock to the MSY level and, if necessary, develop a plan to rebuild the stock.

Objective 4. Where conservation problems have been identified for nongroundfish species and the best scientific information shows that the groundfish fishery has a direct impact on the ability of that species to maintain its long-term reproductive health, the Council may consider establishing management measures to control the impacts of groundfish fishing on those species. Management measures may be imposed on the groundfish fishery to reduce fishing mortality of a nongroundfish species for documented conservation reasons. The action will be designed to minimize disruption of the groundfish fishery, in so far as consistent with the goal to minimize the bycatch of nongroundfish species, and will not preclude achievement of a quota, harvest guideline, or allocation of groundfish, if any, unless such action is required by other applicable law.

Objective 5. Describe and identify essential fish habitat (EFH), adverse impacts on EFH, and other actions to conserve and enhance EFH, and adopt management measures that minimize, to the extent practicable, adverse impacts from fishing on EFH.

Economics.

Objective 6. Attempt to achieve the greatest possible net economic benefit to the nation from the managed fisheries.

Objective 7. Identify those sectors of the groundfish fishery for which it is beneficial to promote year-round marketing opportunities and establish management policies that extend those sectors fishing and marketing opportunities as long as practicable during the fishing year.

Objective 8. Gear restrictions to minimize the necessity for other management measures will be used whenever practicable.

Utilization.

Objective 9. Develop management measures and policies that foster and encourage full utilization (harvesting and processing) of the Pacific coast groundfish resources by domestic fisheries.

Objective 10. Recognizing the multispecies nature of the fishery and establish a concept of managing by species and gear or by groups of interrelated species.

Objective 11. Strive to reduce the economic incentives and regulatory measures that lead to wastage of fish. **Also, develop management measures that minimize bycatch to the extent practicable and, to the extent that bycatch cannot be avoided, minimize the mortality of such bycatch. In addition, promote and support monitoring programs to improve estimates of total fishing-related mortality and bycatch, as well as those to improve other information necessary to determine the extent to which it is practicable to reduce bycatch and bycatch mortality.**

Objective 12. Provide for foreign participation in the fishery, consistent with the other goals to take that portion of the optimum yield (OY) not utilized by domestic fisheries while minimizing conflict with domestic fisheries.

Social Factors.

Objective 13. When conservation actions are necessary to protect a stock or stock assemblage, attempt to develop management measures that will affect users equitably.

Objective 14. Minimize gear conflicts among resource users.

Objective 15. When considering alternative management measures to resolve an issue, choose the measure that best accomplishes the change with the least disruption of current domestic fishing practices, marketing procedures, and environment.

Objective 16. Avoid unnecessary adverse impacts on small entities.

Objective 17. Consider the importance of groundfish resources to fishing communities, provide for the sustained participation of fishing communities, and minimize adverse economic impacts on fishing communities to the extent practicable.

Objective 18. Promote the safety of human life at sea.

2.2 Operational Definition of Terms

Acceptable Biological Catch (ABC) is a biologically based estimate of the amount of fish that may be harvested from the fishery each year without jeopardizing the resource. It is a seasonally determined catch that may differ from MSY for biological reasons. It may be lower or higher than MSY in some years for species with fluctuating recruitment. The ABC may be modified to incorporate biological safety factors and

risk assessment due to uncertainty. Lacking other biological justification, the ABC is defined as the MSY exploitation rate multiplied by the exploitable biomass for the relevant time period.

Bycatch means fish which are harvested in a fishery, but which are not sold or kept for personal use or donated to a charitable organization and includes economic discards and regulatory discards.

Charter fishing means fishing from a vessel carrying a passenger for hire (as defined in section 2101(21a) of title 46, United States Code) who is engaged in recreational fishing.

Closure, when referring to closure of a fishery, means that taking and retaining, possessing or landing the particular species or species complex is prohibited.

Council means the Pacific Fishery Management Council, including its Groundfish Management Team (GMT), Scientific and Statistical Committee (SSC), Groundfish Advisory Subpanel (GAP), and any other committee established by the Council.

Commercial fishing is (1) fishing by a person who possesses a commercial fishing license or is required by law to possess such license issued by one of the states or the federal government as a prerequisite to taking, landing, and/or sale; or (2) fishing which results in or can be reasonably expected to result in sale, barter, trade, or other disposition of fish for other than personal consumption.

Domestic annual harvest (DAH) is the estimated total harvest of groundfish by U.S. fishermen. It includes the portion expected to be utilized by domestic processors and the estimated portion, if any, that will be delivered to foreign processors joint venture processing (JVP) which are permitted to receive U.S. harvested groundfish in the exclusive economic zone (EEZ).

Domestic annual processing (DAP) is the estimated annual amount of U.S. harvest that domestic processors are expected to process and the amount of fish that will be harvested, but not processed (e.g., marketed as fresh whole fish used for private consumption or used for bait).

Economic discards means fish which are the target of a fishery, but which are not retained because they are of an undesirable size, sex, quality, or for other economic reasons.

Essential fish habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

Fishing means (1) the catching, taking, or harvesting of fish; (2) the attempted catching, taking, or harvesting of fish; (3) any other activity which can reasonably be expected to result in the catching, taking, or harvesting of fish; or (4) any operations at sea in support of, or in preparation for, any activity described above. This term does not include any activity by a vessel conducting authorized scientific research.

Fishing year is defined as January 1 through December 31.

Fishing community means a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economy needs and includes fishing vessel owners, operators, crew, and recreational fishers and United States fish processors that are based in such community.

Harvest guideline (HG) is an specified numerical harvest objective which is not a quota. Attainment of a HG does not require closure of a fishery.

Incidental catch or incidental species means groundfish species caught when fishing for the primary purpose of catching a different species.

Individual fishing quota (IFQ) means a federal permit under a limited access system to harvest a quantity of fish expressed by a unit or units representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by a person.

Joint venture processing (JVP) is the estimated portion of DAH that exceeds the capacity and intent of U.S. processors to utilize, or for which domestic markets are not available, that is expected to be harvested by U.S. fishermen and delivered to foreign processors in the EEZ. (JVP = DAH - DAP.)

Maximum sustainable yield (MSY) is an estimate of the largest average annual catch or yield that can be taken over a significant period of time from each stock under prevailing ecological and environmental conditions. It may be presented as a range of values. One MSY may be specified for a group of species in a mixed-species fishery. Since MSY is a long-term average, it need not be specified annually, but may be reassessed periodically based on the best scientific information available.

MSY stock size means the largest long-term average size of the stock or stock complex, measured in terms of spawning biomass or other appropriate units, that would be achieved under an MSY control rule in which the fishing mortality rate is constant. The proxy typically used in this fishery management plan is 40% of the estimated unfished biomass, although other values based on the best scientific information are also authorized.

Optimum yield (OY) means the amount of fish which will provide the greatest overall benefit to the U.S., particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems, is prescribed as such on the basis of the maximum sustainable yield from the fishery as reduced by any relevant economic, social, or ecological factor; and in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

Overfished describes any stock or stock complex whose size is sufficiently small that a change in management practices is required to achieve an appropriate level and rate of rebuilding. The term generally describes any stock or stock complex determined to be below its overfished/rebuilding threshold. The default proxy is generally 25% of its estimated unfished biomass; however, other scientifically valid values are also authorized.

Overfishing means fishing at a rate or level that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis. More specifically, overfishing is defined as exceeding a maximum allowable fishing mortality rate. For any groundfish stock or stock complex, the maximum allowable mortality rate will be set at a level not to exceed the corresponding MSY rate (F_{msy}) or its proxy (e.g., $F_{35\%}$).

Processing or to process means the preparation or packaging of groundfish to render it suitable for human consumption, retail sale, industrial uses, or long-term storage, including, but not limited to, cooking, canning, smoking, salting, drying, filleting, freezing, or rendering into meal or oil, but does not mean heading and gutting unless additional preparation is done.

Processor means a person, vessel, or facility that (1) engages in processing, or (2) receives live groundfish directly from a fishing vessel for retail sale without further processing.

Prohibited species are those species and species groups which must be returned to the sea as soon as is practicable with a minimum of injury when caught and brought aboard except when their retention is authorized by other applicable law. Exception may be made in the implementing regulations for tagged fish, which must be returned to the tagging agency, or for examination by an authorized observer.

Quota means a specified numerical harvest objective, the attainment (or expected attainment) of which causes closure of the fishery for that species or species group. Groundfish species or species groups under this FMP for which quotas have been achieved shall be treated in the same manner as prohibited species.

Recreational fishing means fishing for sport or pleasure, but not for sale.

Regulatory discards are fish harvested in a fishery which fishermen are required by regulation to discard whenever caught or are required by regulation to retain, but not sell.

Reserve is a portion of the harvest guideline or quota set aside at the beginning of the year to allow for uncertainties in preseason estimates of DAP and JVP.

Stock Assessment and Fishery Evaluation (SAFE) document is a document prepared by the Council that provides a summary of the most recent biological condition of species in the fishery management unit, and the social and economic condition of the recreational and commercial fishing industries, and the fish processing industry. It summarizes, on a periodic basis, the best available information concerning the past, present, and possible future condition of the stocks and fisheries managed by the FMP.

Target fishing means fishing for the primary purpose of catching a particular species or species group (the target species).

Total allowable level of foreign fishing (TALFF) is the amount of fish surplus to domestic needs and available for foreign harvest. It is a quota determined by deducting the DAH and reserve, if any, from a species harvest guideline or quota.

Exploitable biomass is the biomass that is available to a unit of fishing effort. Defined as the sum of the population biomass at age (calculated as the mean within the fishing year) multiplied by the age-specific availability to the fishery. Exploitable biomass is equivalent to the catch biomass divided by the instantaneous fishing mortality rate.

Spawning biomass is the biomass of mature female fish at the beginning of the year. If the production of eggs is not proportional to body weight, then this definition should be modified to be proportional to expected egg production.

Spawning biomass per recruit is the expected egg production of a female fish over its lifetime. Alternatively, this is the mature female biomass of an equilibrium stock divided by the mean level of recruitment that produced this stock.

Density dependence is the degree to which recruitment declines as spawning biomass declines. Typically we assume that a Beverton-Holt form is appropriate and that the level of density-dependence is such that the recruitment only declines by ten percent when the spawning biomass declines by 50%.

F is the instantaneous rate of fishing mortality. F typically varies with age, so the F values are presented for the age with maximum F. Fish of other ages have less availability to the fishery, so a unit of effort applies a lower relative level of fishing mortality to these fish.

F_{msy} is the fishing mortality rate that maximizes catch biomass in the long term.

$F_{0.1}$ is the fishing mortality rate at which a change in fishing mortality rate will produce a change in yield per recruit that is ten percent of the slope of the yield curve at nil levels of fishing mortality.

F_{OF} is the rate of fishing mortality defined as overfishing.

$F_{x\%}$ is the rate of fishing mortality that will reduce female spawning biomass per recruit to x percent of its unfished level. $F_{100\%}$ is zero, and $F_{35\%}$ is a reasonable proxy for F_{msy}.

3.0 AREAS AND STOCKS INVOLVED

The management regime of this fishery management plan (FMP) applies to:

1. The U.S. exclusive economic zone (EEZ) of the northeast Pacific ocean that lies between the U.S.-Canada border (as specified in Federal Register, Volume 42, Number 44, March 7, 1977, page 12938) and the U.S.-Mexico border (Figure 3-1).

2. All foreign and domestic commercial and recreational vessels which are used to fish for groundfish in the management area.

3. All groundfish stocks which comprise this fishery management unit (see Section 3.1).

Management Areas. Upon consideration of stock distribution and domestic and foreign historical catch statistics, the following statistical areas (Figure 3-1) have been determined by the Pacific Fishery Management (Council) to be the most convenient administrative and biological management areas. These areas are based on International North Pacific Fisheries Commission (INPFC) statistical areas, but in some cases have been modified slightly. The areas are, from south to north:

Conception - Southern boundary of EEZ to 36°00' N latitude
Monterey - 36°00' N latitude to 40°30' N latitude
Eureka - 40°30' N latitude to 43°00' N latitude
Columbia - 43°00' N latitude to 47°30' N latitude
Vancouver - 47°30' N latitude to northern boundary of the EEZ

These areas may be modified or deleted and additional statistical reporting and management areas may be added, modified, or deleted if necessary to refine information or management of a species or species group. Changes will be implemented in accordance with the procedures in Chapters 5 and 6.

3.1 Species Managed by this Fishery Management Plan

Table 3-1 is the listing of species managed under this FMP.

TABLE 3-1. Common and scientific names of species included in this FMP.

Common Name	Scientific Name
	SHARKS
Leopard shark	*Triakis semifasciata*
Soupfin shark	*Galeorhinus zyopterus*
Spiny dogfish	*Squalus acanthias*
Big skate	*Raja binoculata*
California skate	*R. inornata*
Longnose skate	*R. rhina*
	RATFISH
Ratfish	*Hydrolagus colliei*
	MORIDS
Finescale codling	*Antimora microlepis*
	GRENADIERS
Pacific rattail	*Coryphaenoides acrolepis*
	ROUNDFISH
Lingcod	*Ophiodon elongatus*
Cabezon	*Scorpaenichthys marmoratus*
Kelp greenling	*Hexagrammos decagrammus*
Pacific cod	*Gadus macrocephalus*
Pacific whiting (hake)	*Merluccius productus*
Sablefish	*Anoplopoma fimbria*
~~Jack mackerel~~	~~*Trachurus symmetricus*~~

TABLE 3-1. Common and scientific names of species included in this FMP.

Common Name	Scientific Name
	ROCKFISH
Aurora rockfish	*Sebastes aurora*
Bank rockfish	*S. rufus*
Black rockfish	*S. melanops*
Black and yellow rockfish	*S. chrysomelas*
Blackgill rockfish	*S. melanostomus*
Blue rockfish	*S. mystinus*
Bocaccio	*S. paucispinis*
Bronze spotted rockfish	*S. gilli*
Brown rockfish	*S. auriculatus*
Calico rockfish	*S. dallii*
California scorpionfish	*Scorpaena gutatta*
Canary rockfish	*Sebastes pinniger*
Chilipepper	*S. goodei*
China rockfish	*S. nebulosus*
Copper rockfish	*S. caurinus*
Cowcod	*S. levis*
Darkblotched rockfish	*S. crameri*
Dusky rockfish	*S. ciliatus*
Flag rockfish	*S. rubrivinctus*
Gopher rockfish	*S. carnatus*
Grass rockfish	*S. rastrelliger*
Greenblotched rockfish	*S. rosenblatti*
Greenspotted rockfish	*S. chlorostictus*
Greenstriped rockfish	*S. elongatus*
Harlequin rockfish	*S. variegatus*
Honeycomb rockfish	*S. umbrosus*
Kelp rockfish	*S. atrovirens*
Longspine thornyhead	*Sebastolobus altivelis*
Mexican rockfish	*Sebastes macdonaldi*
Olive rockfish	*S. serranoides*
Pink rockfish	*S. eos*
Pacific ocean perch	*Sebastes alutus*
Quillback rockfish	*S. maliger*
Redbanded rockfish	*S. babcocki*
Redstripe rockfish	*S. proriger*
Rosethorn rockfish	*S. helvomaculatus*
Rosy rockfish	*S. rosaceus*
Rougheye rockfish	*S. aleutianus*
Sharpchin rockfish	*S. zacentrus*
Shortbelly rockfish	*S. jordani*
Shortraker rockfish	*S. borealis*
Shortspine thornyhead	*Sebastolobus alascanus*
Silvergray rockfish	*Sebastes brevispinis*
Speckled rockfish	*S. ovalis*
Splitnose rockfish	*S. diploproa*
Squarespot rockfish	*S. hopkinsi*
Starry rockfish	*S. constellatus*
Stripetail rockfish	*S. saxicola*
Tiger rockfish	*S. nigrocinctus*
Treefish	*S. serriceps*
Vermilion rockfish	*S. miniatus*
	FLATFISH
Arrowtooth flounder (turbot)	*Atheresthes stomias*
Butter sole	*Isopsetta isolepis*
Curlfin sole	*Pleuronichthys decurrens*
Dover sole	*Microstomus pacificus*
English sole	*Parophrys vetulus*

TABLE 3-1. Common and scientific names of species included in this FMP.

Common Name	Scientific Name
	FLATFISH (continued)
Flathead sole	*Hippoglossoides elassodon*
Pacific sanddab	*Citharichthys sordidus*
Petrale sole	*Eopsetta jordani*
Rex sole	*Glyptocephalus zachirus*
Rock sole	*Lepidopsetta bilineata*
Sand sole	*Psettichthys melanostictus*
Starry flounder	*Platichthys stellatus*

a/ The category "rockfish includes all genera and species of the family Scopaenidae, even if not listed, that occur in the Washington, Oregon, and California area. The Scopaenidae genera are *Sebastes, Scorpana, Sebastolobus, and Scorp.*

FIGURE 3-1. International North Pacific Fisheries Commission (INPFC) statistical area in the U.S. exclusive economic zone seaward of Washington, Oregon, and California.

4.0 OPTIMUM YIELD

Optimum yield (OY) is defined in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) as the amount of fish which will provide the greatest overall benefit to the Nation. The Magnuson-Stevens Act also specifies that OY is based on maximum sustainable yield (MSY), and may be equal to or less than MSY. The fishery management plan (FMP) authorizes establishment of a numerical or non-numerical OY for any groundfish species or species group and lays out the procedures the Council will follow in determining appropriate numerical OY values. An OY may be specified for the fishery management area as a whole or for specific subareas. Numerical OYs will be specified annually, based on acceptable biological catches (ABCs) for major species or species groups, which are in turn based on quantitative or qualitative stock assessments. "Control rules" for determining the numerical values of OYs ensure they will not exceed the ABCs except under tightly limited conditions.

Most of the 83 species managed by the FMP have never been assessed in either a quantitative or qualitative manner. In some cases even basic catch statistics are unavailable, because many species (rockfish, for example) are not sorted unless specifically required by regulation. Species of this type have generally not been subject to numerical harvest limits, but rather harvest is limited by gear restrictions and market demand. Other management measures which determine the total amount of harvest each year include trip landing and frequency limits. Those species without a specified OY and not included in a multi-species OY will be included in a non-numerical OY, which is defined as all the fish that can be taken under the regulations, specifications, and management measures authorized by the FMP and promulgated by the U.S. Secretary of Commerce. This non-numerical OY is not a predetermined numerical value, but rather the harvest that results from regulations, specifications, and management measures as they are changed in response to changes in the resource and the fishery. In many cases, the absence of a numerical specification reflects the absence of basic management information, such as abundance estimates and catch statistics. The non-numerical OY concept allows for a variable amount of groundfish to be harvested annually, limited by such constraints as gear restrictions, management measures for other species, and/or absence of consumer acceptance or demand.

The close spatial relationship of many groundfish species throughout the management area results in commercial and recreational catches often consisting of mixtures of several species. This is especially the case in the trawl fishery where fishermen may target on one species, but unavoidable harvest several other species. In such cases, the optimum harvest strategy often is to target on a group (complex or assemblage) of groundfish species. The grouping of groundfish species into multispecies numerical and non-numerical OYs provides the flexibility to manage to obtain the optimum public benefit from the groundfish fishery as a whole rather than the maximum yield from each species. In other cases, single species management may be necessary to provide adequate resource protection, bycatch controls, or equitable allocation. In such cases, the Council may determine it more appropriate to use individual species management by means of quotas, harvest guidelines, allocations by gear type, and other management measures.

Managing multiple species complexes for OY from the complex as a whole necessarily may result in some degree of overfishing or failure to allow recovery to the MSY level for some individual stocks. The Council will strive, to the extent practicable, to avoid overfishing individual stocks or preventing a stock from recovering to the MSY level. In the event the Council determines that greater long-term benefits will be gained from the groundfish fishery by overfishing individual stocks or by preventing a stock from recovering to its MSY level, it will justify the action in writing in accordance with the procedures in Section 5.3.6 (Stock Rebuilding) or in Section 5.5 (Annual Implementation Procedures for Specifications and Apportionments). Conversely, the Council may determine that greater benefits will accrue from protecting an individual stock by constraining the multiple species complex or specific components of that complex.

Prior to implementation of the FMP in 1982, the states of Washington, Oregon, and California managed the groundfish fishery without the use of quotas. State regulations since the mid-1940s took the form of area closures (such as San Francisco Bay), legal gear definitions, minimum codend mesh regulations, size limits, bag limits, and other nonquota management measures. Implementation of the FMP built upon those historical management practices by increasing the level of catch monitoring, improving the assessment of stock conditions, and establishing other mechanisms for responding to management needs. It provides for continuation of the historical fishery on traditionally harvested groundfish species while allowing for the

development of new fisheries for underutilized species. The FMP, as amended, provides for the establishment of resource conservation measures such as harvest guidelines or quotas through the annual specification procedure and annual and inseason management measures through the "points of concern" and socioeconomic framework mechanisms.

5.0 SPECIFICATION AND APPORTIONMENT OF HARVEST LEVELS

The ability to establish and adjust harvest levels is the first major tool at the Council's disposal to exercise its resource stewardship responsibilities. Each fishing year, the Council will assess the biological, social, and economic condition of the Pacific coast groundfish fishery and update maximum sustainable yield (MSY) estimates or proxies for specific stocks (management units) where new information on the population dynamics is available. The Council will make this information available to the public in the form of the *Stock Assessment and Fishery Evaluation (SAFE)* document described in Section 5.1. Based upon the best scientific information available, the Council will evaluate the current level of fishing relative to the MSY level for stocks where sufficient data are available. Estimates of the acceptable biological catch (ABC) for major stocks will be developed, and the Council will identify those species or species groups which it proposes to be managed by the establishment of numerical harvest levels (optimum yields [OYs], harvest guidelines [HGs], or quotas). For those stocks judged to be below their overfished/rebuilding threshold, the Council will develop a stock rebuilding management strategy.

The process for specification of numerical harvest levels includes the estimation of ABC, the establishment of OYs for various stocks, calculation of specified allocations between harvest sectors, and the apportionment of numerical specifications to domestic annual processing (DAP), joint venture processing (JVP), total allowable level of foreign fishing (TALFF), and the reserve. The specification of numerical harvest levels described in this chapter is the process of designating and adjusting overall numerical limits for a stock either throughout the entire fishery management area or throughout specified subareas. The process normally occurs annually between September and November, but can occur, under specified circumstances at other times of the fishing year. The Council will identify those OYs which should be designated for allocation between limited entry and open access sectors of the commercial industry. Other numerical limits which allocate the resource or which apply to one segment of the fishery and not another are imposed through the socioeconomic framework process described in Chapter 6 rather than the specification process.

The National Marine Fisheries Service (NMFS) Regional Administrator will review the Council's recommendations, supporting rationale, public comments, and other relevant information; and, if it is approved, will undertake the appropriate method of implementation. Rejection of a recommendation will be explained in writing.

The procedures specified in this chapter do not affect the authority of the U.S. Secretary of Commerce (Secretary) to take emergency regulatory action as provided for in Section 305(c) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) if an emergency exists involving any groundfish resource or to take such other regulatory action as may be necessary to discharge the Secretary's responsibilities under Section 305(d) of the Magnuson-Stevens Act.

The annual specification process, in general terms, occurs as follows:

1. The Council will determine the MSY or MSY proxy and ABC for each major stock. Typically, the MSY proxy will be in terms of a fishing mortality rate ($F_{x\%}$,) and ABC will be the $F_{x\%}$ applied to the current biomass estimate.

2. Every species will either have its own designated OY or be included in a multispecies OY. Species which are included in a multispecies OY may also have individual OYs, have individual HGs, or be included in a HG for a subgroup of the multispecies OY. Stocks without quantitative or qualitative assessment information may be included in a numerical or non-numerical OY.

3. To determine the OY for each stock, the Council will determine the best estimate of current abundance and its relation to its precautionary and overfished thresholds. If the abundance is above the precautionary threshold, OY will be equal to or less than ABC. If abundance falls below the precautionary threshold, OY will be reduced according to the harvest control rule for that stock. If abundance falls below the overfished/rebuilding threshold, OY will be set according to the interim rebuilding rule until the Council develops a formal rebuilding plan for that species.

4. For any stock the Secretary has declared overfished or approaching the overfished condition, or for any stock the Council determines is in need of rebuilding, the Council will develop a rebuilding plan.

5. The Council may reserve and deduct a portion of the ABC of any stock to provide for compensation for vessels conducting scientific research authorized by NMFS. Prior to the research activities, the Council will authorize amounts to be made available to a research reserve. However, the deduction from the ABC will be made in the year after the "compensation fishing"; the amounts deducted from the ABC will reflect the actual catch during compensation fishing activities.

6. The Council will identify stocks which are likely to be fully harvested (i.e., the ABC, OY, or HG achieved) in the absence of specific management measures and for which allocation between limited entry and open access sectors of the fishery is appropriate.

7. The Council will recommend the apportionment of numerical specifications between DAH, DAP, JVP, TALFF, and the reserve.

This chapter describes the steps in this process.

5.1 SAFE Document

For the purpose of providing the best available scientific information to the Council for evaluating the status of the fisheries relative to the MSY and overfishing definition, developing ABCs, determining the need for individual species or species group management, setting and adjusting numerical harvest levels, assessing social and economic conditions in the fishery, and updating the appendices of this fishery management plan (FMP); a SAFE document is prepared annually. Not all species and species groups can be reevaluated every year due to limited state and federal resources. However, the SAFE document will in general contain the following information:

1. A report on the current status of Washington, Oregon, and California groundfish resources by major species or species group.

2. Specify and update estimates of harvest control rule parameters for those species or species groups for which information is available.

3. Estimates of MSY and ABC for major species or species groups.

4. Catch statistics (landings and value) for commercial, recreational, and charter sectors.

5. Recommendations of species or species groups for individual management by OYs.

6. A brief history of the harvesting sector of the fishery, including recreational sectors.

7. A brief history of regional groundfish management.

8. A summary of the most recent economic information available, including number of vessels and economic characteristics by gear type.

9. Other relevant biological, social, economic, ecological, and essential fish habitat information which may be useful to the Council.

The SAFE document is normally completed late in the year, generally late October, when the most current stock assessment and fisheries performance information is available. The Council will make the SAFE document available to the public by such means as mailing lists or newsletters and will provide copies upon request.

5.2 Determination of MSY or MSY Proxy and B_{msy} (replaces section 5.2)

Harvest policies are to be specified according to standard reference points such as MSY (MSY, interpreted as an average achievable catch over a prolonged period), the biomass that produces MSY (B_{msy}) and the fishing rate (F_{msy}) that tends to hold biomass near B_{msy}. In this FMP, MSY generally refers to a constant F control rule that is assumed to produce the maximum average yield over time while protecting the spawning potential of the stock. (Pacific whiting is generally based on a variable F control rule.) Fishing rates above F_{msy} eventually result in biomass smaller than B_{msy} and produce less harvestable fish on a sustainable basis. Accordingly, management should avoid fishing rates that hold biomass below B_{msy} for long periods. This is especially important during periods of unfavorable environment in which resources may be less productive than usual and the risk of stock depletion is greater.

The problem with an F_{msy} control rule is that it is tightly linked to an assumed level of density-dependence in recruitment, and there is insufficient information to determine the level of density-dependence in recruitment for many West Coast groundfish stocks. Therefore, the use of approximations or proxies is necessary. Absent a more accurate determination of F_{msy}, the Council will apply default MSY proxies. The current (1998) proxies are $F_{35\%}$ for all species except rockfish and $F_{40\%}$ for rockfish[1/]. However, these values ($F_{35\%}$ and $F_{40\%}$) are provided here as examples only and are expected to be modified from time to time as scientific knowledge improves. If available information is sufficient, values of F_{msy}, B_{msy}, and more appropriate harvest control rules may be developed for any species or species group. For example, the Council generally has applied a variable F control rule for management of Pacific whiting.

At this time, it is generally believed that, for many species, $F_{35\%}$ strikes a balance between obtaining a large fraction of the MSY if recruitment is highly insensitive to reductions in spawning biomass and preventing a rapid depletion in stock abundance if recruitment is found to be extremely sensitive to reductions in spawning biomass. The long-term expected yield under an $F_{35\%}$ policy depends upon the (unknown) level of density-dependence in recruitment. The recommended level of harvest will reduce the average lifetime egg production by each female entering the stock to 35% of the lifetime egg production for females that are unfished.

The short-term yield under an $F_{35\%}$ policy will vary as the abundance of the exploitable stock varies. This is true for any fishing policy that is based on a constant exploitation rate. The abundance of the stock will vary, because of the effects of fishing, and because of natural variation in recruitment. When stock abundance is high (i.e., near its average unfished level), short-term annual yields can be approximately two to three times greater than the expected long-term average annual yield. For many of the long-lived groundfish species common on the West Coast, this "fishing down" transition can take decades. Many of the declines in ABC that occurred during the 1980s were the result of this transition from a lightly exploited, high abundance stock level to a fully exploited, moderately abundant stock level.

Recent work (Clark 1993, Mace 1994, and Ianelli 1995) indicates that $F_{35\%}$ may not be the best approximation of F_{msy}, given more realistic information about recruitment than was initially used by Clark in 1991. In his 1993 publication Clark extended his 1991 results by improving the realism of his simulations and analysis. In particular he (1) modeled stochasticity into the recruitment process, (2) introduced serial correlation into recruitment time series, and (3) performed separate analyses for the Ricker and Beverton-Holt spawner-recruit functions. For rockfish, these changes improved the realism of his spawning biomass per recruit (SPR) harvest policy calculations, because these species are known to have stochastic recruitment and they appear to display serial correlation in recruitments (especially on interdecadal time scales), and because the Beverton-Holt spawner-recruit curve may be biologically the most plausible recruitment model. The effect of each of these changes, in isolation and in aggregate, was to decrease F_{msy}. Consequently, the estimated SPR reduction needed to provide an optimal F_{msy} proxy (defined as that level of fishing which produces the largest assured proportion of MSY), must necessarily be increased. Clark concluded that $F_{40\%}$ is the optimal rate for fish stocks exhibiting recruitment variability similar to Alaska groundfish stocks. Likewise, Mace (1994) recommended the use of $F_{40\%}$ as the target mortality rate when the stock-recruitment relationship is

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1/ In the rest of this document use of $F_{35\%}$ will be taken to mean $F_{40\%}$ in the case of rockfish, and the hybrid fishing mortality rate strategy for Pacific whiting.

unknown. Lastly, Ianelli (1995) determined that $F_{44\%}$ was a good F_{msy} proxy for Gulf of Alaska Pacific ocean perch, although he subsequently indicated that a recent recruitment to that stock was larger than expected and that $F_{44\%}$ may be too conservative in that case.

Based on this information and advice by its Groundfish Management Team, in 1997 the Council concluded that $F_{40\%}$ should be used as the proxy for F_{msy} for rockfish in the absence of specific knowledge of recruitment or life history characteristics which would allow a more accurate determination of F_{msy}. This and other proxies may be revised on the basis of further information and experience.

In the past, these fishing rates were treated by the Council (as intended) as targets. Under the Magnuson-Stevens Act as amended in 1996, these fishing rates are more appropriately considered to be limits which should not be exceeded. Technically, exceeding F_{msy} now constitutes overfishing.

The Council will consider any new scientific information relating to calculation of MSY or MSY proxies and may adopt new values based on improved understanding of the population dynamics and harvest of any species or group of species.

The biomass level that produces MSY (i.e., B_{msy}) is also generally unknown and assumed to be variable over time due to long-term fluctuations in ocean conditions, so that no single value is appropriate. Current scientific thought is that B_{msy} (and/or the natural range of biomass under F_{msy}) usually falls somewhere between 0.3 to 0.5 of the average unfished abundance (mean $B_{unfished}$), and rarely falls below one quarter of that amount, (i.e., $B_{msy} > 0.25$ mean $B_{unfished}$). Rebuilding, or at least a reduced harvest rate, may be required if abundance falls below these levels.

There are many possible approximations and estimates of mean $B_{unfished}$. If the necessary data exist, the following standard methodology is the preferred approach:

$$\text{mean } B_{unfished} = \text{mean } R * SP(F=0)$$

Where mean R is the average estimated recruitment over all reliable years, and SP(F=0) is the spawning potential per recruit at zero fishing mortality rate. Alternative reference points based on mean $R * SP(F_{35\%})$, or reconstruction of mean $B_{unfished}$ from stock-recruitment relationships may also be used. SP(F=0) is normally available as part of the calculation leading to determination of $F_{35\%}$.

5.3 Determination of ABC, OY, Precautionary Threshold, and Overfished/Rebuilding Threshold

The Magnuson-Stevens Act as amended in 1996 defines OY as the amount of fish that is prescribed on the basis of MSY from the fishery as reduced by any relevant economic, social, or ecological factors. By this definition, overfishing occurs if a stock is harvested at a level in excess of F_{msy}. Moreover, overfished stocks (i.e., those that have declined to below a specified overfished/rebuilding threshold) are to be rebuilt to a level that is consistent with producing MSY. In establishing OYs for West Coast groundfish, this FMP utilizes the interim step of calculating ABCs for major stocks or management units (groups of species).

ABC, B_{msy}, and overfished/rebuilding stock size threshold cannot be precisely defined for all species, because of the absence of available information for many species managed under the FMP. In this FMP, the term "overfishing" is used to denote situations where catch exceeds or is expected to exceed the established ABC or MSY proxy ($F_{x\%}$). The term "overfished" describes a stock who's abundance is below its overfished/rebuilding threshold. Overfished/rebuilding thresholds in general are linked to the same productivity assumptions that determine the ABC levels. The default value of this threshold is 25% of the estimated unfished biomass level or 50% of B_{msy}, if known.

Three categories of species are identified. The first are the few species for which a quantitative stock assessment can be conducted on the basis of catch-at-age or other data. ABCs and overfished/rebuilding thresholds can generally be calculated for these species. The second category includes a large number of species for which some biological indicators are available, but a quantitative analysis cannot be conducted. It is difficult to estimate overfished and overfishing thresholds for the second category of species *a priori*, but indicators of long term, potential overfishing can be identified. ABCs for species in this category are typically

set at a constant level and some monitoring is necessary to determine if this level of catch is causing a slow decline in stock abundance. The third category includes minor species which are caught, but for which there is, at best, only information on landed biomass. For species in this category, it is impossible to determine MSY, ABC, or an overfished threshold.

For category 1 species, in addition to the overfished/rebuilding threshold, a precautionary threshold is established. The default value will be 40% of mean $B_{unfished}$. This level of biomass is expected to be near B_{msy}, and if abundance is between the overfished/rebuilding threshold and the precautionary threshold, a precautionary reduction in harvest will implemented to avoid further declines in abundance.

5.3.1 Determination of ABC

5.3.1.1 Stocks with Quantitative Assessments, Category 1

The stocks with quantitative assessments are those that have recently been assessed by a catch-at-age analysis. Annual evaluation of the appropriate MSY proxy (e.g., $F_{35\%}$) for species in this category will require some specific information in the SAFE document. Estimated age-specific maturity, growth, and availability to the fishery (with evaluation of changes over time in these characteristics) are sufficient to determine the relationship between fishing mortality and yield-per-recruit and spawning biomass-per-recruit. The estimated time series of recruitment, spawning biomass, fishing mortality are also required to determine whether recent trends indicate a point of concern. In general, ABC will be calculated by applying $F_{35\%}$ (or $F_{40\%}$ or other established MSY proxy) to the best estimate of current biomass. This current biomass estimate may be for a single year or the average of the present and several future years. Thus, ABC may be intended to remain constant over a period of three or more years. All ABCs will remain in effect until revised, and , whether revised or not, will be announced at the beginning of the year along with other specifications.

5.3.1.2 Stocks with ABC Set by Nonquantitative Assessment, Category 2

These stocks with ABC set by nonquantitative assessments typically do not have a recent, quantitative assessment, but there may be a previous assessment or some indicators of the status of the stock. Detailed biological information is not routinely available for these stocks, and ABC levels have typically been established on the basis of average historical landings. Typically, the spawning biomass, level of recruitment, or the current fishing mortality rate for Category 2 stocks are unknown. The Council places high priority on improving the information for managing these stocks so that they may be moved to Category 1 status.

5.3.1.3 Stocks Without ABC Values, Category 3

Of the 83 groundfish species managed under the FMP, ABC values have been established for only about 25. The remaining species are incidentally landed and usually are not listed separately on fish landing receipts. Information from fishery independent surveys are often lacking for these stocks, because of their low abundance or they are not vulnerable to survey sampling gear. Without an at-sea observer program, it is unlikely that a data base will be developed in the future for these stocks to upgrade the assessment capability or evaluate their overfishing potential. Interim ABC values may be established for these stocks based on qualitative information, including advice from the Council's advisory entities.

5.3.2 Determination of OY

Reduction in catches or fishing rates for either precautionary or rebuilding purposes is an important component of converting values of ABC to values of OY. This relationship is specified by the harvest control rule. All OYs will remain in effect until revised, and, whether revised or not, will be announced at the beginning of the year along with other specifications.

Groundfish stock assessments generally provide the following information to aid in determination of ABC and OY.

1. Current biomass (or reproductive potential) estimate.

2. F_{msy} or proxy, translated into exploitation rate.

3. Estimate of MSY biomass (B_{msy}), unfished biomass (based on average recruitment), precautionary threshold, and/or overfished/rebuilding threshold.

4. Precision estimate (e.g., confidence interval) for current biomass estimate.

Determination of Numerical OYs If Stock Assessment Information Is Available (Category 1)

The Council will follow these steps in determining numerical OYs. The recommended numerical OY values will include any necessary actions to rebuild any stock determined to be below its overfished/rebuilding threshold and may include adjustments to address uncertainty in the status of the stock.

1. ABC: Multiply the current biomass estimate times the F_{msy} exploitation rate or its proxy to get ABC.

2. Precautionary adjustment: If the abundance is above the specified precautionary threshold, OY may be equal to or less than ABC. If current biomass estimate is less than the precautionary threshold, the harvest rate will be reduced according to the harvest control rule specified in Section 5.3.5 in order to accelerate a return of abundance to optimal levels. If the abundance falls below the overfished/rebuilding threshold, the harvest control rule will generally specify a greater reduction in exploitation as an interim management response toward rebuilding the stock while a formal rebuilding plan is being developed. The rebuilding plan will include a specific harvest control rule designed to rebuild the stock, and that control rule will be used in this stage of the determination of OY.

3. Uncertainty adjustments: In cases where there is a high degree of uncertainty about the biomass estimate and other parameters, OY may be further reduced accordingly.

4. Other adjustments to OY: Other social, economic, or ecological considerations, including reduction for anticipated bycatch, may be made. Amounts of fish harvested as compensation for private vessels participating in NMFS resource survey activities will also be deducted from ABC prior to setting OY.

5. These adjustments could include increasing OY above the default value up to the overfishing level as long as the management still allows achievement of the rebuilding specified in the National Standard Guidelines:
   (a) In cases where overfishing is occurring, Council action will be sufficient to end overfishing.
   (b) In cases where a stock or stock complex is overfished, Council action will specify a time period for rebuilding the stock or stock complex that satisfies the requirements of section 304(e)(4)(A) of the Magnuson-Stevens Act.
      (i) The Council will consider a number of factors in determining the time period for rebuilding:
         (1) The status and biology of the stock or stock complex.
         (2) Interactions between the stock or stock complex and other components of the marine ecosystem (also referred to as "other environmental conditions").
         (3) The needs of fishing communities.
         (4) Recommendations by international organizations in which the United States participates.
         (5) Management measures under an international agreement in which the United States participates.
      (ii) These factors enter into the specification of the time period for rebuilding as follows:
         (1) The lower limit of the specified time period for rebuilding is determined by the status and biology of the stock or stock complex and its interactions with other components of the marine ecosystem and is defined as the amount of time that would be required for rebuilding if fishing mortality were eliminated entirely.
         (2) If the lower limit is less than ten years, then the specified time period for rebuilding may be adjusted upward to the extent warranted by the needs of fishing communities and recommendations by international organizations in which the United States participates, except that no such upward adjustment can result in the specified time period exceeding ten years, unless management measures under an international agreement in which the United States participates dictate otherwise.

(3) If the lower limit is ten years or greater, then the specified time period for rebuilding may be adjusted upward to the extent warranted by the needs of fishing communities and recommendations by international organizations in which the United States participates, except that no such upward adjustment can exceed the rebuilding period calculated in the absence of fishing mortality, plus one mean generation time or equivalent period based on the species' life-history characteristics. For example, suppose a stock could be rebuilt within twelve years in the absence of any fishing mortality, and has a mean generation time of eight years. The rebuilding period, in this case, could be as long as 20 years.

(iii) Any new rebuilding program will commence as soon as the first measures to rebuild the stock or stock complex are implemented.

(iv) Any pre-existing rebuilding plans will be reviewed to determine whether they are in compliance with all requirements of the Magnuson-Stevens Act. (Note: Only Pacific ocean perch falls into this category.)

(c) For fisheries managed under an international agreement, Council action must reflect traditional participation in the fishery, relative to other nations, by fishermen of the United States.

6. These adjustments could include increasing OY above the overfishing level as long as the harvest level meets the standards of the mixed stock exception in the National Standard Guidelines: Harvesting one species of a mixed-stock complex at its optimum level may result in the overfishing of another stock component in the complex. The Council may decide to permit this type of overfishing only if all of the following conditions are satisfied:
   (a) The Council demonstrates by analysis that such action will result in long-term net benefits to the Nation.
   (b) The Council demonstrates by analysis that mitigating measures have been considered and that a similar level of long-term net benefits cannot be achieved by modifying fleet behavior, gear selection/ configuration, or other technical characteristic in a manner such that no overfishing would occur.
   (c) The resulting rate or level of fishing mortality will not cause any species or evolutionarily significant unit thereof to require protection under the Endangered Species Act.

7. For species complexes (such as Sebastes complex), the OY will generally be set equal to the sum of the individual component ABCs, HGs, and/or OYs, as appropriate.

Determination of a Numerical OY If ABC Is Based on Nonquantitative Assessment (Category 2)

1. ABC may be based on average of past landings, previous nonquantitative assessment, or other qualitative information.

2. Precautionary adjustments, if any, would be based on relevant information. In general, the Council will follow a risk-averse approach and may recommend an OY below ABC if there is a perception the stock is below its MSY biomass level. If a declining trend persists for more than three years, then a focused evaluation of the status of the stock, its ABC, and the overfishing parameters will be quantified. If data are available, such an evaluation should be conducted at approximately five-year intervals even when negative trends are not apparent. In fact, many stocks are in need of re-evaluation to establish a baseline for monitoring of future trends. Whenever an evaluation indicates the stock may be declining and approaching an overfished state, then the Council should:
   a. Recommend improved data collection for this species.
   b. Determine the rebuilding rate that would increase the multispecies value of the fishery.

3. Uncertainty adjustment: In cases where there is a high degree of uncertainty about the condition of the stock or stocks, OY may be reduced accordingly.

4. Amounts of fish harvested as compensation for industry research activities will also be deducted.

5. These adjustments could include increasing OY above the default value as indicated for Category 1 stocks, items 5 and 6 above.

Non-numerical OY for Stocks with No ABC Values (Category 3)

Fish of these species are incidentally landed and usually are not listed separately in fish landing receipts. Information from fishery-independent surveys are often lacking for these stocks, because of their low abundance or they are not vulnerable to survey sampling gear. Without an at-sea observer program and/or requirement that landings of all species be recorded separately, it is unlikely that a data base will be developed in the future for these species to upgrade the assessment capability or evaluate their overfishing potential.

These species typically may be included in a non-numerical OY that is defined as all the fish that can be taken under the regulations, specifications, and management measures authorized by the FMP and promulgated by the Secretary. Such an OY may not be a predetermined numerical value, but rather that harvest that results from regulations, specifications, and management measures as they are changed in response to changes in the resource and the fishery. Nothing in this FMP prevents inclusion of these species in a numerical OY if the Council believes that is more appropriate.

5.3.3 Determination of Precautionary Thresholds

The precautionary threshold is the biomass level at which point the harvest rate will be reduced to help the stock return to the MSY level. The precautionary threshold will be the B_{msy} level, if known. The default precautionary threshold will be 40% of the estimated unfished biomass level. The Council may recommend different precautionary thresholds for any species or species group based on the best scientific information about that species or group. It is expected the threshold will be between 25% and 50% of the estimated unfished biomass level.

5.3.4 Determination of Overfished/Rebuilding Thresholds

As described in section 5.3, the overfished/rebuilding threshold, $B_{rebuild}$, is generally in the range of 25% to 40% of $B_{unfished}$, and may also be written as

$$B_{rebuild} = x\% * \text{mean } R * SP(F=0)$$

The default overfished/rebuilding threshold for category 1 groundfish is $.25B_{unfished}$. The Council may establish different thresholds for any species based on information provided in stock assessments, the SAFE document, or other scientific or groundfish management-related report. For example, if B_{msy} is known, the overfished threshold may be set equal to 50% of that amount. The Council may also specify a lower level of abundance where catch or fishing effort is reduced to zero. This minimum abundance threshold (B_{min}) would correspond to an abundance that severely jeopardizes the stock's ability to recover to B_{msy} in a reasonable length of time; likely values fall between five percent and ten percent of the average unfished level.

5.3.5 Default Precautionary and Interim Rebuilding OY Calculation

The default OY/rebuilding plan can be described as an "ICES-type catch-based approach" that consists of a modification of the catch policy, where catch (C) declines from $C(F_{msy})$ at the precautionary threshold in a straight line to F=0 at the minimum abundance threshold of ten percent of the estimated mean unfished biomass (sometimes called pristine or virgin biomass or reproductive potential). This approach could also be described as an OY based on a variable F_{SPR} that is progressively more conservative at low biomass levels. The abbreviated name for this is the "40-10" default adjustment. In most cases, there is inadequate information to estimate F_{msy}; in such cases, the best proxy for F_{msy} will be used. The default proxy values will be $F_{40\%}$ for rockfish in the *Sebastes* complex and $F_{35\%}$ for other species. The Council anticipates scientific information about the population dynamics of the various stocks will improve over time and that this information will result in improved estimates of appropriate harvest rates and MSY proxies. Thus, these initial default proxy values will be replaced from time to time. Such changes will not require amendment to the FMP, but the scientific basis for new values must be documented.

The greater amount of catch reduction applied below the precautionary threshold will foster quicker return to the MSY level. If a stock falls below its overfished/rebuilding threshold, this line would be used as the interim rebuilding plan during the year until the Council develops a formal rebuilding plan. The point at which the line

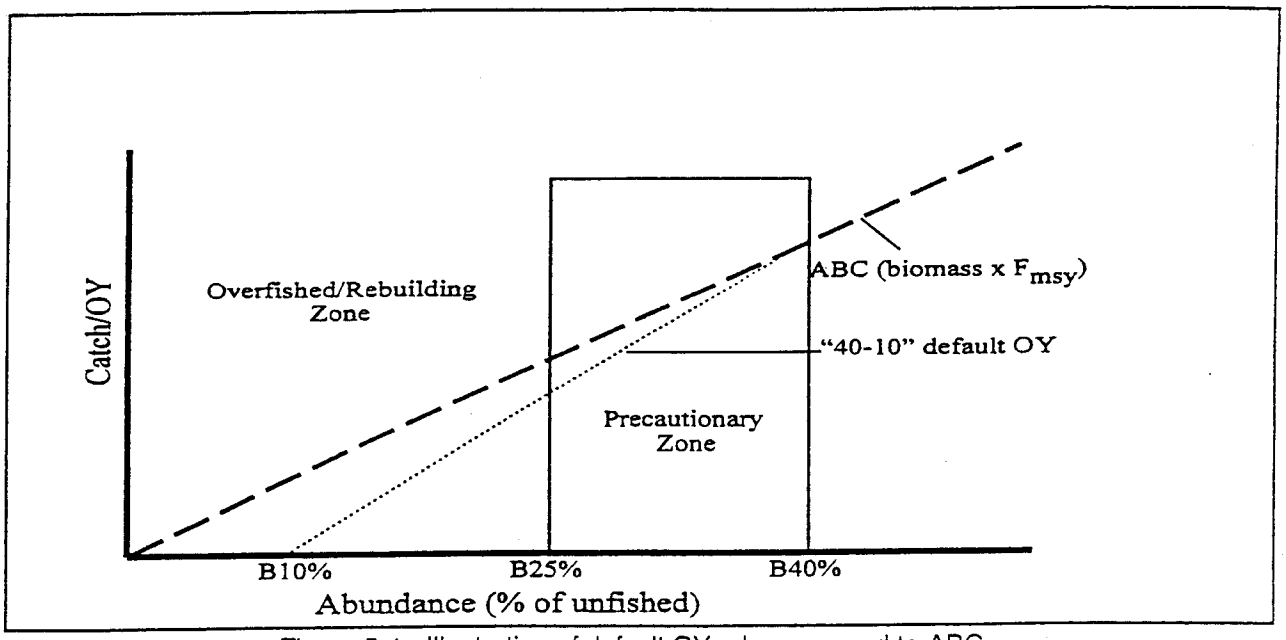

Figure 5-1. Illustration of default OY rule compared to ABC.

intersects the horizontal axis does not necessarily imply zero catch would be allowed, but rather is for determining the slope of the line.

In order to apply this default approach, a minimal amount of information is necessary; only stocks in Category 1 can be managed in this way. For stocks with inadequate information to apply this approach, the Council will consider other methods of ensuring that overfishing will be avoided. The Council will consider the approaches discussed in the National Standard Guidelines in developing such recommendations for stocks in Categories 2 and 3.

5.3.6 Stock Rebuilding

As required by the Magnuson-Stevens Act within one year of being notified by the Secretary that a stock is overfished or approaching a condition of being overfished, the Council will prepare a recommendation to end the overfished condition and rebuild the stock(s) or to prevent the overfished condition from occurring. For a stock that is overfished, the rebuilding plan will specify a time period for ending the overfished condition and rebuilding the stock. Overfishing restrictions and recovery benefits should be fairly and equitably allocated among sectors of the fishery. The Council may recommend the Secretary implement interim measures to reduce overfishing until the Council's program has been developed and implemented.

The Council may consider a number of factors in determining the time period for rebuilding, including:

1. The status and biology of the stock or stock complex.
2. Interactions between the stock or stock complex and other components of the marine ecosystem or environmental conditions.
3. The needs of fishing communities.
4. Recommendations by international organizations in which the United States participates.
5. Management measures under an international agreement in which the United States participates.

The lower limit of the specified time period for rebuilding will be determined by the status and biology of the stock or stock complex and its interactions with other components of the marine ecosystem or environmental conditions and is defined as the amount of time that would be required for rebuilding if fishing mortality were eliminated entirely.

If the lower limit is less than ten years, then the specified time period for rebuilding may be adjusted upward to the extent warranted by the needs of fishing communities and recommendations by international organizations in which the United States participates, except that no such upward adjustment may result in the specified time period exceeding ten years, unless management measures under an international agreement in which the United States participates dictate otherwise.

If the lower limit is ten years or greater, then the specified time period for rebuilding may be adjusted upward to the extent warranted by the needs of fishing communities and recommendations by international organizations in which the United States participates, except that no such upward adjustment can exceed the rebuilding period calculated in the absence of fishing mortality, plus one mean generation time or equivalent period based on the species' life-history characteristics. For example, if a stock could be rebuilt within 12 years in the absence of any fishing mortality, and has a mean generation time of eight years, the rebuilding period could be as long as 20 years.

In general, the Council will consider the following questions in developing rebuilding plans.

1. What is the apparent cause of the current condition (historical fishing patterns, a declining abundance or recruitment trend, a change in assessment methodology, or other factors)?

2. Is there a downward trend in recruitment that may indicate insufficient compensation in the spawner-recruitment relationship?

3. Based on an comparison of historical harvest levels (including discards) relative to recommended ABC levels, has there been chronic over harvest?

4. Is human-induced environmental degradation implicated in the current stock condition? Have natural environmental changes been observed that may be affecting growth, reproduction, and/or survival?

5. Would reduction in fishing mortality be likely to improve the condition of the stock?

6. Is the particular species caught incidentally with other species? Is it a major or minor component in a mixed-stock complex?

For Category 2 species, the following may be evaluated as potential indicators of overfishing:

catch per effort from logbooks
catch area from logbooks
index of stock abundance from surveys
stock distribution from surveys
mean size of landed fish

If declining trends persist for more than three years, then a focused evaluation of the status of the stock, its ABC, and overfishing threshold will be quantified. If data are available, such an evaluation should be conducted at approximately five year intervals even when negative trends are not apparent. In fact, many stocks are in need of re-evaluation to establish a baseline for monitoring of future trends. Whenever an evaluation indicates the stock may be declining and approaching an overfished state, the Council should:

1. Improve data collection for this species so it can be moved to Category 1.

2. Determine the rebuilding rate that would allow the stock to return to MSY in no longer than ten years.

For Category 3 species, information from fishery independent surveys are often lacking for these species because of their low abundance or they are not vulnerable to survey sampling gear. Without an at-sea observer program, it is unlikely that a data base will be developed in the future for these species to evaluate the risk of overfishing.

5.4 Authorization and Accounting for Fish Taken as Compensation for Authorized Scientific Research Activities.

At a Council meeting, NMFS will advise the Council of upcoming resource surveys that would be conducted using private vessels with groundfish as whole or partial compensation. For each proposal, NMFS will identify the maximum number of vessels expected or needed to conduct the survey, an estimate of the species and amounts of compensation fish likely to be needed to compensate vessels for conducting the survey, when the fish would be taken, and when the fish would be deducted from the ABC in determining the OY/harvest guideline. NMFS will initiate a competitive solicitation to select vessels to conduct resource surveys. NMFS will consult with the Council regarding the amounts and types of groundfish species to be used to support the surveys. If the Council approves NMFS' proposal, NMFS may proceed with awarding the contracts, taking into account any modifications requested by the Council. If the Council does not approve the proposal to use fish as compensation to pay for resource surveys, NMFS will not use fish as compensation.

Because the species and amounts of fish used as compensation will not be determined until the contract is awarded, it may not be possible to deduct the amount of compensation fish from the ABC or harvest guideline in the year that the fish are caught. Therefore, the compensation fish will be deducted from the ABC the year after the fish are harvested. During the annual specification process, NMFS will announce the total amount of fish caught during the year as compensation for conducting a resource survey, which then will be deducted from the following year's ABCs in setting the OYs.

5.5 Determination of DAH, DAP, JVP, and TALFF

In some cases, U.S. harvesting and/or processing capacity and intent may be insufficient to fully utilize all the fish that may be harvested. When the entire amount of fish available for harvest will not be caught by U.S. fishermen and processed by U.S. (domestic) processors, and if it can be harvested without severely impacting another species that is fully utilized by the U.S. industry, any quantity of fish excess to DAP may be made available for JVP. If DAH (i.e., the sum of DAP and JVP) is less than the amount of fish available for harvest, any further remainder may be apportioned to the foreign directed fishery as TALFF. When it is determined that quantities of a species or species group exist which are surplus to domestic processing needs, the Council will consider recommending a numerical HG or quota for the purpose of further apportionment to DAH, DAP, JVP, TALFF, and the reserve.

Prior to the next year's fishing season (usually about September of the preceding year), NMFS will conduct a survey of domestic processors and joint venture operations (if any) to estimate processing capacity, planned utilization, and related information. The DAP, the estimate of domestic annual processing needs which is derived from the survey and subsequent public testimony, is subtracted first from OY. If after subtracting the DAP, any harvestable quantity of fish remains and is requested for joint venture operations, the amount requested may be specified for JVP after providing for the reserve. The sum of DAP and JVP is DAH, an estimate of the total domestic annual harvest. Any remainder may be made available for foreign fishing as TALFF. TALFF is only that quantity of fish surplus to DAH and the reserve. TALFF will always be a quota. DAH, DAP, and JVP may be either a quota or HG.

A reserve will be set aside at the beginning of the year for any species with a JVP or TALFF. The reserve allows for uncertainties regarding estimates of DAP and DAH by providing a buffer for the domestic industry should its processing and harvesting needs exceed initial estimates. At the beginning of the year the reserve will equal 20% of the OY for a species unless DAP is greater than 80% of OY. In that case, the reserve will be the difference between OY and DAP. The reserve may be released during the year to DAH (DAP and/or JVP) or TALFF, with highest priority to DAP followed by JVP, and lastly, TALFF.

Generally, NMFS will present the results of the domestic and JVP survey to the Council for consultation and public comment concurrent with the Council's consideration of annual specifications. The Council may adopt

recommendations for annual apportionments for implementation in accordance with the annual procedures for developing and implementing annual specifications described in Section 5.5. Apportionments may be adjusted inseason following the procedures in Section 5.6. Incidental allowances for bycatch in the joint venture and foreign directed fisheries are discussed in Sections 6.5.4 and 6.5.5, respectively.

5.6 Annual Implementation Procedures for Specifications and Apportionments (previously section 5.8)

Annually, the Council will develop recommendations for the specification of ABCs, OYs, any HGs or quotas, and apportionments to DAH, DAP, JVP, and TALFF and the reserve over the span of two Council meetings. In addition during this process, the Council may recommend establishment of HGs and quotas for species or species groups within an OY.

The Council will develop preliminary recommendations at the first of two meetings (usually in August or September) based upon the best stock assessment information available to the Council at the time and consideration of public comment. After the first meeting, the Council will provide a summary of its preliminary recommendations and their basis to the public through its mailing list as well as providing copies of the information at the Council office and to the public upon request. The Council will notify the public of its intent to develop final recommendations at its second meeting (usually October or November) and solicit public comment both before and at its second meeting.

At its second meeting, the Council will again consider the best available stock assessment information which should be contained in the recently completed SAFE report and consider public testimony before adopting final recommendations to the Secretary. Following the second meeting, the Council will submit its recommendations along with the rationale and supporting information to the Secretary for review and implementation.

Upon receipt of the Council's recommendations supporting rationale and information, the Secretary will review the submission, and, if approved, publish a notice in the *Federal Register* making the Council's recommendations effective January 1 of the upcoming fishing year.

In the event that the Secretary disapproves one or more of the Council's recommendations, he may implement those portions approved and notify the Council in writing of the disapproved portions along with the reasons for disapproval. The Council may either provide additional rationale or information to support its original recommendation, if required, or may submit alternative recommendations with supporting rationale. In the absence of an approved recommendation at the beginning of the fishing year, the current specifications in effect at the end of the previous fishing year will remain in effect until modified, superseded, or rescinded.

5.7 Inseason Procedures for Establishing or Adjusting Specifications and Apportionments (previously 5.9)

5.7.1 Inseason Adjustments to ABCs

Occasionally, new stock assessment information may become available inseason that supports a determination that an ABC no longer accurately describes the status of a particular species or species group. However, adjustments will only be made during the annual specifications process and a revised ABC announced at the beginning of the next fishing year. The only exception is in the case where the ABC announced at the beginning of the fishing year is found to have resulted from incorrect data or from computational errors. If the Council finds that such an error has occurred, it may recommend the Secretary publish a notice in the *Federal Register* revising the ABC at the earliest possible date.

5.7.2 Inseason Establishment and Adjustment of OYs, HGs, and Quotas

OYs and HGs may be established and adjusted inseason (1) for resource conservation through the "points of concern" framework described in Chapter 6; (2) in response to a technical correction to ABC described above; or, (3) under the socioeconomic framework described in Chapter 6.

Quotas, except for apportionments to DAH, DAP, JVP, TALFF, and reserve, may be established and adjusted inseason only for resource conservation or in response to a technical correction to ABC.

5.7.3 Inseason Apportionment and Adjustments to DAH, DAP, JVP, TALFF, and Reserve

It may become necessary inseason to adjust DAH, DAP, JVP, TALFF, and the reserve to respond to the establishment or adjustment of a numerical OY, HG, or quota; revisions to ABC; an inseason reassessment of DAP and JVP needs; or an inseason release of the reserve. Estimates of the upcoming year's production by domestic processors are difficult to make accurately before the season begins. Processor survey responses are often optimistic and may not materialize during the year. Machinery installation delays, changes in markets, and better than normal alternative fisheries for the fishing fleets (or processors) may all affect their actual production. Therefore, a DAH reassessment process with a mechanism to make adjustments to apportionments within DAH (to DAP and/or JVP) or to TALFF, and to release the reserve is required to achieve full utilization of certain stocks and to insure the domestic processor preference intent of the Magnuson-Stevens Act is met.

The DAH reassessment process may be initiated at any time during the year that NMFS or the Council determines appropriate. The process begins with NMFS reassessing the needs of the domestic processing industry and updating its previous estimate of domestic processing intent.

Based upon this reassessment, all or part of the reserve may be apportioned among DAH, DAP, JVP, and TALFF with domestic needs met first (and with DAP having priority over JVP). If the domestic industry does not intend to harvest the entire reserve, the remainder may be made available to TALFF.

In addition to apportionment of the reserve, further adjustments may be made if the reassessment indicates that the domestic industry will not use the quantities designated for DAH. In this case, surplus DAP could be made available to JVP, or surplus DAH to TALFF. This release would only be made if inseason performance of U.S. processors and harvesters was clearly expected to fall short of DAH estimates and if the JVP and foreign harvesters indicated a desire to utilize amounts in excess of their initial apportionment.

Following reassessment of the DAH, the NMFS Regional Administrator will consult with the Council, if practicable, before publishing a notice in the *Federal Register* seeking public comment for a reasonable period of time on the proposed adjustments to the apportionments. After receiving public comment, the Regional Administrator will publish a final notice in the *Federal Register* announcing the effectiveness of the adjustments.

Sometimes the pace of the fisheries may be so rapid that failure to act quickly to make adjustments to apportionments would ultimately result in the inability of the fishery to take advantage of an adjustment. Foreign processing vessels may leave to participate in other fisheries before an adjustment releasing additional fish to the JVP can be made through process described above. In such cases where rapid action is necessary to prevent underutilization of the resource, the Regional Administrator may immediately publish a notice in the *Federal Register* making the adjustments effective and seek public comment for a reasonable period of time afterwards. If insufficient time exists to consult with the Council, the Regional Administrator will inform the Council in writing of actions taken within two weeks of the effective date.

6.0 MANAGEMENT MEASURES (New text in bold).

The regulatory measures available to manage the West Coast groundfish fisheries include, but are not limited to, harvest guidelines, quotas, landing limits, frequency limits, gear restrictions (escape panels or ports, codend mesh size, etc.), time/area closures, prohibited species, bag and size limits, permits, other forms of effort control, allocation, reporting requirements, and onboard observers. This section of the fishery management plan (FMP) describes these measures and their general application for management of the groundfish fisheries in the Washington, Oregon, and California region.

The FMP, as amended, establishes the fishery management program and the process and procedures the Council will follow in making adjustments to that program. It also sets the limits of management authority of the Council and the U.S. Secretary of Commerce (Secretary) when acting under the FMP. Management measures implementing the FMP, which directly control fishing activities, must be consistent with the goals and objectives of the FMP, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), and other applicable law. Since the FMP provides several general framework procedures for making management decisions, not all management measures authorized by the FMP will be implemented at any given time. Management decisions made under the framework procedures outlined in the FMP are intended to be implemented without the need to amend the FMP.

This FMP establishes two framework procedures through which the Council is able to recommend the establishment and adjustment of specific management measures for the Pacific coast groundfish fishery. The "points of concern" framework allows the Council to develop management measures that respond to resource conservation issues and the "socioeconomic" framework allows the Council to develop management measures in response to social, economic, and ecological issues that affect the fishing community. Associated with each framework are a set of criteria which form the basis for Council recommendations and with which Council recommendations will be consistent. **The process for developing and implementing management measures normally will occur over the span of at least two Council meetings, with an exception that provides for more timely Council consideration under certain specific conditions. This process is explained in more detail in Section 6.2.**

This FMP contemplates the Secretary will publish management measures recommended by the Council in the *Federal Register* as either "notices" or "regulations." Generally, management measures of broad applicability and permanent effectiveness are intended to be published as "regulations" while those measures more narrow in their applicability and which are meant to be effective only during the current fishing year, or even of shorter duration, and which might also require frequent adjustment, are intended to be published as "notices".

The National Marine Fisheries Service (NMFS) Regional Administrator will review the Council's recommendation, supporting rationale, public comments, and other relevant information; and, if it is approved, will undertake the appropriate method of implementation. Rejection of the recommendation will be explained in writing.

The procedures specified in this chapter do not affect the authority of the Secretary to take emergency regulatory action as provided for in Section 305(c) of the Magnuson-Stevens Act if an emergency exists involving any groundfish resource, or to take such other regulatory action as may be necessary to discharge the Secretary's responsibilities under Section 305(d) of the Magnuson-Stevens Act.

6.1 General List of Management Measures

In the early stages of fishery development, there is generally little concern with management strategies. As fishing effort increases, management measures become necessary to prevent overfishing and adverse social and economic impacts.

Recruitment, growth, natural mortality, and fishing mortality affect the size of fish populations. Fishing mortality is the only factor which can be effectively controlled in the ocean; and, therefore, marine fishery management has focused primarily on measures which influence fishing mortality. The principal measures which traditionally have been used to control fishing mortality include, but are not limited to, the following:

1. **Permits, licenses and endorsements**
2. Mesh size
3. Landing limits and trip frequency limits
4. Quotas, **including individual transferable quotas (ITQs)**
5. Escape panels or ports
6. Size limits
7. Bag limits
8. Time/area closures
9. Other forms of effort control including input controls on fishing gear such as restrictions on trawl size or longline length or number of hooks or pots
10. Allocation

The management measures discussed in this section do not include those additional measures necessary to monitor catch and effort or to enforce regulations. The FMP authorizes the promulgation of regulations necessary to enforce the provisions of the FMP and its implementing regulations through the appropriate rulemaking procedure described in Section 6.2. Although this document only discusses in detail those management measures just listed, other types of management measures may have valid applicability and are intended to be available to the Council providing their consideration is consistent with the criteria and general procedures contained in this FMP. An example of an untried management measure that holds some theoretical promise in addressing bycatch problems is the creation of an incentive program which rewards fishermen by granting access to a reserve quota if they have maintained a documented bycatch rate below a specified level.

6.1.1 Permits, Licenses, and Endorsements

Permits and licenses are used to enumerate participants in an industry and, if eligibility requirements are established or the number of permits is limited, to restrict participation. Participation in the Washington, Oregon, and California groundfish fishery was partially limited beginning in 1994 when the federal vessel license limitation program was implemented (Amendment 6). Subsequently, Amendment 9 further limited participation in the fixed-gear sablefish fishery by establishing a sablefish endorsement. There is currently no federal permit requirement for other commercial participants (fishers or processors) or recreational participants (private recreational or charter). The Council may determine that effective management of the fishery requires accurate enumeration of the number of participants in these sectors and may establish a permit requirement to accomplish this. In addition, some form of limitation on participation may be necessary in order to protect the resource or to achieve the objectives of the FMP.

6.1.2 Mesh Size

In net fisheries, a most common management measure applied world wide has been a minimum mesh size. By increasing or decreasing mesh size, it is possible to increase or decrease the size of fish retained in the net. Control over the size of entry into the fishery can ensure that sufficient numbers of immature fish pass through the net to protect the long-term productivity. Mesh size also can be adjusted to maximize the yield of certain species.

However, mesh size is not a panacea, because a single mesh size is unlikely to provide the optimal age of recruitment for each species. In a multispecies fishery, a single mesh size will tend to over harvest some species while over protecting others. Ideally, the selected mesh size should tend to maximize the economic yield to the fishery over the longest period possible.

Mesh size in fish pots (traps) also affects the size of fish retained in the trap. By increasing the minimum mesh size in all or part of the trap, small fish may be allowed to escape.

6.1.3 Landing and Frequency Limits

A trip limit is the amount of groundfish that may be taken and retained, possessed, or landed from a single fishing trip. Trip landing limits and trip frequency limits are used to control landings to delay achievement of a quota or harvest guideline and thus avoid premature closure of a fishery if it is desirable to extend the fishery over a longer time. Trip landing limits also can be utilized to minimize targeting on a species or species group while allowing landings of some level of incidental catch. Trip landing limits are most effective in fisheries where the fisherman can control what is caught. In a multispecies fishery, trip limits can discourage targeting while, at the same time, providing for the landing of an incidental catch species which requires a greater degree of protection than the other species in the multispecies catch. Conversely, a trip limit may be necessary to restrict the overall multispecies complex catch in order to provide adequate protection to a single component of that catch.

6.1.4 Quotas, Including Individual Transferable Quotas

Quotas are specified harvest limits, the attainment of which causes closure of the fishery for that species, gear type, or individual participant. Quotas may be established for intentional allocation purposes or to terminate harvest at a specified point. They may be specified for a particular area, gear type, time period, species or species group, and/or vessel or permit holder. **Quotas can apply to either target species or bycatch species.**

6.1.5 Escape Ports and Panels

Escape ports and panels are used in traps. Escape ports allow small fish to escape once caught in the trap. An escape panel is part of a trap which is constructed of biodegradable material or which is secured with biodegradable material. When the material degrades, it leaves a hole in the trap which allows fish to escape. Thus, the panel prevents continued fishing if gear is lost or not attended for extended periods of time. Similarly, blowout panels could be used in a trawl fishery to limit the catch per haul.

6.1.6 Size Limits

Size limits are used to prevent the harvest of immature fish or those which have not reached their full reproductive capacity. In some cases, size limits are utilized in reverse to harvest younger recruit or pre-recruits and protecting older, larger spawning stock. Generally, harvesting the larger members of the population tends to increase the yield by taking advantage of the combined growth of individual fish. Size limits can be applied to all fisheries, but are generally used where fish are handled individually or in small groups such as trap-caught sablefish and recreational-caught fish. Size limits lose their utility in cases where the survival of the fish returned to the sea is low (e.g., rockfish).

6.1.7 Bag Limits

Bag limits have long been used in the recreational fishery and are perhaps the oldest method used to control recreational fishing. The intended effect of bag limits is to spread the available catch over a large number of anglers and to avoid waste.

6.1.8 Time/Area Closures (Seasons and Closed Areas)

In recent years, overcapacity of the harvesting and processing sectors has lead to more restrictive management. While the Council has tried to maintain year-round fishing and processing opportunities, it has become more difficult to do so without making discard worse. It may be necessary to restrict the amount of time vessels are allowed to fish, and this could take form of seasons for the entire fleet, regions of the coast, or individual vessel seasons. The fixed gear (nontrawl) sablefish fishery is an extreme example of a seasonal approach, with the season restricted to a week or less. Seasons may also be helpful to protect spawning concentrations of certain species in order to avoid times when the fish are most concentrated or particularly vulnerable. In this respect, closure of certain areas to protect spawning lingcod or petrale sole may be advisable.

Time/area closures have also been used in management of the Pacific whiting fishery. In this case, the foreign fishery was controlled by season (June 1 through October 31), area (no fishing within 12 miles off shore or south of 39°N latitude) and quota. The domestic fishery has also been managed with seasons that typically have taken the form of a beginning date, an "unrestricted" period, and closure when the harvest limit is reached. Outside the "unrestricted" season, an incidental catch allowance is typically provided to prevent regulatory bycatch.

6.1.9 Other Forms of Effort Control

Other forms of effort controls commonly used include restrictions on the number of units of gear, or restrictions on the size of trawls, or length of longlines, or the number of hooks or pots. **These measures may also be useful in reducing bycatch.**

6.1.10 Allocation

Allocation is the apportionment of an item for a specific purpose or to a particular person or group of persons. Allocation of fishery resources may result from any type of management measure, but is most commonly a numerical quota or harvest guideline for a specific gear or fishery sector. Most fishery management measures allocate fishery resources to some degree, because they invariably affect access to the resource by different fishery sectors by different amounts. These allocative impacts, if not the intentional purpose of the management measure, are considered to be indirect or unintentional allocations. Direct allocation occurs when numerical quotas, harvest guidelines, or other management measures are established with the specific intent of affecting a particular group's access to the fishery resource.

Fishery resources may be allocated to accomplish a single biological, social or economic objective, or a combination of such objectives. The entire resource, or a portion, may be allocated to a particular group, although the Magnuson-Stevens Act requires that allocation among user groups be determined in such a way that no group, person, or entity receives an undue share of the resource. The socioeconomic framework described in Section 6.2.3 provides criteria for direct allocation. Allocative impacts of all proposed management measures should be analyzed and discussed in the Council's decision making process.

6.2 General Procedures for Establishing and Adjusting Management Measures

Management measures are normally imposed, adjusted, or removed at the beginning of the fishing year, but may, if the Council determines it necessary, be imposed, adjusted, or removed at any time during the year. Management measures may be imposed for resource conservation, social or economic reasons consistent with the criteria, procedures, goals, and objectives set forth in the FMP.

Because the potential actions which may be taken under the two frameworks established by the FMP cover a wide range analyses of biological, social, and economic impacts will be considered at the time a particular change is proposed. As a result, the time required to take action under either framework will vary depending on the nature of the action, its impacts on the fishing industry, resource, environment, and review of these impacts by interested parties. Satisfaction of the legal requirements of other applicable law (e.g., the Administrative Procedure Act, Regulatory Flexibility Act, Executive Order 12291, etc.) for actions taken under this framework requires analysis and public comment before measures may be implemented by the Secretary.

Four different categories of management actions are authorized by this FMP, each of which requires a slightly different process. Management measures may be established, adjusted, or removed using any of the four procedures. The four basic categories of management actions are as follows:

A. Automatic Actions - Automatic management actions may be initiated by the NMFS Regional Administrator without prior public notice, opportunity to comment, or a Council meeting. These actions are nondiscretionary, and the impacts previously must have been taken into account. Examples include fishery, season, or gear type closures when a quota has been projected to have been attained. The Secretary will publish a single "notice" in the *Federal Register* making the action effective.

B. "Notice" Actions Requiring at Least One Council Meeting and One *Federal Register* Notice - These include all management actions other than "automatic" actions that are either nondiscretionary or for which the scope of probable impacts has been previously analyzed.

These actions are intended to have temporary effect, and the expectation is that they will need frequent adjustment. They may be recommended at a single Council meeting (usually November), although the Council will provide as much advance information to the public as possible concerning the issues it will be considering at its decision meeting. The primary examples are those management actions defined as "routine" according to the criteria in Section 6.2.1. These include trip landing and frequency limits for all gear types for widow rockfish, sablefish (including size limits), Pacific ocean perch, the Sebastes complex, nontrawl year-end trip limits for sablefish, and recreational bag limits for rockfish and lingcod. Previous analysis must have been specific as to species and gear type before a management measure can be defined as "routine" and acted upon at a single Council meeting. If the recommendations are approved, the Secretary will waive for good cause the requirement for prior notice and comment in the *Federal Register* and will publish a single "notice" in the *Federal Register* making the action effective. This category of actions presumes the Secretary will find that the extensive notice and opportunity for comment on these types of measures along with the scope of their impacts already provided by the Council will serve as good cause to waive the need for additional prior notice and comment in the *Federal Register.*

C. Abbreviated Rulemaking Actions Normally Requiring at Least Two Council Meetings and One *Federal Register* "Rule" - These include all management actions (1) being classified as "routine", or (2) intended to have permanent effect and are discretionary, and for which the impacts have not been previously analyzed. Examples include changes to or imposition of gear regulations, or imposition of landing or frequency limits for the first time on any species or species group, or gear type. The Council will develop and analyze the proposed management actions over the span of at least two Council meetings (usually September and November) and provide the public advance notice and opportunity to comment on both the proposals and the analysis prior to and at the second Council meeting. If the Regional Administrator approves the Council's recommendation, the Secretary will waive for good cause the requirement for prior notice and comment in the *Federal Register* and publish a "final rule" in the *Federal Register* which will remain in effect until amended. If a management measure is designated as "routine" by "final rule" under this procedure, specific adjustments of that measure can subsequently be announced in the *Federal Register* by "notice" as described in the previous paragraphs. Nothing in this section prevents the Secretary from exercising the right not to waive the opportunity for prior notice and comment in the *Federal Register*, if appropriate, but presumes the Council process will adequately satisfy that requirement.

The primary purpose of the previous two categories of abbreviated notice and rulemaking procedures is to accommodate the Council's September-November meeting schedule for developing annual management recommendations, to satisfy the Secretary's responsibilities under the Administrative Procedures Act, and to address the need to implement management measures by January 1 of each fishing year.

It should be noted the two Council meeting process refers to two decision meetings. The first meeting to develop proposed management measures and their alternatives, the second meeting to make a final recommendation to the Secretary. For the Council to have adequate information to identify proposed management measures for public comment at the first meeting, the identification of issues and the development of proposals normally must begin at a prior Council meeting, usually the July Council meeting.

D. Full Rulemaking Actions Normally Requiring at Least Two Council Meetings and Two *Federal Register* Rules (Regulatory Amendment) - These include any proposed management measure that is highly controversial or any measure which directly allocates the resource. The Council normally will follow the two meeting procedure described for the abbreviated rulemaking category. The Secretary will publish a "proposed rule" in the *Federal Register* with an appropriate period for public comment followed by publication of a "final rule" in the *Federal Register.*

Management measures recommended to address a resource conservation issue must be based upon the establishment of a "point of concern" and consistent with the specific procedures and criteria listed in Section 6.2.2.

Management measures recommended to address social or economic issues must be consistent with the specific procedures and criteria described in Section 6.2.3.

6.2.1 Routine Management Measures

"Routine" management measures are those the Council determines are likely to be adjusted on an annual or more frequent basis. Measures are classified as "routine" by the Council through either the full or abbreviated rulemaking process (C. or D. above). In order for a measure to be classified as "routine", the Council will determine that the measure is of the type normally used to address the issue at hand and may require further adjustment to achieve its purpose with accuracy.

As in the case of all proposed management measures, prior to initial implementation as "routine" measures, the Council will analyze the need for the measures, their impacts, and the rationale for their use. Once a management measure has been classified as "routine" through one of the two rulemaking procedures outlined above, it may be modified thereafter through the single meeting "notice" procedure (B. above) only if (1) the modification is proposed for the same purpose as the original measure, and (2) the impacts of the modification are within the scope of the impacts analyzed when the measure was originally classified as "routine." The analysis of impacts need not be repeated when the measure is subsequently modified if the Council determines that they do not differ substantially from those contained in the original analysis. The Council may also recommend removing a "routine" classification.

Experience gained from management of the Pacific coast groundfish fishery indicates that certain measures usually require modification on a frequent basis to ensure that they meet their stated purpose with accuracy. These measures are commercial trip landing limits and trip frequency limits, including landing frequency and notification requirements and recreational bag limits as they have been applied to specific species, species groups, sizes of fish, and gear types. Their purpose in application to the commercial fishery has consistently been either to stretch the duration of the fishery so as not to disturb traditional fishing and marketing patterns, to reduce discards and wastage, or to discourage targeted fishing while allowing small incidental catches when attainment of a harvest guideline or quota is imminent. For the recreational fishery, bag and size limits have been imposed to spread the available catch over a large number of anglers, to avoid waste, and to provide consistency with state regulations.

As of October 1998, the measures listed below by species and gear type had been classified as "routine" measures through the rulemaking process. Recreational bag and size limits have also been designated as "routine."

Limited Entry Trip Landing and Frequency Limits

Widow rockfish - all gear
Sebastes complex - all gear
Yellowtail rockfish - all gear
Canary rockfish - all gear
Bocaccio - all gear
Pacific ocean perch - all gear
Sablefish (including size limits)
    trawl gear
    nontrawl gear
Dover sole - all gear
Thornyhead rockfish (separately or combined) - all gear
Pacific whiting - all gear
Lingcod (including size limits) - all gear

Open Access Trip Landing and Frequency Limits

All groundfish species, separately or in any combination - all gear types

Recreational Bag and Size Limits

Lingcod
Rockfish

Any measure designated as "routine" for one specific species, species group, or gear type may not be treated as "routine" for a different species, species group, or gear type without first having been classified as "routine" through the rulemaking process.

The Council will conduct a continuing review of landings of those species for which harvest guidelines, quotas, **optimum yields (OYs)** or specific "routine" management measures have been implemented and will make projections of the landings at various times throughout the year. If in the course of this review it becomes apparent the rate of landings is substantially different than anticipated and that the current "routine" management measures will not achieve the annual management objectives, the Council may recommend inseason adjustments to those measures. Such adjustments may be implemented through the single meeting "notice" procedure.

6.2.2 Resource Conservation Issues - The "Points of Concern" Framework

The "points of concern" process is the Council's second major tool (along with setting harvest levels) in exercising its resource stewardship responsibilities. The process is intended to foster a continuous and vigilant review of the Pacific coast groundfish stocks and fishery to prevent unintended overfishing or other resource damage. To facilitate this process a Council-appointed management team (the Groundfish Management Team [GMT] or other entity) will monitor the fishery throughout the year, taking into account any new information on the status of each species or species group to determine whether a resource conservation issue exists that requires a management response. The Council developed the "points of concern" criteria to assist it in determining when a focused review on a specific species or species group is warranted which might result in the need to recommend the implementation of specific management measures to address the resource conservation issue. The FMP authorizes the Council to act based solely on the "points of concern," which allows the Council to respond quickly and directly to a resource conservation issue. In conducting this review, the GMT or other entity will utilize the most current catch, effort, and other relevant data from the fishery.

In the course of the continuing review, a "point of concern" occurs when any one or more of the following is found or expected:

1. Catch for the calendar year is projected to exceed the best current estimate of acceptable biological catch (ABC) for those species for which a harvest guideline or quota is not specified.
2. Catch for the calendar year is projected to exceed the current harvest guideline or quota.
3. Any change in the biological characteristics of the species/species complex is discovered such as changes in age composition, size composition, and age at maturity.
4. Exploitable biomass or spawning biomass is below a level expected to produce MSY for the species/species complex under consideration.
5. Recruitment is substantially below replacement level.
6. **Estimated bycatch of a species or species group increases substantially above previous estimates, or there is information that abundance of a bycatch species has declined substantially.**
7. **Impacts of fishing gear on EFH are discovered and modification to gear or fishing regulations could reduce those impacts.**

Once a "point of concern" is identified, the GMT will evaluate current data to determine if a resource conservation issue exists and will provide its findings in writing at the next scheduled Council meeting. If the GMT determines a resource conservation issue exists, it will provide its recommendation, rationale, and analysis for the appropriate management measures that will address the issue.

In developing its recommendation for management action, the Council will choose an action from one or more of the following categories which include the types of management measures most commonly used to address resource conservation issues.

- Harvest guidelines
- Quotas
- Cessation of directed fishing (foreign, domestic or both) on the identified species or species group with appropriate allowances for incidental harvest of that species or species group
- Size limits
- Landing limits
- Trip frequency limits
- Area or subarea closures
- Time closures
- Seasons
- Gear limitations, which include, but are not limited to, definitions of legal gear, mesh size specifications, codend specifications, marking requirements, and other gear specifications as necessary.
- Observer coverage
- Reporting requirements
- Permits
- Other necessary measures

Direct allocation of the resource between different segments of the fishery is, in most cases, not the preferred response to a resource conservation issue. Council recommendations to directly allocate the resource will be developed according to the criteria and process described in Section 6.2.3, the socioeconomic framework.

After receiving the GMT's report, the Council will take public testimony and, if appropriate, will recommend management measures to the NMFS Regional Administrator accompanied by supporting rationale and analysis of impacts. The Council's analysis will include a description of (a) how the action will address the resource conservation issue consistent with the objectives of the FMP; (b) likely impacts on other management measures, other fisheries **and bycatch;** (c) economic impacts, particularly the cost to the commercial and recreational segments of the fishing industry; and **(d) impacts on fishing communities.**

The NMFS Regional Administrator will review the Council's recommendation and supporting information and will follow the appropriate implementation process described in Section 6.2 depending on the amount of public notice and comment provided by the Council and the intended permanence of the management action. If the Council contemplates the need for frequent adjustments to the recommended measures, it may classify them as "routine" through the appropriate process described in Section 6.2.1.

If the NMFS Regional Administrator does not concur with the Council's recommendation, the Council will be notified in writing of the reasons for the rejection.

Nothing in this section is meant to derogate from the authority of the Secretary to take emergency action under Section 305(c) of the Magnuson-Stevens Act.

6.2.3 Nonbiological Issues--The Socioeconomic Framework

From time to time non-biological issues may arise which require the Council to recommend management actions to address certain social or economic issues in the fishery. Resource allocation, seasons, or landing limits based on market quality and timing, safety measures, and prevention of gear conflicts make up only a few examples of possible management issues with a social or economic basis. In general, there may be any number of situations where the Council determines that management measures are necessary to achieve the stated social and/or economic objectives of the FMP.

Either on its own initiative or by request, the Council may evaluate current information and issues to determine if social or economic factors warrant imposition of management measures to achieve the Council's established management objectives. Actions that are permitted under this framework include all of the categories of actions authorized under the "points of concern" framework with the addition of direct resource allocation.

If the Council concludes that a management action is necessary to address a social or economic issue, it will prepare a report containing the rationale in support of its conclusion. The report will include the proposed

management measure, a description of other viable alternatives considered, and an analysis that addresses the following criteria (a) how the action is expected to promote achievement of the goals and objectives of the FMP; (b) likely impacts on other management measures, other fisheries **and bycatch;** (c) biological impacts; (d) economic impacts, particularly the cost to the fishing industry; **(e) impacts on fishing communities;** and (f) how the action is expected to accomplish at least one of the following:

1. Enable a quota, harvest guideline, or allocation to be achieved.
2. Avoid exceeding a quota, harvest guideline, or allocation.
3. Extend domestic fishing and marketing opportunities as long as practicable during the fishing year, for those sectors for which the Council has established this policy.
4. Maintain stability in the fishery by continuing management measures for species that previously were managed under the points of concern mechanism.
5. Maintain or improve product volume and flow to the consumer.
6. Increase economic yield.
7. Improve product quality.
8. **Reduce anticipated bycatch and bycatch mortality.**
9. Reduce gear conflicts, or conflicts between competing user groups.
10. Develop fisheries for underutilized species with minimal impacts on existing domestic fisheries.
11. Increase sustainable landings.
12. Increase fishing efficiency.
13. Maintain data collection and means for verification.
14. Maintain or improve the recreational fishery.
15. Any other measurable benefit to the fishery.

The Council, following review of the report, supporting data, public comment and other relevant information, may recommend management measures to the NMFS Regional Administrator accompanied by relevant background data, information, and public comment. The recommendation will explain the urgency in implementation of the measure(s), if any, and reasons therefore.

The NMFS Regional Administrator will review the Council's recommendation, supporting rationale, public comments, and other relevant information, and, if it is approved, will undertake the appropriate method of implementation. Rejection of the recommendation will be explained in writing.

The procedures specified in this chapter do not affect the authority of the Secretary to take emergency regulatory action as provided for in Section 305(c) of the Magnuson-Stevens Act if an emergency exists involving any groundfish resource, or to take such other regulatory action as may be necessary to discharge the Secretary's responsibilities under Section 305(d) of the Magnuson-Stevens Act.

If conditions warrant, the Council may designate a management measure developed and recommended to address social and economic issues as a "routine" management measure provided that the criteria and procedures in Section 6.2.1 are followed.

Quotas, including allocations, implemented through this framework will be set annually and may be modified inseason only to reflect technical corrections of acceptable biological catch (ABC). (In contrast, quotas may be imposed at any time of year for resource conservation reasons under the points of concern mechanism.)

6.2.3.1 Allocation

In addition to the requirements described in Section 6.2.3, the Council will consider the following factors when intending to recommend direct allocation of the resource.

1. Present participation in and dependence on the fishery, including alternative fisheries.
2. Historical fishing practices in, and historical dependence on, the fishery.
3. The economics of the fishery.
4. Any consensus harvest sharing agreement or negotiated settlement between the affected participants in the fishery.

5. Potential biological yield of any species or species complex affected by the allocation.
6. Consistency with the Magnuson-Stevens Act national standards.
7. Consistency with the goals and objectives of this FMP.

The modification of a direct allocation cannot be designated as "routine" unless the specific criteria for the modification have been established in the regulations.

6.3 Bycatch Management

6.3.1 Bycatch of Nongroundfish Species

Groundfish fishing activities may directly impact certain non-groundfish species, and this FMP authorizes implementation of measures to control groundfish fishing to share conservation burdens identified under overfishing definitions adopted by the Council, the Endangered Species Act (ESA), or other applicable laws, while minimizing disruption of the groundfish fishery. Specifically, the intention is to reduce bycatch or other direct mortality of any species. Section 6.1 of this FMP lists nine principal measures which traditionally have been found most useful in controlling fishing mortality. Any of these measures may be employed to control fishing impacts on non-groundfish species. However, allocation may not be the primary intention of any such regulation.

The process for implementing and adjusting such measures may be initiated at any time. In addition, some measures may be designated as routine (see Section 6.2.1), which will allow adjustment at a single meeting based on relevant information available at the time if (1) the modification is proposed for the same purpose as the original measure, and (2) the impacts of the modification are within the scope of the impacts analyzed when the measure was originally classified as routine.

Generally, the Council will initiate the process of establishing or adjusting management measures when a resource problem with a non-groundfish species is identified and it has been determined that groundfish fishing regulations will reduce the total impact on that species or stock. It is anticipated this will generally occur when a state or federal resource management agency (such as the U.S. Department of the Interior, NMFS, or state fishery agency) or the Council's Salmon Technical Team (STT) presents the Council with information substantiating its concern for a particular species. The Council will review the information and refer it to the Scientific and Statistical Committee (SSC), GMT, STT, or other appropriate technical advisory group for evaluation. If the Council determines, based on this review, that management measures may be necessary to prevent harm to a non-groundfish species facing conservation problems or to address requirements of the ESA, Marine Mammal Protection Act, other relevant federal natural resource law or policy, or international agreement, it may implement appropriate management measures in accordance with the procedures identified in Section 6.2. The intention of the measures may be to share conservation burdens while minimizing disruption of the groundfish fishery, but under no circumstances may the intention be simply to provide more fish to a different user group or to achieve other allocation objectives.

6.3.2 Standardized Reporting Methodology

Bycatch and discard survival data, information to assess impacts on the population and ecosystem, and data on social and economic effects of alternative management measures to reduce bycatch are limited. Due to these limitations, precise estimates of bycatch, bycatch mortality, or associated effects of alternative conservation and management measures are not possible.

The Council supports monitoring programs to improve estimates of total fishing-related mortality and bycatch, as well as those to improve other information used to determine the extent to which it is practicable to reduce bycatch and bycatch mortality. Sources of this information may include at-sea observer programs, new technology to monitor catch weight and species composition, or better use of industry-reported catch and discard information. Timely summaries of the amount and type of bycatch for each fishery should be collated in annual *Stock Assessment and Fishery Evaluation (SAFE)* reports.

6.3.3 Measures to Control Bycatch

Limited resources are available to the Council and NMFS to address bycatch problems, and a variety of bycatch problems exists in the groundfish fishery. Therefore, the Council will identify and prioritize the bycatch problems in the fishery, based on the benefits to the U.S. expected to accrue from addressing these problems and the practicality of addressing these problems. The Council will develop measures to reduce bycatch and bycatch mortality in accordance with the points of concern or socioeconomic framework provisions of this FMP.

6.4 Recreational Catch and Release Management

The Council may develop recreational catch-and-release programs for any groundfish stock through the appropriate rulemaking process. The Council will assess the type and amount of groundfish caught and released alive during fishing under such a program and the mortality of such fish. Management measures for such a program will, to the extent practicable, minimize mortality and ensure extended survival of such groundfish.

6.5 Other Management Measures

6.5.1 Generic

6.5.1.1 Permits

Federal permits may be required for individuals or vessels that harvest groundfish and for individuals or facilities (including vessels) that process groundfish or take delivery of live groundfish. In determining whether to require a harvesting or processing permit, and in establishing the terms and conditions for issuing a permit, the Council may consider any relevant factors including whether a permit:

1. **Will enhance the collection of biological, economic, or social data.**
2. **Will provide better enforcement of laws and regulations, including those designed to ensure conservation and management and those designed to protect consumer health and safety.**
3. **Will help achieve the goals and objectives if the FMP.**
4. **Will help prevent or reduce overcapacity in the fishery.**
5. **May be transferred, and under what conditions.**

Separate permits or endorsements may be required for harvesting and processing or for vessels or facilities based on size, type of fishing gear used, species harvested or processed, or such other factors that may be appropriate. The permits and endorsements are also subject to sanctions, including revocation, as provided by section 308 of the Magnuson-Stevens Act.

In establishing a permit requirement, the Council will follow the full-rulemaking procedures in Section 6.2.

6.5.1.2 Observers

All fishing vessels operating in this management unit including catcher/processors, at-sea processors, and those vessels which harvest in the Washington, Oregon, and California area and land in another area, may be required to accommodate NMFS-certified onboard observers for the purposes of collecting scientific data. An observer program will be considered only for circumstances where other data collection methods are deemed insufficient for management of the fishery. Implementation of any observer program will be in accordance with appropriate federal procedures including economic analysis and public comment.

There may be a priority need for observers on at-sea processing vessels to collect data normally collected at shore based processing plants. Certain information for management of the fishery can be obtained from logbooks and other reporting requirements, but the collection of some types of data would be too onerous for

some fishermen to collect. Processing vessels must be willing to accommodate onboard observers and may be required to provide the NMFS-certified observers prior to issuance of any required federal permits.

Observers are required on foreign vessels operating in the Exclusive Economic Zone (EEZ) according to the Magnuson-Stevens Act.

6.5.1.3 Habitat Protection (General)

Beginning in January 1989, the Marine Plastic Pollution Research and Control Act of 1987 (PL 100-220, MARPOL) restricted the dumping of gear or other material from domestic vessels. The Secretary, upon the recommendation of the Council, may propose additional management measures restricting disposal of fishing gear by domestic and foreign vessels. **A description of the groundfish habitat and effects of habitat alteration, as required by the Magnuson-Stevens Act, appear in the Appendix 11.10. EFH provisions are found in Section 6.6.**

6.5.1.4 Vessel Safety Considerations

The Council will consider, and may provide for, temporary adjustments, after consultation with the U.S. Coast Guard and persons utilizing the fishery, regarding access to the fishery for vessels otherwise prevented from harvesting, because of weather or other ocean conditions affecting the safety of the vessels. A description of vessel safety considerations, as required by the Magnuson-Stevens Act, appear in Appendix 11.6.

6.5.2 Domestic--Commercial

All measures, unless otherwise specified, apply to all domestic vessels regardless of whether catch is landed and processed on shore or processed at sea.

6.5.2.1 Permits (General)

All U.S. commercial fishing vessels are required by state laws to be in possession of a current fishing or landing permit from the appropriate state agency in order to land groundfish in the Washington, Oregon, and California area. Federal limited entry permits authorize fishing within limits and restrictions specified for those permits. Nonpermitted vessels are also subject to specified limits and restrictions. Federal permits may also be required for groundfish processors. In the event that a federal fishing or access permit is required, failure to obtain and possess such a federal permit will be in violation of this FMP.

6.5.2.2 Catch Restrictions

The FMP authorizes the commercial and recreational harvest of species listed in Chapter 3 of this plan, and provides for limiting the harvest of these species in Chapters 5 and 6. The specific catch restrictions on groundfish currently in effect when Amendment 4 was implemented, including limits on groundfish caught in nongroundfish fisheries, are referenced in Chapter 12. However, some of these catch restrictions have subsequently been modified under the framework provisions.

Prohibited Species. It is unlawful under this FMP for any person to retain any species of salmonid or Pacific halibut caught by means of trawl fishing gear, except where a Council approved monitoring program is in effect. State regulations prohibit the landing of crab incidentally caught in trawl gear off Washington and Oregon. However, trawl fishermen may land Dungeness crab in the State of California in compliance with the state landing law. Retention of salmonids and Pacific halibut caught by means of other groundfish fishing gear is also prohibited unless authorized by 50 CFR Parts 301, 371, or 661. Specifically, salmonids are prohibited species for longline and pot gear. Halibut may be retained and landed by troll and longline gear only during times and under conditions set by International Pacific Halibut Commission and/or other federal regulations. Salmon taken by troll gear may be retained and landed only as specified in troll salmon regulations. Species identified as prohibited must be returned to the sea as soon as practicable with a minimum of injury when caught and brought aboard, after allowing for sampling by an observer, if any. Exceptions may be made for the recovery of tagged fish.

Groundfish species or species groups under this FMP for which the quota has been reached shall be treated in the same manner as prohibited species.

The FMP authorizes the designation of other prohibited species in the future or the removal of a species from this classification, consistent with other applicable law for that species.

6.5.2.3 Gear Restrictions

This plan authorizes the use of trawls, pots (traps), longlines, hook-and-line, and setnets (gillnets and trammel nets) as legal gear for the commercial harvest of groundfish. The use of setnets is prohibited in all areas north of 38° N latitude.

Implementation and modification of specific management measures regarding gear, such as definitions of legal gear, mesh size restrictions, codend size (length, diameter, or volume), chafing gear, gear marking, escape panels and ports, and the length of time gear may be left unattended, are authorized by this FMP. Gear restrictions may be established, modified, or removed under the points of concern or socioeconomic frameworks described in Chapter 6. Any changes in gear regulations should be scheduled so as to minimize costs to the fishing industry, insofar as this is consistent with achieving the goals of the change.

The original FMP and implementing regulations, as amended, specified minimum mesh size and other gear restrictions, which are listed in Chapter 12. Several provisions have subsequently been modified under the procedures outlined in this FMP.

6.5.2.4 Reporting Requirements

This FMP authorizes domestic vessel permit applications and reporting requirements.

Surveys to Determine Domestic Allocation Harvest. Surveys of the domestic industry will be conducted biannually by NMFS, at the appropriate time determined by NMFS, to determine amounts of fish not needed by the domestic processing industry, which then may be made available to joint venture or foreign fishing, as described in Sections 5.8 and 5.9.3.

Permit Applications. Permit applications for the domestic groundfish fishery, including, but not limited to exempted fishing permits, are authorized by this FMP. Such applications may include vessel name, length, type, documentation number or state registration number, radio call sign, home port, and capacity; owner or operator's name, mailing address, telephone number, and relationship of the applicant to the owner; type of fishing gear to be used, if any; signature of the applicant, and any other information found necessary for identification and registration of the vessel.

Other Reporting and Recordkeeping Requirements. Catch, effort, biological, and other data necessary for implementation of this FMP will continue to be collected by the States of Washington, Oregon, and California under existing state data collection provisions. Federal reporting requirements will be implemented only when the data collection and reporting systems operated by state agencies fail to provide the Secretary with statistical information for adequate management.

Several major instances where state reporting requirements may be insufficient have been identified. The first is where a vessel harvests fish within the Washington, Oregon, and California management area, but lands outside the management area. The second case occurs when a vessel (usually a processor) remains at sea for a long period of time before offloading its catch shore side. In the first case, reporting of the harvest may never occur, which could affect stock assessments dependent on accurate catch information. In the second case, reporting frequently is delayed several weeks or even months. Delayed reporting could seriously hamper inseason management of quota and harvest guideline species. Another relates to fish that are captured and discarded at sea; most state programs do not require vessels to report bycatch or other discards.

To address these inadequacies, the FMP authorizes implementation of federal reporting requirements in addition to those of the various states. (Such requirements will be announced in the *Federal Register*.) The

owner or operator of any vessel that retains fish harvested in the area managed by this FMP whose port of landing is outside the management area may be required to report those catches in a timely manner. They also may be required to submit a completed fish landing ticket from either Washington, Oregon, or California, or an equivalent document containing all of the information required by the state on that fishticket.

In addition, these vessels, or vessels that remain at sea for long periods of time (in particular, those that process their catch or the catch of another vessel at sea) may be required to report within a specified time period.

1. Vessel name.
2. Radio call sign.
3. Documentation number or federal permit number.
4. Company representative and telephone, fax, and/or telex number.
5. Vessel location including daily positions.
6. Check-in and check-out reports giving the time, date, location of the beginning or ending of any fishing activity.
7. Gear type.
8. Reporting area and period.
9. Duration of operation.
10. Estimated catch by species and area, species disposition (including discards, product type, and weights).
11. Product recovery ratios, products sold (in weight and value by species and product type, and if applicable, size or grade).
12. Any other information deemed necessary for management of the fishery.

These vessels also may be required to maintain and submit logbooks, accurately recording the following information in addition to the information listed above, and for a specified time period. Daily and cumulative catch by species, effort, processing, and transfer information; crew size; time, position, duration, sea depth, and catch by species of each haul or set; gear information; identification of catcher vessel, if applicable; information on other parties receiving fish or fish products; and any other information deemed necessary.

These vessels may be required to inform a NMFS enforcement or U.S. Coast Guard office prior to landing or offloading any seafood product. Such vessels may also be required to report prior to departing the Washington, Oregon, and California management area with fish or fish products on board.

The Council intends that any special reporting requirements will be imposed only if it could be expected to enhance the NMFS's ability to monitor the catch more accurately. It is also understood that any additional collection of information must be consistent with the requirements of the Paperwork Reduction Act (PRA).

6.5.2.5 Vessel Identification

The FMP authorizes vessel identification requirements which may be modified as necessary to facilitate enforcement and vessel recognition.

6.5.3 Domestic - Recreational

6.5.3.1 Permits (General)

All U.S. recreational fishermen are required by state laws to obtain a recreational permit or license in order to fish. In the event that a federal license or permit is required, failure to obtain and possess such federal permit will be in violation of this FMP.

6.5.3.2 Catch Restrictions

This FMP authorizes establishment of catch restrictions on the recreational fishery which are consistent with the goals and objectives of the FMP and the national standards established by the Magnuson-Stevens Act. Any such catch restrictions will be established in accordance with the appropriate procedures in Sections 6.2.1, 6.2.2, or 6.2.3.

6.5.3.3 Gear Restrictions

Legal recreational gear are hook-and-line and spear.

6.5.4 Joint Venture--Domestic Vessels

U.S. vessels operating in joint ventures are domestic vessels and traditionally have been treated the same as U.S. vessels delivering shoreside. However, conditions in the fishery could warrant separate treatment in the future.

Although all U.S. vessels have been subject to the same regulations, joint venture catcher operations may be affected indirectly by restrictions (such as closed areas) placed on the foreign processing vessels that receive U.S. catch at sea.

6.5.5 Joint Venture--Foreign Vessels

These measures apply to joint venture operations in which foreign processing vessels receive U.S.-caught fish at sea.

Management of the joint venture is the same as under the original FMP with the following exceptions (1) in Section 6.3.5.5, the authority to establish, modify, or remove a season for the whiting joint venture is added; (2) in Section 6.3.5.5, the amendment provides the authority for area closures in the whiting joint venture, which may subsequently be modified or removed; (3) Section 6.3.5.5 also clarifies that the 39° N latitude southern boundary applies to joint ventures for species other than Pacific whiting, unless modified, consistent with the procedures in Sections 6.2.2 and 6.2.3; (4) in Section 6.3.5.3, the amendment provides authority for changing the way incidental retention limits are applied, which currently is to 5,000 mt increments of target species received; and (5) in Section 6.3.5.8, provisions for closing the joint venture fishery are changed to reflect the use of harvest guidelines and quotas.

6.5.5.1 Permits

All foreign vessels operating in this management area shall have on board a permit issued by the Secretary pursuant to the Magnuson-Stevens Act.

6.5.5.2 Target Species

A foreign nation may conduct joint venture operations only for species for which there is a joint venture processing (JVP) and which that nation is authorized to receive by its vessel permit.

6.5.5.3 Incidental Catch

Incidental catch refers to groundfish species which are unavoidably caught while fishing for the authorized target species. It is recognized that catches of species that are fully utilized by the domestic processing industry will occur and are unavoidable in joint venture fisheries for Pacific whiting. The Council has adopted the policy originally established by the trawl preliminary FMP to allow minimal incidental allowances which are consistent with the status of the stocks and the efficiency of the joint venture fisheries. These incidental allowances are not to be considered as surpluses to domestic processing needs (i.e., JVPs) and are allowed to provide for full utilization of the authorized target species.

Unless otherwise specified, incidental allowances for bycatch in the joint venture fishery are percentages that determine the amount that may be retained in the joint venture. Incidental allowances may be established or changed at any time during the year, but are published at least annually, concurrent with the annual specifications of JVP.

The Council may choose to use factors other than percentages in specifying incidental allowances or may change the way incidental allowances are applied (for example, to 5,000 mt increments of Pacific whiting received in the joint venture, or based on specified retention amounts).

The NMFS Regional Administrator may establish or modify incidental species allowances to reflect changes in the condition of the resource and performance of the U.S. industry. The Regional Administrator will consult with the Council, consider public testimony received, and consider the following factors before establishing or changing incidental allowances (1) observed rates in the previous joint venture; (2) current estimates of relative abundance and availability of species caught incidentally; (3) ability of the foreign vessels to take the JVP; (4) past and projected foreign and U.S. fishing effort; (5) status of stocks; (6) impacts on the domestic industry; and (7) other relevant information. Changes will be made following the same procedures as for annual or inseason changes to the specifications in Chapter 5.

The incidental retention percentages that applied to the joint venture for Pacific whiting in 1990 appear in Chapter 12.

6.5.5.4 Prohibited Species

Prohibited species means salmonids, Pacific halibut, Dungeness crab, and any species of fish which that vessel is not specifically authorized to retain, including fish received in excess of any authorization, landing limit, or quota. These species must be immediately returned to the sea with a minimum of injury after allowing for sampling by an observer, if any. This FMP authorizes the designation of other prohibited species in the future, or the removal of a species from this classification if consistent with the applicable law for that species.

6.5.5.5 Season and Area Restrictions

Season. There is no season restriction, unless otherwise specified according to this FMP.

Area. The joint venture fishery for Pacific whiting may not be conducted south of 39° N latitude. Unless otherwise specified, joint venture fisheries for other species are prohibited south of 39° N latitude as well.

Season and area restrictions for foreign vessels operating in a joint venture (including additional area restrictions for the Pacific whiting joint venture) may be established, modified, or removed at any time during the year in accordance with the procedures in Sections 6.2.2 and 6.2.3 or by foreign vessel permit conditions.

Season and area restrictions on the joint venture fishery for Pacific whiting, effective in 1990 appear in Chapter 12.

6.5.5.6 Reporting and Recordkeeping Requirements

Foreign nations receiving U.S. harvested fish in a joint venture are required to submit detailed reports of fishing effort, location, amount, and disposition of species received by species or species group, and transfer of fish or fish products, as needed for monitoring and management of the fishery. Unless otherwise specified, reports of the receipt of U.S. harvested fish must be submitted weekly. The NMFS Regional Administrator may require daily reports when 90% of the JVP or of an incidental allowance is reached. In addition, each country must report the arrival, departure, and positions of each of its vessels, as specified under the regulations and permit conditions, as needed for monitoring deployment of the fleet.

Logbooks are required under 50 CFR Part 611 to fulfill the fishery conservation, management, and enforcement purposes of the Magnuson-Stevens Act. These logs include a communications log, transfer log, and daily joint venture log which record haul by haul and daily receipt, effort, and production information.

6.5.5.7 Dumping

Foreign vessels are prohibited from dumping pollutants and fishing gear which would degrade the environment or interfere with domestic fishing operations.

6.5.5.8 Fishery Closure

The joint venture fishery shall cease each year when (1) the JVP quota for the target species has been received; (2) the overall quota or harvest guideline for the target species is reached; (3) the applicable open

season has ended, if any; or (4) as necessary for resource conservation reasons under the points of concern mechanism.

6.5.5.9 Observers

Observers shall be placed on each foreign processing vessel while it is operating in the joint venture, as provided by Title II of the Magnuson-Stevens Act. The law provides for the following exceptions to this requirement:

1. If an observer is aboard the mothership(s) of a mothership/catcher vessel fleet.
2. If the vessel is in the EEZ for such a short time than at observer would be impractical.
3. If facilities for quartering an observer are inadequate or unsafe.
4. For reasons beyond the control of the Secretary an observer is not available.

6.5.5.10 Other Restrictions

The Secretary may impose additional requirements for the conservation and management of fishery resources covered by the vessel permit or for national defense or security reasons. These restrictions include, but are not limited to, season, area, and reporting requirements.

The highest priority of this FMP is to provide for conservation of the resource. Any restriction on the joint venture fishery may be modified under the points of concern mechanism for resource conservation reasons.

6.5.6 Foreign--Commercial

These measures apply to foreign vessels that operate in a fishery directed on an allocated species for which there is a total allowable level of foreign fishing (TALFF). This is a foreign operation in which foreign vessels both catch and process the fish and often is called the "directed foreign fishery" or the "foreign trawl fishery".

Management of the directed foreign fishery is the same as under the original FMP with the following exceptions, (1) Section 6.5.6.5 provides authority for modifying the June 1 through October 31 season for the foreign fishery for Pacific whiting, consistent with the FMP's implementing regulations; (2) Section 6.5.6.5 provides for additional area restrictions in the foreign fishery for Pacific whiting, which subsequently may be modified or removed; (3) Section 6.5.6.5 clarifies that seasons and areas for nonwhiting foreign fisheries are the same as for the Pacific whiting fishery, unless modified, consistent with the FMP's implementing regulations; and, (4) In Section 6.5.6.8, fishery closure provisions have been changed to reflect the use of harvest guidelines and quotas.

6.5.6.1 Permits

All foreign vessels operating in this management area shall have on board a permit issued by the Secretary pursuant to the Magnuson-Stevens Act.

6.5.6.2 Target Species

Target fishing is allowed only for species for which the foreign nation has received an allocation of TALFF.

6.5.6.3 Incidental Catch

Incidental catch refers to groundfish species which are unavoidably caught while fishing for the allocated target species. It is recognized that catches of species that are fully utilized by the domestic fishing industry will occur and are unavoidable in foreign fisheries for Pacific whiting. The Council has adopted the policy originally established by the trawl preliminary management plan to allow minimal incidental allowances which are consistent with the status of the stocks and the efficiency of the foreign fishery. These incidental allowances are not to be considered as surpluses to domestic fishermen's needs (i.e., TALFFs) and are allowed to provide for full utilization of the allocated target species.

Unless otherwise specified, incidental allowances for bycatch in the foreign fishery are percentages that determine the amount that may be caught in the foreign fishery. Incidental allowances may be established or changed at any time during the year, but are published at least annually, concurrent with the annual specifications of TALFF.

The Council may choose to use factors other than percentages in specifying incidental allowances or may change the way incidental allowances are applied (for example, based on specified catch amounts).

The NMFS Regional Administrator may establish or modify incidental species allowances to reflect changes in the condition of the resource and performance of the U.S. industry. The NMFS Regional Administrator will consult with the Council, consider public testimony received, and consider the following factors before establishing or changing incidental allowances (1) observed rates in the previous foreign directed fishery; (2) current estimates of relative abundance and availability of species caught incidentally; (3) ability of the foreign vessels to take the TALFF; (4) past and projected foreign and U.S. fishing effort; (5) status of stocks; (6) impacts on the domestic industry; and (7) other relevant information. Changes will be made following the same procedures as for annual or inseason changes to the specifications in Chapter 5.

Incidental catch percentages that would have applied to foreign fishing for Pacific whiting in 1990 appear in Chapter 12.

6.5.6.4 Prohibited Species

Prohibited species means salmonids, Pacific halibut, Dungeness crab, and any species of fish which that vessel is not specifically permitted to retain, including fish received in excess of any allocation. These species must be immediately returned to the sea with a minimum of injury after allowing for sampling by an observer, if any. This FMP authorizes the designation of other prohibited species, or the removal of species from this classification if consistent with the applicable law for that species.

6.5.6.5 Season, Area, and Gear Restrictions

Season. The season for the foreign fishery (any species) is June 1 to October 31, unless otherwise specified under the framework procedures of this FMP.

Area. The directed fishery for Pacific whiting may not be conducted in the following areas:

- south of 39° N latitude;
- north of 47°30' N latitude;
- shoreward of 12 nautical miles from shore;
- in the Columbia River Recreational Fishery Sanctuary (described in Chapter 12); or,
- in the Klamath River Sanctuary (described in Chapter 12).

Unless otherwise specified, the area restrictions listed above for the Pacific whiting fishery also apply to foreign fisheries for other species. (The sanctuaries may be removed, renamed, or coordinates refined, as needed.)

Gear. Unless otherwise specified, gear used in the directed foreign fishery (for any species) is an off-bottom (pelagic) trawl with minimum mesh size of 100 mm (3.92 inches) between opposing knots. Chafing gear may be used with this net if: the mesh size of the chafing gear is at least two times the mesh of the inner codend; it is aligned knot-to-knot to the inner net and tied to the straps and riblines; and, it is not connected directly to the terminal end of the codend. Fishing on-bottom or use of liners or any other method which would have the effect of reducing the mesh size in the codend are not allowed.

Season, area, and gear restrictions for a directed foreign fishery (including additional area restrictions on the Pacific whiting fishery) may be established, modified, or removed at any time in accordance with the procedures in Sections 6.2.2 and 6.2.3 or by vessel permit condition.

Season, area, and gear restrictions that would have applied to foreign fishing in 1990 appear in Chapter 12 (no foreign fishery has occurred since 1989).

6.5.6.6 Reporting and Recordkeeping Requirements

Foreign nations operating in the directed fishery are required to submit detailed reports of fishing effort, location, amount and disposition of catch by species or species group, and transfer of fish or fish products, as needed for monitoring and management of the fishery. Unless otherwise specified, catch reports must be submitted weekly. The NMFS Regional Administrator may require daily reports when 90% of a nation's fishing allocation or incidental allowance for any species or species group is reached. In addition, each country must report the arrival, departure and positions of each of its vessels, as specified under the regulations and permit conditions, as necessary for monitoring deployment of the fleet.

Logbooks are required to fulfill the fishery conservation, management, and enforcement purposes of the Magnuson-Stevens Act. These logs may include a communications log, transfer log, and daily catch log which record haul by haul and daily catch, effort, and production information.

6.5.6.7 Dumping

Foreign vessels are prohibited from dumping pollutants and fishing gear which would degrade the environment or interfere with domestic fishing operations.

6.5.6.8 Fishery Closure

The directed foreign fishery shall cease each year when (1) that nation's allocation of TALFF is reached, (2) the maximum incidental catch allowance for that nation of any species or species group is reached, (3) the overall quota or harvest guideline for the allocated species is reached, (4) the applicable open season is ended, or (5) as necessary for resource conservation reasons under the points of concern mechanism.

6.5.6.9 Observers

The requirement to carry observers on foreign catcher vessels is the same as for joint venture processing vessels (Section 6.5.5.9).

6.5.6.10 Other Restrictions

The imposition of additional requirements for the conservation and management of fishery resources covered by the vessel permit, or for national defense or security reasons, is the same as for the joint venture fishery (Section 6.5.5.10).

The highest priority of this FMP is to provide for conservation of the resource. Any restriction on the foreign fishery may be modified under the points of concern mechanism for resource conservation reasons.

6.5.7 Foreign--Recreational

Foreign recreational fishing refers to any fishing from a foreign vessel not operated for profit or scientific research, and may not involve the sale, barter, or trade of any part of the catch. This FMP authorizes establishment of catch restrictions on the foreign recreational fishery which are consistent with the goals and objectives of the FMP and the national standards established by the Magnuson-Stevens Act.

6.5.8 Access Limitation **and Capacity Reduction Programs**

The current condition of the groundfish fisheries of the Washington, Oregon, and California region is such that further reduction of the limited entry fleet may be required in the near future. Research and monitoring programs may need to be developed and implemented for the fishery so that information required in a capacity reduction program is available. Such data should indicate the character and level of participation in the fishery, including (1) investment in vessel and gear; (2) the number and type of units of gear; (3) the

distribution of catch; (4) the value of catch; (5) the economic returns to the participants; (6) mobility between fisheries; and (7) various social and community considerations.

6.6 Essential Fish Habitat

The Magnuson-Stevens Act (revised in Public Law 104-267) and the Sustainable Fisheries Act (SFA) requires Councils to include descriptions of Essential Fish Habitat (EFH) in all federal fishery management plans (FMPS), and also potential threats to EFH. In addition, the Magnuson-Stevens Act requires Federal agencies to consult with NMFS on activities that may adversely affect EFH. Section 11.10 of this FMP includes a description of EFH for the 83 groundfish species included in this plan, fishing effects on EFH, nonfishing effects on EFH, and options to avoid or minimize adverse effects on EFH or promote conservation and enhancement of EFH.

6.6.1 Magnuson-Stevens Act Directives Relating to Essential Fish Habitat

The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." To clarify this definition, the following interpretations are made: "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means "the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem;" and "spawning, breeding, feeding, or growth to maturity" covers the full life cycle of a species. The definition of EFH may include habitat for an individual species or an assemblage of species, whichever is appropriate to the FMP.

The Magnuson-Stevens Act requires Councils to identify in FMPs any fishing activities that may adversely affect EFH. The Magnuson-Stevens Act also requires that, where fishing-related adverse impacts to EFH are identified, FMPs must include management measures that minimize those adverse effects from fishing, to the extent practicable.

The FMP also identifies potential nonfishing threats to EFH. Upon implementation of the FMP amendment, federal agencies will be required to consult with NMFS on all activities, and proposed activities, authorized, funded, or undertaken by the agency that may adversely affect EFH. NMFS must provide recommendations to conserve EFH to federal agencies on such activities. NMFS must also provide recommendations to conserve EFH to state agencies if it receives information on their actions. The Council may provide EFH recommendations on actions that may affect habitat, including EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from actions or proposed actions authorized, funded, or undertaken by that agency. The Council will encourage federal agencies conducting or authorizing work that may adversely affect groundfish EFH to minimize disturbance to EFH.

6.6.2 Definition of Essential Fish Habitat for Groundfish

The Pacific Coast Groundfish FMP manages 83 species over a large and ecologically diverse area. Research on the life histories and habitats of these species varies in completeness, so while some species are well-studied, there is relatively little information on certain other species. Information about the habitats and life histories of the species managed by the FMP will certainly change over time, with varying degrees of information improvement for each species. For these reasons, it is impractical for the Council to include EFH definitions for each of the managed species in the body of the FMP. Therefore, the FMP includes a description of a limited number of composite EFHs for all Pacific coast groundfish species. Life histories and EFH designations for each of the individual species are provided in a separate EFH document which will be revised and updated to include new information as it becomes available. Such changes will not require FMP amendment. This framework approach is similar to the Council's stock assessment process, which annually uses the SAFE

document to update information about groundfish stock status without amending the FMP. Like the SAFE document, any EFH updates will be reviewed in a Council public forum.

There are substantial gaps in the knowledge of many Pacific coast groundfish species. This FMP identifies many of those data gaps and makes suggestions regarding future research efforts. The FMP also identifies where research is needed on fishing and nonfishing impacts on groundfish EFH. Protecting, conserving, and enhancing EFH are long-term goals of the Council, and these EFH provisions of the FMP are an important element in the Council's commitment to a better understanding of Pacific coast groundfish populations and their habitat needs.

6.6.2.1 Composite Essential Fish Habitat Identification

The 83 groundfish species managed by this FMP occur throughout the EEZ and occupy diverse habitats at all stages in their life histories. Some species are widely dispersed during certain life stages, particularly those with pelagic eggs and larvae; the EFH for these species/stages is correspondingly large. On the other hand, the EFH of some species/stages may be comparatively small, such as that of adults of many nearshore rockfishes which show strong affinities to a particular location or type of substrate. As a consequence of the large number of species and their diverse habitat associations, the entire EEZ becomes EFH when all the individual EFHs are taken together.

EFH for Pacific coast groundfish is defined as the aquatic habitat necessary to allow for groundfish production to support long-term sustainable fisheries for groundfish and for groundfish contributions to a healthy ecosystem. Descriptions of groundfish fishery EFH for each of the 83 species and their life stages result in over 400 EFH identifications. When these EFHs are taken together, the groundfish fishery EFH includes 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 seaward to the boundary of the U.S. EEZ.

This 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" EFH identifications are as follows.

1. Estuarine - Those waters, substrates and associated biological communities within bays and estuaries of the EEZ, from 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 33 CFR 80.1 (Coast Guard lines of demarcation).

2. Rocky Shelf - Those waters, substrates, and associated biological communities living on or within ten 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 (~200 meters or 109 fathoms).

3. Nonrocky Shelf - Those waters, substrates, and associated biological communities living on or within ten 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 (~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 biological communities living on or within 20 meters (11 fathoms) overlying the substrates of the continental slope and basin below the shelf break (~200 meters or 109 fathoms) and extending to the westward boundary of the EEZ.

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

7. Oceanic Zone - Those waters and 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.

These composites are shown graphically in the following figures. There is inadequate Information to produce a map of the rocky shelf composite, so the rocky and nonrocky shelf composites are combined in these figures.

6.6.3 Management Measures To Minimize Adverse Impacts on Essential Fish Habitat from Fishing

The Council may use any of the following management measures to minimize adverse effects on EFH from fishing, if there is evidence that a fishing activity is having an identifiable adverse effect on EFH. Such management measures shall be implemented under the Points of Concern Framework, Section 6.2.2.

- Fishing gear restrictions
- Time/area closures
- Harvest limits
- Other

In determining whether it is practicable to minimize an adverse effect from fishing, the Council will consider whether, and to what extent, the fishing activity is adversely impacting EFH, the nature and extent of the adverse effect on EFH, and whether management measures are practicable. The Council will consider the long and short term costs and benefits to the fishery and EFH, along with other appropriate factors, consistent with national standard 7.

6.6.4 Review and Revision of Essential Fish Habitat Definitions and Descriptions

The Council will periodically review the available information on EFH descriptions, fishing impacts and nonfishing impacts, and include new information in the annual SAFE document or similar document. A review and update of available information will be conducted at least once every five years as appropriate, but the Council may schedule more frequent reviews in response to recommendation by the Secretary or for other reasons.

11.10 ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (revised in Public Law 104-267, The Sustainable Fisheries Act [SFA]) requires Councils to include descriptions of Essential Fish Habitat (EFH) in all federal fishery management plans (FMPs), and also potential threats to EFH. In addition, the Magnuson-Stevens Act requires Federal agencies to consult with the National Marine Fisheries Service (NMFS) on activities that may adversely affect EFH. A source document has been prepared that provides a detailed description of each of the 83 groundfish species included in this plan, including information about each life history stage. The following sections describe EFH for each groundfish species, fishing effects on EFH, nonfishing effects on EFH, and options to avoid or minimize adverse effects on EFH or promote conservation and enhancement of EFH.

11.10.1 Magnuson-Stevens Act Directives Relating to EFH

The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." To clarify this definition, the following interpretations are made: "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means "the habitat required to support a sustainable fishery and the managed species" contribution to a healthy ecosystem;" and "spawning, breeding, feeding, or growth to maturity" covers the full life cycle of a species. The definition of EFH may include habitat for an individual species or an assemblage of species, whichever is appropriate to the FMP.

The Magnuson-Stevens Act requires Councils to identify in FMPs any fishing activities that may adversely affect EFH. The Magnuson-Stevens Act also requires that, where fishing-related adverse impacts to EFH are identified, FMPs must include management measures that minimize those adverse effects from fishing, to the extent practicable.

The FMP also identifies potential non-fishing threats to EFH. Upon implementation of the FMP amendment, federal agencies will be required to consult with NMFS on all activities, and proposed activities, authorized, funded, or undertaken by the agency that may adversely affect EFH. NMFS must provide recommendations to conserve EFH to federal agencies on such activities. NMFS must also provide recommendations to conserve EFH to state agencies if it receives information on their actions. The Council may provide EFH recommendations on actions that may affect habitat, including EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from actions or proposed actions authorized, funded, or undertaken by that agency. The Council will encourage federal agencies conducting or authorizing work that may adversely affect groundfish EFH to minimize disturbance to EFH.

11.10.2 Definition of EFH for Groundfish, and Composite EFH Identification

The Pacific coast Groundfish FMP manages 83 species over a large and ecologically diverse area. Research on the life histories and habitats of these species varies in completeness, so while some species are well-studied, there is relatively little information on certain other species. Information about the habitats and life histories of the species managed by the FMP will certainly change over time, with varying degrees of information improvement for each species. For these reasons, it is impractical for the Council to include EFH definitions for each of the managed species in the body of the FMP. Therefore, the FMP includes a description of a limited number of composite EFHs for all Pacific coast groundfish species. Life histories and EFH designations for each of the individual species are provided as an appendix which will be revised and updated to include new information as it becomes available. Such changes will not require FMP amendment. This framework approach is similar to the Council's stock assessment process, which annually uses the Stock Assessment and Fishery Evaluation (SAFE) document to update information about groundfish stock status without amending the FMP. Like the SAFE document, any EFH updates will be reviewed in a Council public forum.

There are substantial gaps in the knowledge of many Pacific coast groundfish species. This FMP identifies many of those data gaps and makes suggestions regarding future research efforts. The FMP also identifies where research is needed on fishing and non-fishing impacts on groundfish EFH. Protecting, conserving, and enhancing EFH are long-term goals of the Council, and these EFH provisions of the FMP are an important element in the Council's commitment to a better understanding of Pacific coast groundfish populations and their habitat needs.

The 83 groundfish species managed by this FMP occur throughout the exclusive economic zone (EEZ) and occupy diverse habitats at all stages in their life histories. Some species are widely dispersed during certain life stages, particularly those with pelagic eggs and larvae; the EFH for these species/stages is correspondingly large. On the other hand, the EFH of some species/stages may be comparatively small, such as that of adults of many nearshore rockfishes which show strong affinities to a particular location or type of substrate. As a consequence of the large number of species and their diverse habitat associations, the entire EEZ becomes EFH when all the individual EFHs are taken together.

EFH for Pacific coast groundfish is defined as the aquatic habitat necessary to allow for groundfish production to support long-term sustainable fisheries for groundfish and for groundfish contributions to a healthy ecosystem. Descriptions of groundfish fishery EFH for each of the 83 species and their life stages result in over 400 EFH identifications. When these EFHs are taken together, the groundfish fishery EFH includes 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 seaward to the boundary of the U.S. EEZ.

This 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" EFH identifications are as follows.

1. **Estuarine** - Those waters, substrates and associated biological communities within bays and estuaries of the coasts of Washington, Oregon, and California, seaward from the high tide line (MHHW) or extent of upriver saltwater intrusion. These areas are delineated from the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) and supplemented from NOAA's Coastal Assessment Framework for the water portion of the Estuarine Drainage Areas for two small estuaries (Klamath River and Rogue River), the Columbia River, and San Francisco Bay. NWI defines estuaries as areas with water greater than 0.5 ppt ocean-derived salt.

2. **Rocky Shelf** - Those waters, substrates, and associated biological communities living on or within ten 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 (~200 meters or 109 fathoms).

3. **Non-Rocky Shelf** - Those waters, substrates, and associated biological communities living on or within ten 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 (~200 meters or 109 fathoms).

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

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

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

7. **Oceanic Zone** - Those waters and 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.

These composites are shown graphically in the following figures. There is inadequate Information to produce a map of the rocky shelf composite, so the rocky and nonrocky shelf composites are combined in these figures.

A background resource document has been prepared which identifies and provides extensive descriptions of EFH for each life stage of the 83 species managed by the FMP. This background document provides all the supporting information used for these identifications, including life history descriptions, lists of data sets and references utilized to identify EFH, and a glossary of terms. GIS maps of the distribution of species' life stages in survey and fishery data sets are included as available. For each life stage, tables of known habitat associations, life history traits, reproductive traits and EFH information levels are also provided in the appendix. The four EFH information levels are:

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

The scientific basis for the composite EFHs is rooted in the EFH identifications for individual species' life stages. When Level 1 information is available, EFH for a species' life stage is its general distribution, the geographic area of known habitat associations containing most (e.g., about 95%) of the individuals. If known, areas uncommonly utilized are excluded. Data on West Coast groundfish are not readily available to evaluate the extent of areas most commonly utilized by these species at each life stage. However, for adults of many species, Allen and Smith (1988) report the depth ranges in which about 95% of each species was taken during research surveys in the north Pacific Ocean. When such estimates are available, the EFH is identified as this percentage of its general distribution; otherwise, the general distribution corresponds to the full documented range and habitat associations of the life stage within the EEZ. Rare observations that extend a species range during anomalous environmental conditions are not considered part of its EFH. When no information about the distribution of a species' life stage is available and ancillary information is inadequate to infer its distribution, EFH is not identified for that species' life stage.

When Level 2 information is available, the alternatives of using the general distribution or known concentrations to define EFH for species' life stages may be considered. For adults of a few species, sufficient data are available to evaluate their frequencies of occurrence and densities in all or a portion of their distribution, and areas of known concentrations could be identified. Based on risk-averse and ecosystem approaches and the best scientific information available, EFH is defined as for Level 1 information, (i.e., EFH is the geographic area of known habitat associations [general distribution]), in order to maintain healthy populations and ecosystems and sustain productive fisheries.

Relying on known concentrations alone to designate EFH would not ensure that adequate areas were protected as EFH. Areas of known concentrations based on current information do not adequately address unpredictable annual differences in spatial distributions of a life stage, nor changes due to long-term shifts in oceanographic regimes. There are significant areal (primarily 50 meters to 350 meters on the shelf) and seasonal (chiefly spring and summer) limitations on the survey information upon which descriptions of known concentrations would be primarily based, whereas the general distribution is based on the best available scientific information, as well as fishery and local knowledge of a species' life stage. Also, all habitats occupied by a species contribute to production at some level, and observed concentrations or densities do not necessarily reflect all habitat essential to maintain healthy stocks within the ecosystem. Although contributions from individual locations may be small, collectively they can account for a significant part of total production. A species' long-term productivity is based on both high and low levels of abundance and the

entire distribution may be required during times of high abundance. Finally, there is no discrete or definitive basis for the distinction between known concentrations and general distribution of a species' life stage.

References:

Allen, M.J. and G.B. Smith. 1988. Atlas and zoogeography of common fishes in the Bering Sea and northeastern Pacific. NOAA, NMFS Tech. Rep. 66: 151p.

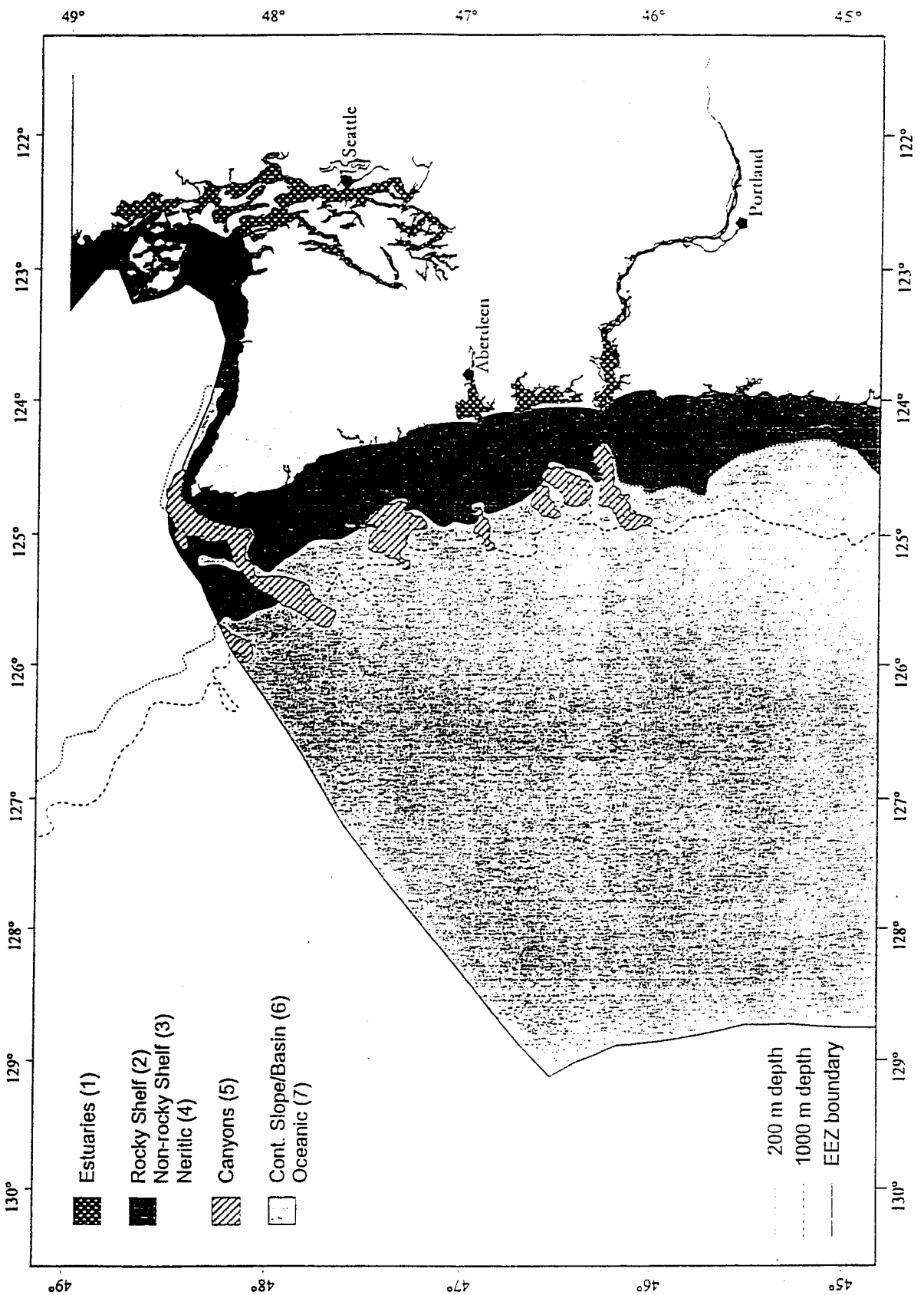

Figure 1. EFH composites.

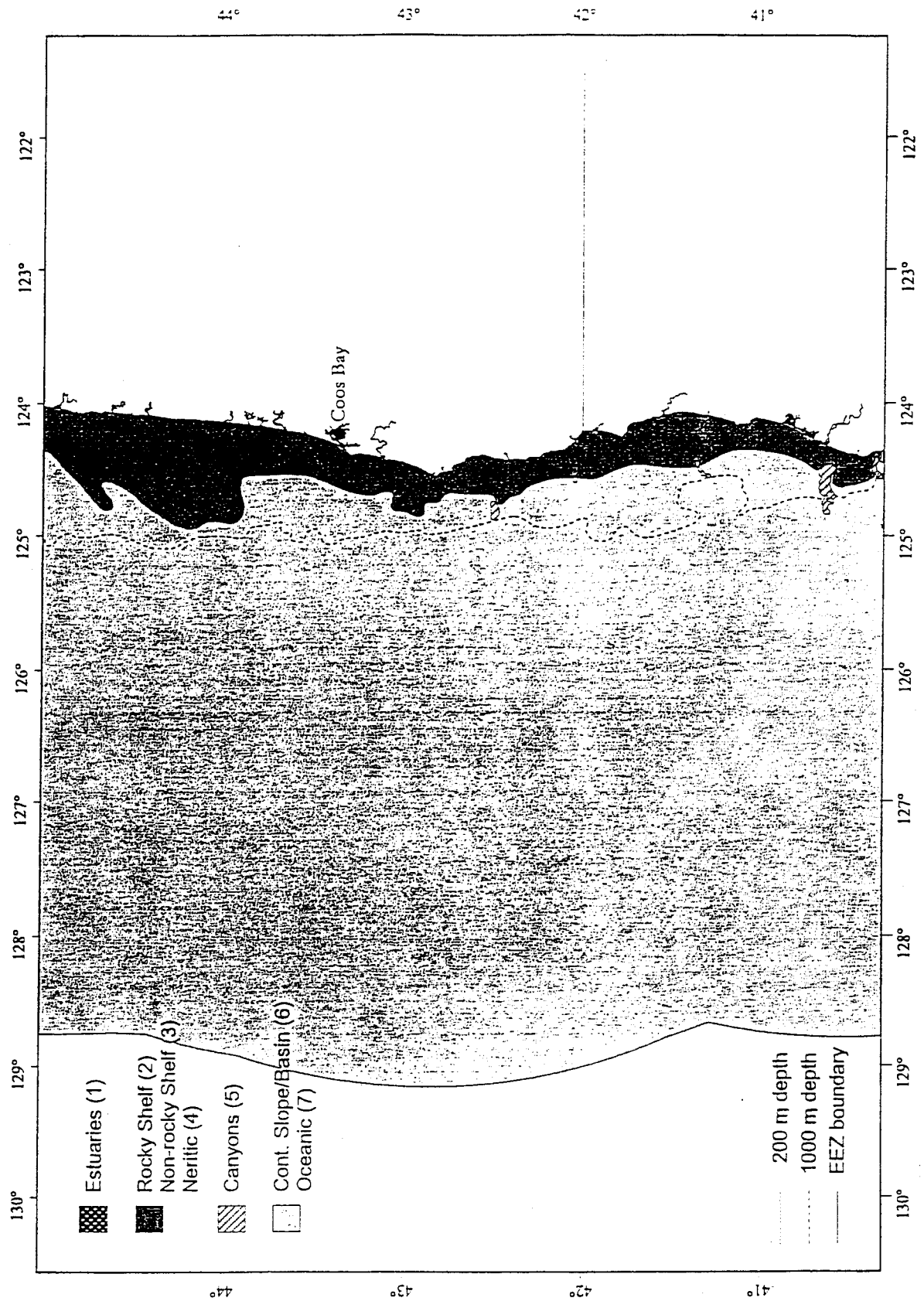

Figure 1. (continued) EFH composites.

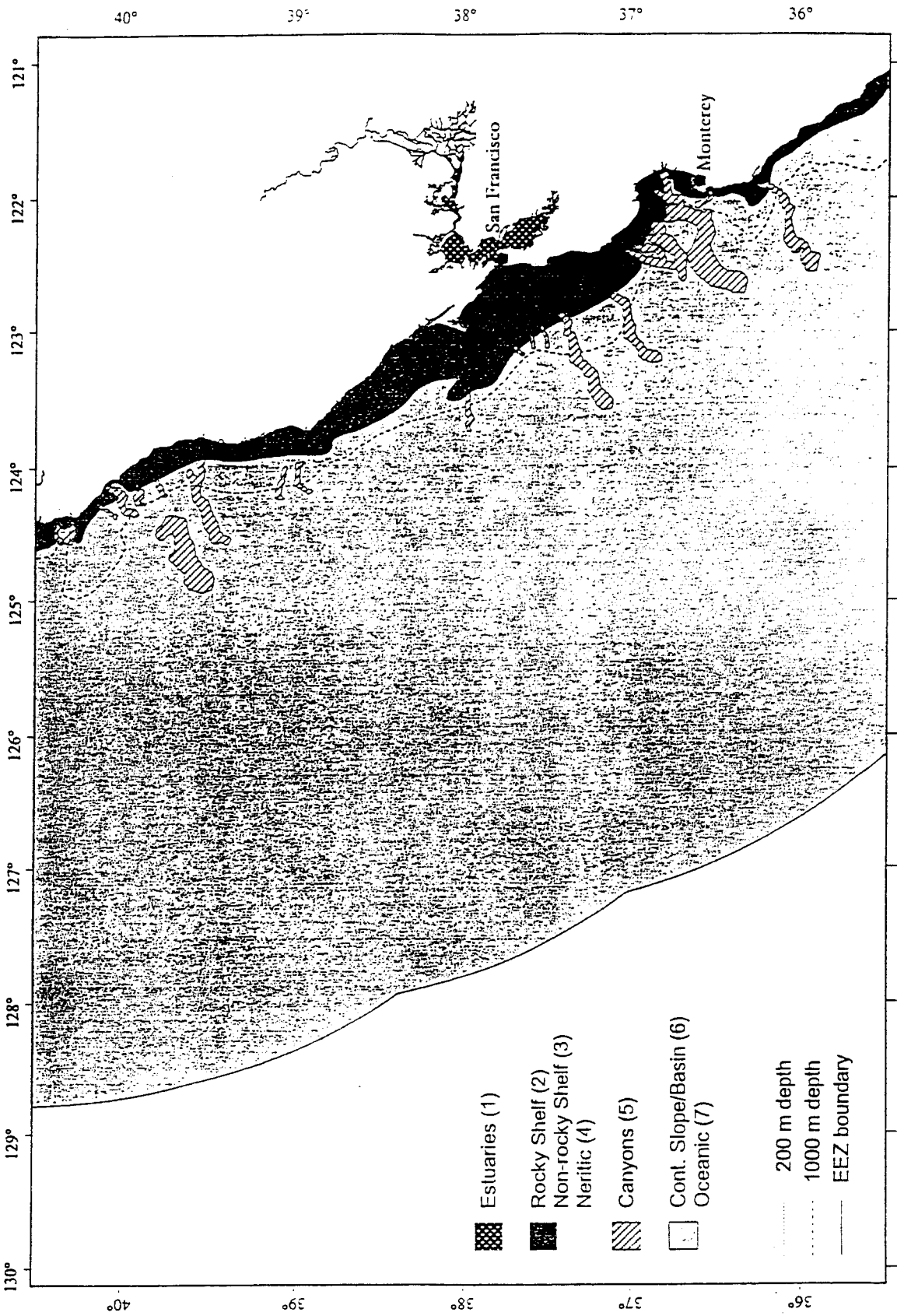

Figure 1. (continued) EFH composites.

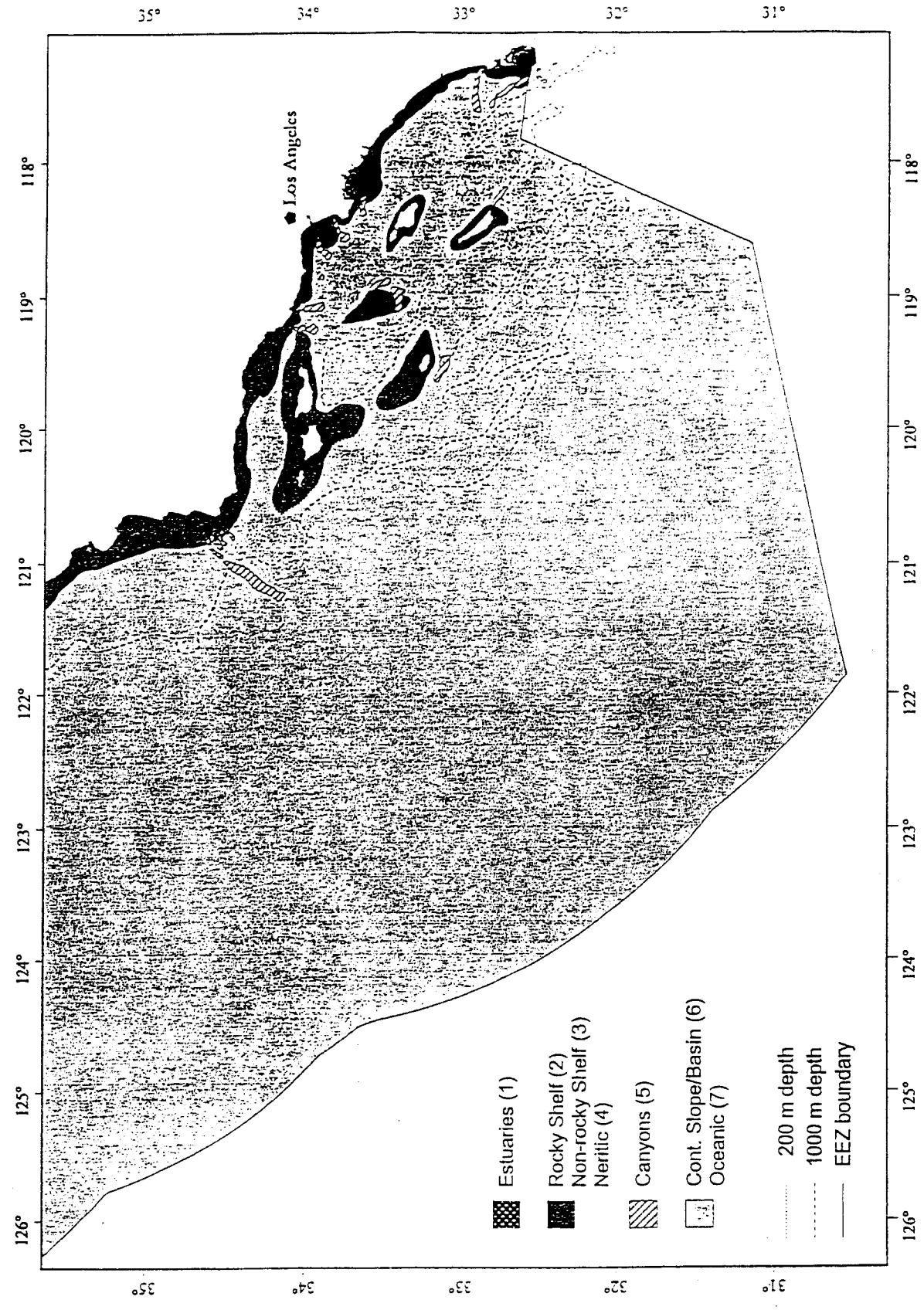

Figure 1. (continued) EFH composites.

Table Legend:

X = The EFH for the particular species and life stage occurs within the EFH composite.

Blank = The EFH for the particular species and life stage is not currently known to occur within the EFH composite or insufficient information is currently available to identify its EFH.

NA = Not applicable. It is used in two ways: when a species does not have a particular life stage in its life history, or when EFH of juveniles is not identified separately for small juvenile and large juvenile stages. For many species, habitats occupied by juveniles differ substantially, depending on the size (or age) of the fish. Frequently, small juveniles are pelagic and large juveniles live on or near the bottom; these life stages are identified separately in the following tables when sufficient information is available to do so. When juvenile habitats do not differ so substantially or when information is insufficient to identify differences, EFH is identified only for the juvenile stage (small and large juveniles combined), and NA (not applicable) is listed in the column for the large juvenile stage in the following tables.

TABLE EFH-1. Species and life stages within the Estuarine Composite EFH.

Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/ Parturition	Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/ Parturition
Leopard Shark	X	X	NA	X	NA	X	Kelp Rockfish				X		
Soupfin Shark	X	X	NA	X	NA	X	Longspine			NA			
Spiny Dogfish	X		X	X	NA	X	Mexican Rockfish			NA			
Big Skate			NA		NA		Olive Rockfish			NA			
California Skate	X	X	NA	X	NA	X	Pacific Ocean Perch						
Longnose Skate			NA		NA		Pink Rockfish			NA			
Ratfish	X	X	NA	X	NA		Quillback Rockfish	X		X	X	X	X
Finescale Codling			NA				Redbanded Rockfish			NA			
Pacific Rattail			NA				Redstripe Rockfish			NA			
Lingcod	X	X	X	X	X	X	Rosethorn Rockfish			NA			
Cabezon	X	X	X	X	X	X	Rosy Rockfish			NA			
Kelp Greenling	X	X	X	X	X	X	Rougheye Rockfish			NA			
Pacific Cod	X	X	NA	X	X	X	Sharpchin Rockfish			NA			
Pacific Whiting (Hake)	X	X	NA	X	X	X	Shortbelly Rockfish						
Sablefish				X			Shortraker Rockfish			NA			
Jack Mackerel	X		NA	X			Shortspine			NA			
Aurora Rockfish							Silverygray Rockfish			NA			
Bank Rockfish							Speckled Rockfish			NA			
Black Rockfish	X			X			Splitnose Rockfish			NA			
Black-and-yellow Rockfish							Squarespot Rockfish			NA			
Blackgill Rockfish							Starry Rockfish			NA			
Blue Rockfish							Stripetail Rockfish			NA			
Bocaccio				X	X		Tiger Rockfish			NA			
Bronzespotted Rockfish			NA				Treefish			NA			
Brown Rockfish	X	X	NA	X		X	Vermilion Rockfish			NA			
Calico Rockfish	X		NA	X			Widow Rockfish						
California Scorpionfish						X	Yelloweye Rockfish			NA			
Canary Rockfish							Yellowmouth			NA			
Chilipepper							Yellowtail Rockfish						
China Rockfish			NA				Arrowtooth Flounder			NA			
Copper Rockfish	X		X	X		X	Butter Sole			NA			
Cowcod			NA				Curlfin Sole			NA			
Darkblotched Rockfish							Dover Sole			NA			
Dusky Rockfish							English Sole	X	X	NA	X	X	X
Flag Rockfish			NA				Flathead Sole			NA			
Gopher Rockfish			NA				Pacific Sanddab			NA	X	X	X
Grass Rockfish			NA				Petrale Sole			NA			
Greenblotched Rockfish			NA				Rex Sole	X		NA			
Greenspotted Rockfish			NA				Rock Sole			NA			
Greenstriped Rockfish			NA				Sand Sole			NA			
Harlequin Rockfish							Starry Flounder	X	X	NA	X	X	X
Honeycomb Rockfish			NA										

TABLE EFH-2. Species and life stages within the Rocky Shelf Composite EFH.

Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/ Parturition	Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/ Parturition
Leopard Shark	X	X	NA	X	NA	X	Kelp Rockfish	X		X			X
Soupfin Shark	X	X	NA	X	NA		Longspine Thornyhead			NA			
Spiny Dogfish	X	X	X		NA		Mexican Rockfish	X		NA			
Big Skate			NA		NA		Olive Rockfish	X		NA	X		X
California Skate			NA		NA		Pacific Ocean Perch	X		X			
Longnose Skate			NA		NA		Pink Rockfish	X		NA			
Ratfish	X	X	NA	X	NA	X	Quillback Rockfish	X		X			X
Finescale Codling			NA				Redbanded Rockfish			NA			
Pacific Rattail			NA				Redstripe Rockfish	X		NA			X
Lingcod	X	X	X			X	Rosethorn Rockfish	X		NA			X
Cabezon	X	X	X			X	Rosy Rockfish	X		NA	X		X
Kelp Greenling	X	X	X			X	Rougheye Rockfish	X		NA			
Pacific Cod			NA				Sharpchin Rockfish	X		NA			X
Pacific Whiting (Hake)			NA				Shortbelly Rockfish	X					X
Sablefish	X						Shortraker Rockfish	X		NA			
Jack Mackerel			NA				Shortspine Thornyhead			NA			
Aurora Rockfish							Silvergray Rockfish	X		NA			
Bank Rockfish	X		NA	X			Speckled Rockfish	X		NA	X		X
Black Rockfish			X				Splitnose Rockfish			NA			
Black-and-yellow Rockfish	X	X	X	X		X	Squarespot Rockfish	X		NA			X
Blackgill Rockfish			X				Starry Rockfish	X		NA			X
Blue Rockfish	X	X	X				Stripetail Rockfish			NA			
Bocaccio	X		X				Tiger Rockfish	X		NA			
Bronzespotted Rockfish			NA				Treefish	X		NA			
Brown Rockfish	X	X	NA	X		X	Vermilion Rockfish	X		NA	X		
Calico Rockfish	X		NA	X			Widow Rockfish	X	X	X			X
California Scorpionfish	X	X	NA	X			Yelloweye Rockfish	X		NA			X
Canary Rockfish	X					X	Yellowmouth Rockfish	X		NA			X
Chilipepper	X		X			X	Yellowtail Rockfish	X	X	X			X
China Rockfish	X		NA	X		X	Arrowtooth Flounder			NA			
Copper Rockfish	X		X				Butter Sole			NA			
Cowcod	X		NA	X			Curlfin Sole			NA			
Darkblotched Rockfish	X	X	X			X	Dover Sole			NA			
Dusky Rockfish							English Sole	X	X	NA	X		
Flag Rockfish	X		NA			X	Flathead Sole			NA			
Gopher Rockfish	X	X	NA	X		X	Pacific Sanddab			NA			
Grass Rockfish	X		NA	X		X	Petrale Sole			NA			
Greenblotched Rockfish	X		NA	X		X	Rex Sole			NA			
Greenspotted Rockfish	X		NA	X		X	Rock Sole	X	X	NA	X		X
Greenstriped Rockfish	X		NA			X	Sand Sole			NA			
Harlequin Rockfish							Starry Flounder			NA			
Honeycomb Rockfish	X		NA	X		X							

TABLE EFH-3. Species and life stages within the Non-Rocky Shelf Composite EFH.

Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/ Parturition	Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/ Parturition
Leopard Shark	X	X	NA	X	NA	X	Kelp Rockfish						
Soupfin Shark	X	X	NA	X	NA	X	Longspine Thornyhead			NA			
Spiny Dogfish	X		X		NA	X	Mexican Rockfish	X		NA			
Big Skate	X	X	NA	X	NA	X	Olive Rockfish			NA			
California Skate	X	X	NA	X	NA	X	Pacific Ocean Perch	X		X			
Longnose Skate	X	X	NA	X	NA	X	Pink Rockfish	X		NA			
Ratfish	X	X	NA	X	NA	X	Quillback Rockfish						
Finescale Codling			NA				Redbanded Rockfish	X		NA			
Pacific Rattail	X	X	NA	X			Redstripe Rockfish			NA			
Lingcod	X		X				Rosethorn Rockfish	X		NA			X
Cabezon							Rosy Rockfish			NA			
Kelp Greenling							Rougheye Rockfish	X		NA			
Pacific Cod	X	X	NA	X		X	Sharpchin Rockfish	X		NA			X
Pacific Whiting (Hake)			NA				Shortbelly Rockfish	X					X
Sablefish	X		X				Shortraker Rockfish	X		NA			
Jack Mackerel			NA				Shortspine Thornyhead	X		NA			
Aurora Rockfish	X	X	X				Silvergray Rockfish	X		NA			
Bank Rockfish	X		NA	X			Speckled Rockfish			NA			
Black Rockfish			X				Splitnose Rockfish	X		NA	X		X
Black-and-yellow Rockfish							Squarespot Rockfish			NA			
Blackgill Rockfish							Starry Rockfish			NA			
Blue Rockfish			X				Stripetail Rockfish	X		NA			X
Bocaccio	X		X				Tiger Rockfish			NA			
Bronzespotted Rockfish			NA				Treefish			NA			
Brown Rockfish			NA				Vermilion Rockfish			NA	X		
Calico Rockfish	X		NA	X			Widow Rockfish	X	X	X			X
California Scorpionfish	X	X	NA	X			Yelloweye Rockfish			NA			
Canary Rockfish							Yellowmouth Rockfish			NA			
Chilipepper	X		X			X	Yellowtail Rockfish	X	X	X			X
China Rockfish			NA				Arrowtooth Flounder	X	X	NA	X		
Copper Rockfish							Butter Sole	X	X	NA			
Cowcod			NA	X			Curlfin Sole	X	X	NA			
Darkblotched Rockfish	X	X	X			X	Dover Sole	X	X	NA	X		
Dusky Rockfish							English Sole	X	X	NA	X		
Flag Rockfish			NA				Flathead Sole	X	X	NA	X		
Gopher Rockfish	X	X	NA	X		X	Pacific Sanddab	X	X	NA	X		
Grass Rockfish			NA				Petrale Sole	X		NA	X		
Greenblotched Rockfish	X		NA	X		X	Rex Sole	X	X	NA			
Greenspotted Rockfish	X		NA	X		X	Rock Sole	X	X	NA	X		X
Greenstriped Rockfish	X		NA			X	Sand Sole	X	X	NA	X		
Harlequin Rockfish							Starry Flounder	X	X	NA	X		
Honeycomb Rockfish			NA										

TABLE EFH-4. Species and Life Stages within the Canyon Composite EFH.

Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/ Parturition	Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/ Parturition
Leopard Shark			NA		NA		Kelp Rockfish						
Soupfin Shark	X	X	NA	X	NA		Longspine Thornyhead			NA			
Spiny Dogfish	X				NA		Mexican Rockfish			NA			
Big Skate			NA		NA		Olive Rockfish	X		NA			X
California Skate			NA		NA		Pacific Ocean Perch	X					
Longnose Skate			NA		NA		Pink Rockfish			NA			
Ratfish			NA		NA		Quillback Rockfish						
Finescale Codling	X		NA				Redbanded Rockfish			NA			
Pacific Rattail			NA				Redstripe Rockfish			NA			
Lingcod							Rosethorn Rockfish			NA			
Cabezon							Rosy Rockfish			NA			
Kelp Greenling							Rougheye Rockfish			NA			
Pacific Cod			NA				Sharpchin Rockfish			NA			
Pacific Whiting (Hake)			NA				Shortbelly Rockfish	X					X
Sablefish	X		X				Shortraker Rockfish			NA			
Jack Mackerel			NA				Shortspine Thornyhead			NA			
Aurora Rockfish							Silvergray Rockfish			NA			
Bank Rockfish	X		NA	X			Speckled Rockfish	X		NA			X
Black Rockfish							Splitnose Rockfish			NA			
Black-and-yellow Rockfish							Squarespot Rockfish	X		NA			X
Blackgill Rockfish							Starry Rockfish			NA			
Blue Rockfish							Stripetail Rockfish			NA			
Bocaccio			X				Tiger Rockfish			NA			
Bronzespotted Rockfish			NA				Treefish			NA			
Brown Rockfish			NA				Vermilion Rockfish	X		NA			
Calico Rockfish			NA				Widow Rockfish	X	X	X			X
California Scorpionfish							Yelloweye Rockfish			NA			
Canary Rockfish							Yellowmouth Rockfish			NA			
Chilipepper							Yellowtail Rockfish						
China Rockfish			NA				Arrowtooth Flounder			NA			
Copper Rockfish							Butter Sole			NA			
Cowcod			NA				Curlfin Sole			NA			
Darkblotched Rockfish							Dover Sole			NA			
Dusky Rockfish							English Sole			NA			
Flag Rockfish			NA				Flathead Sole			NA			
Gopher Rockfish			NA				Pacific Sanddab			NA			
Grass Rockfish			NA				Petrale Sole			NA			
Greenblotched Rockfish	X		NA	X		X	Rex Sole			NA			
Greenspotted Rockfish			NA				Rock Sole			NA			
Greenstriped Rockfish			NA				Sand Sole			NA			
Harlequin Rockfish							Starry Flounder			NA			
Honeycomb Rockfish			NA	X									

TABLE EFH-5. Species and life stages within the Continental Slope Basin Composite EFH.

Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/ Parturition	Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/ Parturition
Leopard Shark			NA		NA		Kelp Rockfish						
Soupfin Shark			NA		NA		Longspine Thornyhead	X	X	NA	X		
Spiny Dogfish	X	X			NA		Mexican Rockfish			NA			
Big Skate	X	X	NA		NA		Olive Rockfish			NA			
California Skate	X	X	NA	X	NA	X	Pacific Ocean Perch	X					X
Longnose Skate	X	X	NA	X	NA	X	Pink Rockfish	X		NA			
Ratfish	X	X	NA	X	NA	X	Quillback Rockfish	X					X
Finescale Codling	X		NA				Redbanded Rockfish	X		NA			
Pacific Rattail	X	X	NA	X			Redstripe Rockfish	X		NA			X
Lingcod	X						Rosethorn Rockfish	X		NA			X
Cabezon							Rosy Rockfish			NA			
Kelp Greenling							Rougheye Rockfish	X		NA			
Pacific Cod	X	X	NA			X	Sharpchin Rockfish	X		NA			X
Pacific Whiting (Hake)			NA				Shortbelly Rockfish	X					X
Sablefish	X	X					Shortraker Rockfish	X		NA			
Jack Mackerel			NA				Shortspine Thornyhead	X	X	NA			
Aurora Rockfish	X	X	X				Silvergray Rockfish	X		NA			
Bank Rockfish	X		NA	X			Speckled Rockfish	X		NA			X
Black Rockfish							Splitnose Rockfish	X		NA			X
Black-and-yellow Rockfish							Squarespot Rockfish			NA			
Blackgill Rockfish	X		X				Starry Rockfish	X		NA			X
Blue Rockfish							Stripetail Rockfish	X		NA			X
Bocaccio	X		X				Tiger Rockfish	X		NA			
Bronzespotted Rockfish	X		NA				Treefish			NA			
Brown Rockfish			NA				Vermilion Rockfish	X		NA			
Calico Rockfish			NA				Widow Rockfish	X	X				X
California Scorpionfish							Yelloweye Rockfish	X		NA			X
Canary Rockfish	X					X	Yellowmouth Rockfish	X		NA			X
Chilipepper	X		X			X	Yellowtail Rockfish	X	X				X
China Rockfish			NA				Arrowtooth Flounder	X	X	NA	X		
Copper Rockfish							Butter Sole	X		NA			
Cowcod			NA				Curlfin Sole	X	X	NA			
Darkblotched Rockfish	X	X				X	Dover Sole	X	X	NA	X		
Dusky Rockfish							English Sole	X		NA			
Flag Rockfish			NA				Flathead Sole	X	X	NA	X		
Gopher Rockfish			NA				Pacific Sanddab			NA			
Grass Rockfish			NA				Petrale Sole	X	X	NA			
Greenblotched Rockfish	X		NA			X	Rex Sole	X	X	NA			
Greenspotted Rockfish			NA				Rock Sole	X	X	NA	X		X
Greenstriped Rockfish			NA				Sand Sole			NA			
Harlequin Rockfish							Starry Flounder			NA			
Honeycomb Rockfish			NA										

TABLE EFH-6. Species and life stages within the Neritic Composite EFH.

Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/ Parturition	Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/ Parturition
Leopard Shark	X	X	NA	X	NA	X	Kelp Rockfish				X		
Soupfin Shark	X	X	NA	X	NA	X	Longspine Thornyhead			NA			
Spiny Dogfish	X		X	X	NA		Mexican Rockfish			NA		X	
Big Skate			NA		NA		Olive Rockfish			NA			
California Skate			NA		NA		Pacific Ocean Perch				X		
Longnose Skate			NA		NA		Pink Rockfish			NA			
Ratfish			NA		NA		Quillback Rockfish				X	X	
Finescale Codling			NA				Redbanded Rockfish			NA			
Pacific Rattail			NA				Redstripe Rockfish			NA			
Lingcod				X	X		Rosethorn Rockfish			NA			
Cabezon				X	X		Rosy Rockfish			NA			
Kelp Greenling				X	X		Rougheye Rockfish			NA			
Pacific Cod	X	X	NA	X	X		Sharpchin Rockfish			NA			
Pacific Whiting (Hake)	X	X	NA	X	X	X	Shortbelly Rockfish						
Sablefish				X	X		Shortraker Rockfish			NA			
Jack Mackerel	X		NA	X		X	Shortspine Thornyhead			NA			
Aurora Rockfish							Silvergray Rockfish			NA			
Bank Rockfish							Speckled Rockfish			NA			
Black Rockfish	X			X			Splitnose Rockfish			NA			
Black-and-yellow Rockfish					X		Squarespot Rockfish			NA			
Blackgill Rockfish				X	X		Starry Rockfish			NA			
Blue Rockfish				X	X		Stripetail Rockfish			NA			
Bocaccio				X	X		Tiger Rockfish			NA			
Bronzespotted Rockfish			NA				Treefish			NA			
Brown Rockfish			NA				Vermilion Rockfish			NA			
Calico Rockfish			NA				Widow Rockfish				X	X	
California Scorpionfish						X	Yelloweye Rockfish			NA			
Canary Rockfish				X	X		Yellowmouth Rockfish			NA			
Chilipepper				X	X		Yellowtail Rockfish						
China Rockfish			NA		X		Arrowtooth Flounder			NA		X	X
Copper Rockfish				X		X	Butter Sole			NA		X	X
Cowcod			NA		X		Curlfin Sole			NA			X
Darkblotched Rockfish							Dover Sole			NA		X	X
Dusky Rockfish							English Sole			NA		X	X
Flag Rockfish			NA				Flathead Sole			NA		X	X
Gopher Rockfish			NA				Pacific Sanddab			NA		X	X
Grass Rockfish			NA				Petrale Sole			NA		X	X
Greenblotched Rockfish			NA				Rex Sole			NA			X
Greenspotted Rockfish			NA				Rock Sole			NA		X	
Greenstriped Rockfish			NA				Sand Sole			NA		X	X
Harlequin Rockfish							Starry Flounder			NA		X	X
Honeycomb Rockfish			NA										

TABLE EFH-7. Species and life stages within the Oceanic Composite EFH.

Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/ Parturition	Species	Adults	Spawning /Mating	Large Juveniles	Juveniles/ Small Juveniles	Larvae	Eggs/
Leopard Shark			NA		NA		Kelp Rockfish						
Soupfin Shark	X		NA		NA		Longspine Thornyhead			NA		X	X
Spiny Dogfish	X				NA		Mexican Rockfish			NA		X	
Big Skate			NA		NA		Olive Rockfish			NA			
California Skate			NA		NA		Pacific Ocean Perch				X	X	
Longnose Skate			NA		NA		Pink Rockfish			NA			
Ratfish			NA		NA		Quillback Rockfish						
Finescale Codling			NA				Redbanded Rockfish			NA			
Pacific Rattail			NA		X		Redstripe Rockfish			NA			
Lingcod							Rosethorn Rockfish			NA			
Cabezon				X	X		Rosy Rockfish			NA			
Kelp Greenling				X	X		Rougheye Rockfish			NA			
Pacific Cod	X	X	NA	X	X		Sharpchin Rockfish			NA		X	
Pacific Whiting (Hake)	X	X	NA		X	X	Shortbelly Rockfish						
Sablefish				X	X	X	Shortraker Rockfish			NA			
Jack Mackerel	X	X	NA	X	X	X	Shortspine Thornyhead			NA		X	X
Aurora Rockfish					X		Silvergray Rockfish			NA			
Bank Rockfish							Speckled Rockfish			NA			
Black Rockfish	X						Splitnose Rockfish			NA			
Black-and-yellow Rockfish							Squarespot Rockfish			NA			
Blackgill Rockfish				X	X		Starry Rockfish			NA			
Blue Rockfish							Stripetail Rockfish			NA			
Bocaccio							Tiger Rockfish			NA			
Bronzespotted Rockfish			NA				Treefish			NA			
Brown Rockfish			NA				Vermilion Rockfish			NA			
Calico Rockfish			NA				Widow Rockfish				X	X	
California Scorpionfish							Yelloweye Rockfish			NA			
Canary Rockfish				X	X		Yellowmouth Rockfish			NA			
Chilipepper							Yellowtail Rockfish				X		
China Rockfish			NA				Arrowtooth Flounder			NA		X	X
Copper Rockfish							Butter Sole			NA			
Cowcod			NA				Curlfin Sole			NA			X
Darkblotched Rockfish				X	X		Dover Sole			NA		X	X
Dusky Rockfish							English Sole			NA			
Flag Rockfish			NA				Flathead Sole			NA		X	X
Gopher Rockfish			NA				Pacific Sanddab			NA		X	X
Grass Rockfish			NA				Petrale Sole			NA		X	X
Greenblotched Rockfish			NA				Rex Sole			NA		X	
Greenspotted Rockfish			NA				Rock Sole			NA			
Greenstriped Rockfish			NA				Sand Sole			NA			
Harlequin Rockfish							Starry Flounder			NA			
Honeycomb Rockfish			NA										

11.10.3 Adverse Impacts on EFH From Fishing Gear and Practices, and Measures to Manage Them

11.10.3.1 Identification of Adverse Impacts of Fishing Gear on EFH

There is little information on the effects of fishing gears on the habitat of Pacific coast groundfish, although there are numerous theories and a great deal of speculation about the effects of various fishing gears on structural habitat. A major challenge the Council will face in addressing gear effects on EFH is the lack of information, and if the Council chooses to impose restrictions in the short term, such decisions would likely have to be based on the assumption that general information about the effects of gear in other environments is applicable to the specific case of the Pacific coast environment.

The available information on the effects of fishing gear on marine fish habitat comes from research that has been concentrated in heavily fished areas off the east coast of Canada and the United States, and in the North Sea. There are substantial differences in sea floor topography, other physical features, and biological characteristics between those regions and the Pacific coast of the United States. In addition, most research in those areas focused on trawl and dredge gears, with little information on the effects of non-mobile (fixed) gears. There is ongoing debate about the applicability of that research to the Pacific coast environment, however information from those areas will be used by the Council as appropriate. Pacific coast trawl adaptations, such as tire roller gear for improving gear performance in rocky areas, have only recently been explored outside of tropical habitats. Habitat protection will be considered as a tool in groundfish stock restoration.

A marine ecosystem in a "virgin" or unfished state would support a specific number and complexity of fish species. As a marine area is fished, the qualities of the ecosystem change in relation to the number of fish of each species removed from the ecosystem and the effects of fishing gear on the habitat(s) of species using that area. After a number of years of fishing, the habitat quality and nature of that marine ecosystem might be significantly different from the virgin ecosystem. Habitat modified by fishing pressure would support a different set of fish species from those supported by virgin habitat for that same area. In general, marine habitats that have been less altered by fishing and other activities are more complex in structure and more productive in lower level organisms such as worms and crustaceans than highly altered habitats. Marine habitats with greater complexity at lower trophic levels and with greater structural complexity tend to support a more complex mix of fish species in greater abundances than altered habitats. In some cases, however, activities that add nutrients to the system can increase total productivity but reduce complexity. Thus, productivity alone should not be used as a measure of environmental integrity.

It is likely there are few, if any, large virgin marine habitats off the Pacific coast. Due to the high relief, rocky nature of Pacific coast bottom habitat, however, there may be pockets of habitat that have undergone few alterations by trawl gear. High relief rock piles that are not accessible to trawl gear are usually accessible to commercial longline and recreational hook-and-line gear. Similarly, marine canyons that have not been trawled may be used by commercial longliners. The Pacific coast groundfish species mix, with a high proportion of rockfish, is evidence that there are several remaining complex habitat areas. The numerous, long-lived rockfish species have evolved to take advantage of varied rock habitats along the length of the coast. As rockfish stocks have been fished down to lower levels, there is little evidence of new increases in stocks of short-lived species that do not rely on high habitat complexity. Thus, alterations to rockfish habitat may not be accompanied by improvements in stocks that are better adapted to the altered habitat. For this reason, protection of rockfish and rockfish habitat is extremely important to long-term sustainability of the groundfish fishery.

Trawl gear, particularly doors and foot ropes, can alter marine habitat complexity. Changes to physical characteristics of the sea floor would include leveling of rock formations, re-suspending sediments, and other disturbances. These effects depend on towing speed, substrate type, strength of tides and currents, and gear configuration (Jones 1992). it has been found that otter doors tend to penetrate the substrate one cm to 30 cm; one cm on sand and rock substrates, and 30 cm in some mud substrates (Krost et al. 1990; Jones 1992; Brylinsky et al. 1994). Another factor that will cause variation in the depth of the troughs made by the otter doors is the size (weight) of the doors (i.e., the heavier the doors the deeper the trough) (Jones 1992). These benthic troughs can disappear in as little as a few hours or days in mud and sand sediments over which there is strong tide or current action (Caddy 1973; Jones 1992), or they can last much longer, from between a few

months to over five years in seabeds with a mud or sandy-mud substrate at depths greater than 100 m with weak or no current flow (Krost et al. 1990; Jones 1992; Brylinsky et al. 1994). Footropes that are designed to roll over the sea floor cause little physical alteration other than smoothing the substrate and minor compression (Brylinsky et al. 1994; Kaiser and Spencer 1996). However, since a trawler may re-trawl the same area several times, these minor compressions can cause a "packing" of the substrate (Schwinghammer et al. 1996). Further compression of the substrate can occur as the net becomes full and is dragged along the bottom. Trawl gear used off the Pacific coast is often modified with a "roller gear" footrope, where rubber tires are packed together along the footrope, allowing the base of the net to bounce along the bottom, or to drag over obstructions without snagging the net. Development of roller gear has allowed trawlers to work in formerly inaccessible rocky areas. New research in the Gulf of Alaska on the impacts of roller gear on bottom habitat may soon provide documentation on the effects of this gear on bottom habitat (Heifetz, 1997). Whatever the direct habitat impacts of roller gear may be, roller gear is effective in allowing trawlers to work in formerly inaccessible, rocky areas.

Similarly, longline gear has been seen to disturb or remove marine plants, corals, and sessile organisms. Observations of halibut longline gear made by NMFS scientists during submersible dives off Southeast Alaska provide some information (NPFMC 1992): "Setline gear often lies slack on the sea-floor and meanders considerably along the bottom. During the retrieval process the line sweeps the bottom for considerable distances before lifting off the bottom. It snags on whatever objects are in its path, including rocks and corals. Smaller rocks are upended, hard corals are broken, and soft corals appear unaffected by the passing line. Invertebrates and other light weight objects are dislodged and pass over or under the line. Fish, notably halibut, frequently moved the groundline numerous feet along the bottom and up into the water column during escape runs disturbing objects in their path. This line motion was noted for distances of 50 feet or more on either side of the hooked fish." Further observations by scientist divers monitoring longline gear off Alaska noted that longlines swept the sea floor, entangling scallops and corals, bringing those animals to the surface during line retrieval (High, 1998).

Although there has been no research conducted on pot gear effects on habitat along the Pacific coast, pot gear may damage demersal plants and animals as it settles, and longlined pots may drag through and damage bottom fauna during gear retrieval. Similarly, anchoring the pot lines or the ends of the longlines may have crushing or dragging effects. In addition to direct bottom habitat alteration, fishing gear that is lost at sea and left to "ghost fish" may cause changes to habitat. Pacific coast groundfish regulations include trap gear restrictions that require trap construction with biodegradable escape panels, so that traps will no longer ghost fish after the escape panels have degraded. Depending on the number of pots that are lost each year and where they are fished, lost pots may alter marine habitat simply by providing a different type of relief than the natural habitat.

Setnets (or gillnets) and trammel nets, which are only used in this fishery south of 38° N latitude, are also known to ghost fish. Ghost fishing gillnets have been observed entangling fish, seabirds, mammals, crabs, and other invertebrates (High 1998). Unlike trap gear, however, gillnets do not biodegrade and likely do not change the relief of marine habitat other than acting as a constant entangling force in areas where they are lost.

Beyond bottom habitat, there may also be fishing impacts to the water column. Although there are presumably few, if any, direct effects from mid-water trawling on EFH, this fishery may alter species complexity in the water column. Off the Pacific coast, there is a large mid-water trawl fishery for Pacific whiting north of 42° N latitude. There may be negative effects from the offal and processing slurry discard associated with these fisheries. Prolonged offal discards from some large-scale fisheries have redistributed prey food away from mid-water and bottom feeding organisms to surface-feeding organisms, usually resulting in scavenger and seabird population increases (Hill and Wassenberg 1990, Evans et al. 1994). Conversely, large offal discards in low-current environments, when not preyed upon by surface scavengers, can also collect and decompose on the ocean floor, creating anoxic bottom conditions. Pacific coast marine habitat is generally characterized by strong current and tide conditions, but there may be either undersea canyons affected by at-sea discard, or bays and estuaries affected by discard from shoreside processing plants (Stevens and Haaga, unpublished). As with bottom trawling off the Pacific coast, little is known about the environmental effects of mid-water trawling and processing discards on habitat conditions.

11.10.3.2 Measures to Minimize Fishing Effects on Groundfish EFH

The interim final rule implementing the EFH provisions of the Magnuson-Stevens Act states that "fishery management options may include, but are not limited to:

> Fishing gear restrictions. These options may include, but are not limited to: seasonal and area restrictions on the use of specified equipment; equipment modifications to allow escapement of particular species or particular life stages (e.g., juveniles); prohibitions on the use of explosives and chemicals; prohibitions on anchoring or setting equipment in sensitive areas; and prohibitions on fishing activities that cause significant physical damage in EFH.
>
> Time/area closures. These actions may include, but are not limited to: closing areas to all fishing or specific equipment types during spawning, migration, foraging, and nursery activities; and designating zones for use as marine protected areas to limit adverse effects of fishing practices on certain vulnerable or rare areas/species/life history stages, such as those areas designated as habitat areas of particular concern.
>
> Harvest limits. These actions may include, but are not limited to, limits on the take of species that provide structural habitat for other species assemblages or communities, and limits on the take of prey species."

The Council concurs with this general guidance, and this FMP authorizes two general measures to mitigate fishing effects on EFH in this FMP. The Council may use any of the following management measures to minimize adverse effects on EFH from fishing, if there is evidence that a fishing activity is having an identifiable adverse effect on EFH. Such management measures shall be implemented under the Points of Concern Framework, Section 6.2.2.

Fishing Gear Restrictions
Time/Area Closures
Harvest Limits

In determining whether it is practicable to minimize an adverse effect from fishing, the Council will consider whether, and to what extent, the fishing activity is adversely impacting EFH, the nature and extent of the adverse effect on EFH, and whether management measures are practicable. The Council will consider the long and short term costs and benefits to the fishery and EFH, along with other appropriate factors, consistent with national standard 7.

Restrictions on fishing equipment could include limitations on the amount, type or configuration of legal gear. Time/area closures could include seasonal and areal restrictions on the use of specified equipment, prohibitions on anchoring or setting equipment in sensitive areas, and prohibition or limitation of fishing activities that cause significant physical damage in EFH (including groundfish harvest limits). The Council may also consider developing harvest limits on species that provide structural habitat for other species assemblages or communities (such as kelps or corals). Currently, the groundfish FMP does not manage harvest of any structural species; adding such species to the management unit would require amendment to the FMP.

There is a growing body of research on the effects of fishing gear on marine habitat and general conclusions about the effects of some gear types on marine habitat may be drawn from this body of research. However, as noted above, there has been little research on Pacific coast groundfish EFH and fishing effects on habitat. While restrictions that target a specific gear type may be useful, there is concern within the fishing industry that gear restrictions for EFH without more complete information could fuel unnecessary conflict between gear groups. The Council may considered developing gear performance standards for all gears used in the groundfish fisheries. Gear performance standards might require that all fishing gear used off the Pacific coast avoid defined levels of habitat alteration. For example, performance standards for bottom gear might require that the gear not move rocks larger than a certain size. Performance standards for setnets and gillnets might require net construction of degradable material to decrease ghost fishing. Any gear performance standards would apply to all participants in the Pacific coast groundfish fishery. In developing gear performance

standards, the Council would seek industry advice on a few selected gear configurations that have a high potential to impact habitat, and pursue restricting their use where habitat is most vulnerable to disturbance.

In addition to measures restricting fishing gears and methods, the Council may consider time/area closures to protect EFH. Such measures might include, but would not be limited to: closing areas to all fishing or specific equipment types to protect spawning, migration, foraging, and nursery habitat; and designating zones for use as marine protected areas to limit adverse effects of fishing practices on certain vulnerable or rare areas/species/life history stages.

Because much of the habitat in the EEZ off the Pacific coast is high relief habitat characterized by numerous rock piles interspersed with sandy bottom plains, there are patches of habitat along the coast that are less accessible to trawling. Species of *Sebastes* are particularly associated with such rocky areas. Because these are long-lived rockfish species with slow maturity rates, they may be more vulnerable to overfishing than shorter-lived, more fecund groundfish species. Investigations into gear effects on habitat should particularly look at gear or vessel modifications that may allow more access to formerly hazardous or entangling rock piles. The EFH Technical Team discussed whether any "natural" or defacto reserves exist as areas inaccessible to all fishing. Team members agreed that while there are some high relief areas that are inaccessible to trawl gear, those areas can usually be used by commercial and recreational hook-and-line gear. Older rockfish associating with rock piles that are inaccessible to trawlers are not protected from capture in other fisheries. However, the actual rock piles will be protected from trawl damage until trawl fishers devise new gear modifications that allow them to fish closer in to the rocks. Areas that are currently inaccessible to trawl nets could be protected against further gear modifications with gear performance standards.

One species that might benefit from limited time/area closures is lingcod. Male lingcod are known to guard nests of incubating eggs during January to early March, and when male lingcod are removed from the nests, the eggs quickly become prey to demersal scavengers. Restrictions to prevent fishing on lingcod during nest guarding months would not protect lingcod habitat directly, unless EFH for egg stage were expanded to include adult male lingcod. In the absence of such a definition, restrictions of this type would be a move towards fishery management that is more closely linked with the life stages of managed species. Cabezon and kelp greenling species also exhibit nest guarding behavior that could be protected by time/area closures. There may be times and areas when a fishing closure could benefit a significant cross-section of managed species during vulnerable life stages.

Beyond protecting trawl-inaccessible areas and time/area closures for particular species, the Council may consider reserves closed to all fishing. Relatively small research reserves could be established to provide information on possible effects of larger or more extensive reserves, with the understanding larger reserves may be useful in habitat and depleted stock protection. The primary goal of no-fishing zones, or regulated marine reserves, would be to allow long-lived species to grow undisturbed to ages and sizes of greater fecundity, with the expectation that a population bank of more productive spawners would put more eggs and more juveniles into the overall ecosystem and the associated fishery. Reserves may also benefit more migratory species by improving the integrity of habitat those species use. Habitat protection and improving habitat integrity would be secondary benefits of reserves. If fishing gear has negative effects on habitats used by vulnerable species, reserves of those habitats would allow long-term recovery from gear effects.

Potential benefits of marine protected areas were discussed in a report by Fujita, et al. (1997) entitled *Can No-Take Marine Reserves Help Rebuild and Sustain the Pacific Coast Groundfish Fishery?* The report envisions a network of marine reserves designed to protect mature adult populations of depleted groundfish stocks in areas of core abundance. The authors suggest that a network of reserves might serve to protect a range of habitat types, with expected improvement in the stock status of those species that depend on the protected habitat. This kind of system would go beyond ensuring that naturally inaccessible areas remain inaccessible in spite of any improvements in gear and vessel maneuverability. With a reserve system of this nature, areas that are now commonly fished may be placed within reserve boundaries.

Also in 1997, NMFS scientists convened a workshop to explore the possible benefits of marine reserves for Pacific coast rockfish populations. In considering the marine reserves as a management tool, workshop conclusions note, "Marine reserves provide one of the few management tools for implementation of multiple

provisions of the Magnuson-Stevens Act that traditional management tools cannot address, including protection of essential fish habitats, incorporating ecosystem principles in fisheries management, and taking a precautionary approach to management." (Yoklavich, 1998) Workshop participants discussed how reserves might be designed to accomplish different research and management goals. They concluded that the available information on rockfish habitats is sufficient to at least create no-fishing research areas. No-fishing research areas off the Pacific coast would provide information on habitat protection and on restoring depleted stocks. Future reserve programs to provide population and habitat banks against overfishing, or for use as fishery management tools, could be based on design principles developed through a no-fishing research areas program.

Section 303 (b) of the Magnuson-Stevens Act gives Councils discretion to include no-fishing or limited fishing zones in their FMPs.

> "Any fishery management plan which is prepared by any Council, or by the Secretary, with respect to any fishery, may . . . (2) designate zones where, and periods when, fishing shall be limited, or shall not be permitted, or shall be permitted only by specified types of fishing vessels or with specified types and quantities of fishing gear."

The individual EFH descriptions in the EFH source document will be helpful when the Council and its advisory bodies consider how to site reserves to most benefit depleted stocks. Design and siting of marine reserves should be undertaken with full participation from the fishing industry, environmental interests, university and agency scientists, as well as tribal, state, and federal managers. Enforcing the boundaries of a no-fishing zone would be impossible if marine reserves were designed without the cooperation of the fishing industry.

NMFS has recommended the Council appoint an advisory body to design gear performance standards for groundfish habitat protection, and to work on siting and design of no-fishing research reserves. The Council may establish one or more advisory bodies to respond to this recommendation. Any regulatory measures developed through this process would be approved and implemented in accordance with the Points of Concern framework of this FMP.

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11.10.4 Adverse Impacts of Nonfishing Related Activities, Gear, and Practices, and Measures to Manage Them

In accordance with Section 600.815 (a) (5) of the EFH regulations, the Council has identified the following non-fishing activities that have the potential to adversely affect groundfish EFH quantity or quality, or both. Broad categories of such activities include, but are not limited to: dredging, fill, excavation, mining, impoundment, discharge, water diversions, thermal additions, actions that contribute to non-point source pollution and sedimentation, introduction of potentially hazardous materials, introduction of exotic species, and the conversion of aquatic habitat that may eliminate, diminish, or disrupt the functions of EFH. This section describes the EFH most likely to be adversely affected by these or other activities. For each activity, known and potential adverse impacts to EFH are described. The descriptions explain the mechanisms or processes that may cause the adverse effects and how these may affect habitat function. GIS and other mapping systems are used to support analyses of data and to present these data in order to geographically depict impacts.

This section also suggests, in an advisory, not mandatory, capacity, proactive conservation measures that would help minimize or avoid the adverse effects of these non-fishing activities on groundfish EFH. These measures should be viewed as options to avoid, minimize, or compensate for adverse impacts and promote the conservation and enhancement of groundfish EFH. Generally, non-water dependent actions should not be located in EFH if such actions may have adverse impacts on EFH. Activities that may result in significant adverse affects on EFH should be avoided where less environmentally harmful alternatives are available. If there are no alternatives, the impacts of these actions should be minimized. Environmentally sound engineering and management practices should be employed for all actions which may adversely affect EFH. Disposal or spillage of any material (dredge material, sludge, industrial waste, or other potentially harmful materials) which would destroy or degrade EFH should be avoided. If avoidance or minimization is not possible, or will not adequately protect EFH, compensatory mitigation to conserve and enhance EFH should be recommended. The Council may recommend proactive measures to conserve or enhance EFH. When developing proactive measures, the Council may develop a priority ranking of the recommendations to assist Federal and state agencies undertaking such measures.

A variety of options to conserve or enhance EFH are available, including, but not limited to:

Enhancement of rivers, streams, and coastal areas. Groundfish EFH located in estuaries that are influenced by rivers, streams, and coastal areas may be enhanced by reestablishing appropriate native vegetation, restoring natural bottom characteristics, or removing unsuitable material from areas affected by human activities. Adverse effects stemming from upland areas that influence EFH may be avoided or minimized by employing measures such as, but not limited to, erosion control, upgrading culverts, removal or modification of operating procedures of dikes or levees to allow for creation of estuarine habitat. Initiation of Federal, state, or local government planning processes to restore watersheds associated with such rivers, streams, or coastal areas may also be recommended.

Water quality and quantity. The Council recommends use of best land management practices for ensuring compliance with water quality standards at state and Federal levels, improved treatment of sewage, proper disposal of waste materials, and providing appropriate in-stream flow to prevent adverse effects to estuarine areas.

Habitat creation. Under appropriate conditions, habitat creation (converting non-EFH to EFH) may be considered as a means of replacing lost or degraded EFH. However, habitat conversion at the expense of other naturally functioning systems must be justified within an ecosystem context.

Established policies and procedures of the Council and NMFS provide the framework for conserving and enhancing essential fish habitat. Components of this framework include avoidance and minimization of adverse impacts; provision of compensatory mitigation whenever the impact is significant and unavoidable; and incorporation of enhancement. New and expanded responsibilities contained in the Magnuson-Stevens Act will be met through appropriate application of these policies and principles. In assessing the potential impacts of proposed projects, the Council and NMFS will be guided by the following general considerations:

- The extent to which the activity would directly and indirectly affect the occurrence, abundance, health, and continued existence of fishery resources.
- The extent to which the potential for cumulative impacts exists.
- The extent to which adverse impacts can be avoided through project modification, alternative site selection or other safeguards.
- The extent to which the activity is water dependent if loss or degradation of groundfish EFH is involved.
- The extent to which mitigation may be used to offset unavoidable loss of habitat functions and values.

Significance of Groundfish Habitats

Pacific coastal waters are some of the most productive in the United States (Resources Agency of California, 1995). The waters and substrate that comprise the EFH under jurisdiction of the Council are diverse, widely distributed, and closely affiliated with other aquatic and terrestrial environments. These characteristics make them susceptible to human activities.

From a broad perspective, fish habitat is the geographic area where the species occurs at any time during its life. This area can be described in terms of ecological characteristics, location, and time. Ecologically, essential habitat includes waters and substrate that focus distribution (e.g., rocky reefs, intertidal salt marshes, or submerged aquatic vegetation) and other characteristics that are less distinct (e.g., turbidity zones, salinity gradients). Spatially, habitats and their use may shift over time due to climatic change, human activities and impacts. The type of habitat available, its attributes, and its functions are important to species productivity, diversity, health, and survival.

For the purposes of determining and evaluating non-fishing impacts to groundfish EFH, the area was partitioned into seven composites based on major habitat types (estuarine, rocky shelf, nonrocky shelf,

canyons, continental slope, neritic zone and oceanic zone.) Of these composites, the estuarine, rocky shelf and nonrocky shelf are probably the most susceptible to deleterious impacts from nonfishing activities.

Estuaries are the bays and inlets influenced by both the ocean and a river and serve as the transitional zone between fresh and salt water (Botkin et al. 1995). Estuaries support a community of plants and animals that are adapted to the zone where fresh and salt waters mix (Zedler et al. 1992). 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 function in a manner beneficial to anadromous and marine fish. Habitat degradation and loss adversely affect inshore and riverine ecosystems critical to living marine resources (Chambers 1992). In addition, the cumulative effects of small changes in many estuaries may have a large systematic impact on estuarine and coastal oceanic carrying capacity (Monaco et al. 1990).

Fox (1992) states: "The ability of habitats to support high productivity levels of marine resources is diminishing, while pressures for their conversion to other uses are continuing." Point and nonpoint discharges, waste dumps, eutrophication, acid rain, and other human impacts reduce this ability (Fox 1992). Population growth and demands for international business trade along the Pacific Rim exert pressure to expand coastal towns and port facilities, resulting in net estuary losses (Kagan 1991, Fawcett and Marcus 1991). Carefoot (1977), discussing Pacific seashores, states "Estuaries are complex systems which can succumb to humankind's massive and pervasive assaults."

Estuarine habitats fulfill fish and wildlife needs for reproduction, feeding, refuge, and other physiological necessities (Simenstad et al. 1991, Good 1987, Phillips 1984). Coastal fish populations depend upon both the quantity and quality of the available habitat (Peters and Cross 1992). Almost all marine and intertidal waters, wetlands, swamps and marshes are critical to fish (Fedler and Crookshank 1992). For example, seagrass beds protect young fish from predators, provide habitat for fish and wildlife, improve water quality, and control sediments (Lockwood 1990, Thayer et al. 1984, Hoss and Thayer 1993, Phillips 1984). In addition, seagrass beds are critical to nearshore food web dynamics (Wyllie-Echeverria and Phillips 1994).

Studies have shown seagrass beds to be among the areas of highest primary productivity in the world (Herke and Rogers 1993, Hoss and Thayer 1993, Emmett et al. 1991). This primary production, combined with other nutrients, provide high rates of secondary production in the form of fish (Herke and Rogers 1993, Good 1987, Sogard and Able 1991, Emmett et al. 1991).

Other estuarine habitats such as mud flats, high salt marsh, and saltmarsh creeks also provide productive shallow water habitat for epibenthic fishes and decapods (Sogard and Able 1991). Simenstad et al. (1990) found that coarse sediment tidal flats were productive benthic infauna areas.

Woody debris plays a significant role in salt marsh ecology (Maser and Sedell 1994). Reductions in woody debris input to the estuaries may affect the ecological balance of the estuary. Large woody debris also plays a significant role in benthic ocean ecology, where deep-sea wood borers convert the wood to fecal matter providing terrestrial based carbon to the ocean food chain (Maser and Sedell 1994). Dams and commercial in-river harvest of large woody debris have dwindled the supply of wood, jeopardizing the ecological link between the forest and the sea (Maser and Sedell 1994).

Estuarine zone fisheries are of great economic importance across the Nation (Herke and Rogers 1993). Three-fourths of the fish species caught in the United States are supported by estuarine habitats (Hinman 1992, Fox 1992). Clams, crabs, oysters, mussels, scallops, and estuarine and nearshore small commercial fishes contributed an average dockside revenue of $389 million nationally from 1990 to 1992 (National Marine Fisheries Service 1993). Using NMFS data, Chambers (1992) determined that seventy-five percent of all commercial fish and shellfish landings are of estuarine-dependent species. At least 31 groundfish species inhabit estuaries and nearshore kelp forests for part, or all, of their life cycle.

Of the habitats associated with the rocky shelf composite, kelp forests are of primary importance. 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. These subtidal communities provide vertically-structured habitat through the water column on the rocky shelf, made up of a canopy of tangled stipes from the water line to a depth of 10

feet, a mid-kelp, water-column region and the bottom, holdfast region. The stands provide nurseries, feeding grounds and/or shelter to a variety of groundfish species and their prey (Feder et al. 1974; Ebeling et al. 1980). Giant kelp communities are highly productive; relative to other habitats including wetlands, shallow and deep sand bottoms and rock bottom artificial reefs, kelp habitats are substantially more productive in the fish communities they support (Bond et al., 1998). Their net primary production is an important component to the energy flow within food webs. Foster and Schiel (1985) reported that the net primary productivity of kelp beds may be the highest of any marine community. The net primary production of seaweeds in a kelp forest is available to consumers in three forms: living tissue on attached plants; drift in the form of whole plants or detached pieces; and, dissolved organic matter exuded by attached and drifting plants (Foster and Schiel, 1985).

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11.10.4.1 Adverse Nonfishing Impacts and Recommended Conservation Measures

The following is a general description of non-fishing related activities that directly or cumulatively, temporarily or permanently may threaten the physical, chemical and biological properties of the habitat utilized by Pacific coast groundfish species and their prey. The direct result of these threats is that the function of EFH may be eliminated, diminished or disrupted. The list includes common and not so common activities that all have known or potential impacts to EFH. The list is not prioritized nor is it all-inclusive. The potential adverse effects described below, however, do not necessarily apply to the described activities in all cases, as the specific circumstances of the proposed activity or project just be carefully considered on a case-by-case basis. Furthermore, some of the activities described below may also have beneficial effects on habitat, which need to be considered in any analysis of an action's net effect by agencies conducting adverse effects analysis.

If the Council believes a proposed activity appears to have the potential to adversely impact EFH, it may advise the action agency and NMFS of its belief. In response, the action agency may need to undertake an EFH assessment to determine whether the proposed activity or activities will impose an adverse impact to the quality and quantity of the habitat. Section 600.905 of the EFH regulations delineates consultation requirements for activities that adversely impact EFH. The following measures are suggested, in an advisory, not mandatory, capacity, as proactive conservation measures that would aid in minimization or avoidance of the adverse effects of these nonfishing activities on EFH.

The potential impacts below are germane to the EFH of 83 species of Pacific coast groundfish and their prey.

1. **DREDGING:** Dredging navigable waters is a continuous impact primarily to benthic habitats, but also to adjacent habitats in the construction and operation of marinas, harbors, and ports. Routine dredging, that is, the excavation of soft bottom substrates, is required to provide or create ship (e.g., ports) and boat (e.g., marinas) navigational access to docking facilities. Dredging is used to create deepwater navigable channels or to maintain existing channels that periodically fill with sediments that flow into these channels from rivers or move by wind, wave, and tidal dynamics. In the process of dredging, excessive quantities and associated qualities of the sea floor are removed, disturbed and re-suspended. Turbidity plumes may arise. Legal mandates covering dredging are the Federal Water Pollution Control Act of 1972 (33 U.S.C. 1251 et seq.) and the River and Harbor Act of 1899 (33 U.S.C. 401 et seq.).

   Adverse Impacts: Dredging may adversely affect infaunal and bottom-dwelling organisms at the site by removing immobile organisms such as polychaete worms and other prey types or forcing mobile animals such as fish to migrate. Benthic plants and animals present prior to a discharge are unlikely to re-colonize if the composition of the deeper layers of sediment are drastically different.

   Dredging events using certain types of dredging equipment can result in greatly elevated levels of fine-grained mineral particles, usually smaller than silt, and organic particles in the water column. These turbidity plumes of suspended particulates may reduce light penetration and lower the rate of photosynthesis (e.g., in adjacent eelgrass beds) and the primary productivity of an aquatic area if suspended for extended periods of times. If suspended particulates persist, fish may suffer reduced

feeding ability and sensitive habitats such as submerged aquatic vegetation beds which provide source of food and shelter may be damaged. The contents of the suspended material may react with the dissolved oxygen in the water and result in short-term oxygen depletion to aquatic resources. Toxic metals and organics, pathogens, and viruses absorbed or adsorbed to fine-grained particulates in the material may become biologically available to organisms either in the water column or through food chain processes.

Dredging as well as the equipment used in the process such as pipelines may damage or destroy spawning, nursery habitat and other sensitive habitats such as emergent marshes and subaquatic vegetation including eelgrass beds and kelp beds. Dredging may also modify current patterns and water circulation of the habitat by changing the direction or velocity of water flow, water circulation, or otherwise changing the dimensions of the water body traditionally utilized by fish for food, shelter or reproductive purposes.

Recommended Conservation Measures:

1. To the maximum extent practicable, new, as opposed to maintenance, dredging should be avoided. Activities that would likely require dredging (such as placement of piers, docks, marinas, etc.) should instead be sited in deep water areas or designed in such a way as to alleviate the need for maintenance dredging. Projects should be permitted only for water dependent purposes, and only when no feasible alternatives are available.

2. Where the dredge equipment employed could cause significant long term impacts due to entrainment of groundfish or prey species, dredging in estuarine waters shallower than 20' in depth should be performed during the time frame when groundfish and prey species are least likely to be entrained. Dredging, except for maintenance dredging, should be avoided in areas with submerged aquatic vegetation.

3. All dredging permits should reference latitude-longitude coordinates of the site so information can be incorporated into geographical information system format. Inclusion of aerial photos may also be required to identify precise locations for long term evaluation.

4. Sediments should be tested for contaminants as per Environmental Protection Agency and U.S. Army Corps of Engineers requirements.

5. The cumulative impacts of past and current dredging operations on EFH should be addressed by Federal, state, and local resource management and permitting agencies and considered in the permitting process.

6. If dredging needs are caused by excess sedimentation in the watershed, those causes should be identified and appropriate management agencies contacted to assure action is done to curtail those causes.

7. Post-dredging bottom surface contours should remain as close as feasible to the pre-dredging condition

8. The bankward slopes of the dredged area should be left so that sloughing would not occur. To show that no sloughing is occurring, long-term monitoring via bathymetric sounding should be conducted.

9. Pipelines and accessory equipment used in conjunction with dredging operations should, to the maximum extent possible, avoid kelp beds, eelgrass beds, estuarine marshes and areas of subaquatic vegetation.

10. Where a dredging equipment type is used that is expected to create significant turbidity (e.g., clamshell) dredging should be conducted using adequate control measures to minimize turbidity.

11. Compensation for significant impacts (short-term, long-term and cumulative) to benthic environments from dredging should be provided where appropriate.

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2. **DREDGE MATERIAL DISPOSAL/FILLS:** The discharge of dredged materials subsequent to dredging operations or the use of fill material in the construction/development of harbors results in sediments (e.g., dirt, sand, mud) covering or smothering existing submerged substrates. Usually these covered sediments are of a soft-bottom nature as opposed to rock or hard-bottom substrates.

   Adverse Impacts: The disposal of dredged or fill material can result in varying degrees of change in the physical, chemical, and biological characteristics of the substrate. Discharges may adversely affect infaunal and bottom-dwelling organisms at the site by smothering immobile organisms (e.g., prey invertebrate species) or forcing mobile animals (e.g., benthic-oriented fish species) to migrate from the area. Infaunal invertebrate plants and animals present prior to a discharge are unlikely to re-colonize if the composition of the discharged material is drastically different. Erosion, slumping, or lateral displacement of surrounding bottom of such deposits can also adversely affect substrate outside the perimeter of the disposal site by changing or destroying benthic habitat. The bulk and composition of the discharged material and the location, method, and timing of discharges may all influence the degree of impact on the substrate.

   The discharge of dredged or fill material can result in greatly elevated levels of fine-grained mineral particles, usually smaller than silt, and organic particles in the water column (i.e., turbidity plumes). These suspended particulates may reduce light penetration and lower the rate of photosynthesis and the primary productivity of an aquatic area if suspended for lengthy intervals. Aquatic vegetation such as eelgrass beds and kelp beds may also be affected. Groundfish and other fish species may suffer reduced feeding ability leading to limited growth and lowered resistance to disease if high levels of suspended particulates persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion. Toxic metals and organics, pathogens, and viruses absorbed or adsorbed to fine-grained particulates in the material may become biologically available to organisms either in the water column or through food chain processes.

   The discharge of dredged or fill material can change the chemistry and the physical characteristics of the receiving water at the disposal site by introducing chemical constituents in suspended or dissolved form. Reduced clarity and excessive contaminants can reduce, change or eliminate the suitability of water bodies for populations of groundfish, other fish species and their prey. The introduction of nutrients or organic material to the water column as a result of the discharge can lead to a high biochemical oxygen demand (BOD), which in turn can lead to reduced dissolved oxygen, thereby potentially affecting the survival of many aquatic organisms. Increases in nutrients can favor one group of organisms such as polychaetes or algae to the detriment of other types.

The discharge of dredged or fill material can modify current patterns and water circulation by obstructing flow, changing the direction or velocity of water flow, changing the direction or velocity of water flow and circulation, or otherwise changing the dimensions of a water body. As a result, adverse changes can occur in the location, structure, and dynamics of aquatic communities; shoreline and substrate erosion and deposition rates; the deposition of suspended particulates; the rate and extent of mixing of dissolved and suspended components of the water body; and water stratification.

Disposal events may lead to the full or partial loss of habitat functions due to extent of the burial at the site. Loss of habitat function can be temporary or permanent.

Recommended Conservation Measures:

1. Upland dredge disposal sites should be considered as an alternative to offshore disposal sites.

2. The cumulative impacts of past and current fill operations on EFH should be addressed by Federal, state, and local resource management and permitting agencies and considered in the permitting process.

3. Any disposal of dredge material in EFH should meet applicable state and/or federal quality standards for such disposal.

4. When reviewing open water disposal permits for dredged material, state and Federal agencies should identify the direct and indirect impacts such projects may have on groundfish EFH. Benthic productivity should be determined by sampling prior to any discharge of fill material. Sampling design should be developed with input from state and Federal resource agencies.

5. The areal extent of any disposal site in groundfish EFH should be minimized. However, in some cases, thin layer disposal may be less deleterious. All non-avoidable adverse impacts (other than insignificant impacts) should be mitigated.

6. All spoil disposal permits should reference latitude-longitude coordinates of the site so information can be incorporated into GIS systems. Inclusion of aerial photos may also be required to identify precise locations for long term evaluation.

7. Further fills in estuaries and bays for development of commercial enterprises should be curtailed.

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3. **OIL/GAS EXPLORATION/PRODUCTION**: Offshore exploration and production of natural gas and oil reserves has been and will continue to be an important aspect of the U. S. economy as demand for energy resources grows. Oil exploration/production occurs in varying water depths and usually over soft-bottom substrates although hard-bottom habitats may be present in the general vicinity. Oil exploration/production areas are vulnerable to an assortment of physical, chemical, and biological disturbances resulting from activities used to locate oil and gas deposits such as high energy seismic surveys to actual physical disruptions resulting from the use and/or installation of anchors, chains, drilling templates, dredging, pipes, platform legs and biofouling communities associated with the platform jacket. During actual operations, the predominant emissions from oil platforms are drilling muds and cuttings, produced water and sanitary wastes.

Adverse Impacts: The impacts of oil exploration-related seismic energy release may interrupt and cause fish to disperse from the acoustic pulse with possible disruption to their feeding patterns. The uses of these high energy sound sources may also disrupt or damage marine life. While available data on fish species does limit concerns regarding potential effects on marine life to sensitive egg and larval stages within a few meters of the sound source, whether this data pertains to all groundfish species is questioned.

Adjacent hard-bottom habitats can be severely impacted by anchoring operations during exploratory operations resulting in the crushing, removal or burial of substrate used for feeding or shelter purposes. Disturbances to the associated epifaunal communities may also result.

The discharge of exploratory drill muds and cuttings can result in varying degrees of change on the sea floor and affect the feeding, nursery and shelter habitat for various life stages of groundfish and shellfish species that are important to commercial and recreational fishers. Drilling muds and cuttings may adversely affect bottom-dwelling organisms (e.g, prey) at the site by burial of immobile forms or forcing mobile forms to migrate. Exploratory activities may also result in resuspension of fine-grained mineral particles, usually smaller than silt in the water column. These suspended particulates may reduce light penetration and lower the rate of photosynthesis and the primary productivity of the aquatic area especially if suspended for lengthy intervals. Groundfish and other fish species may suffer reduced feeding ability leading to limited growth if high levels of suspended particulates persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion.

Benthic forms, especially prey species, present prior to the oil/gas operations may be unlikely to re-colonize if the composition of the substrate is altered drastically. This may be especially true during actual oil/gas production operations when filter-feeding organisms such as mussel colonies may periodically become dislodge from the oil platform and form biological debris mounds on the bottom. This alteration to the sea floor may affect naturally occurring feeding opportunities and spawning habitat.

The discharge of oil drilling muds can change the chemistry and physical characteristics of the receiving water at the disposal site by introducing toxic chemical constituents. Changes in the clarity and the addition of contaminants can reduce or eliminate the suitability of water bodies for habituation of fish species and their prey.

Recommended Conservation Measures:

1. Avoid anchoring exploratory vessels over hard bottom areas as much as possible.

2. Benthic productivity should be determined by sampling prior to any exploratory operations. Areas of high productivity should be avoided to the maximum extent possible. Sampling design should be developed with input from state and Federal resource agencies.

3. Mitigation should be provided for areas impacted.

4. Containment equipment and sufficient supplies to combat spills should be on-site at all facilities that handle oil or hazardous substances.

5. Each facility should have a "Spill Contingency Plan" and all employees should be trained in how to respond to a spill.

6. To the maximum extent practicable, storage of oil and hazardous substances should be located in an area that would prevent spills from reaching the aquatic environment.

7. Construction of roads and facilities adjacent to aquatic environs should include a storm water treatment component that would filter out oils and other petroleum products. Road construction in estuaries should be bridged or adequately culverted to prevent blockage to migrating fish. Culverts should be installed at sufficient intervals to prevent blockage of surface drainage or tidal flow.

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4. **WATER INTAKE STRUCTURES:** The withdrawal of ocean water by offshore water intakes structures is a common coastwide occurrence. Water may be withdrawn for providing sources of cooling water for coastal power generating stations or as a source of potential drinking water as in the case of desalinization plants. If not properly designed, these structures may create unnatural and vulnerable conditions to various fish life stages and their prey. In addition, freshwater withdrawals from riverine systems to support industrial and agricultural operations is also occurs.

   Adverse Impacts: The withdrawal of seawater can create unnatural conditions to the EFH of many species. Various life stages can be affected by water intake operations such as entrapment through water withdrawal, impingement on intake screens, and entrainment through the heat-exchange systems or discharge plumes of both heated and cooled effluent.

   High approach velocities along with unscreened intake structures can create an unnatural current making it difficult for fish species and their prey to escape.. These structures may withdraw most larval and post-larval marine fishery organisms, and some proportion of more advanced life stages. Periods of low light (e.g, turbid waters, nocturnal periods) may also entrap adult and subadult species many of which are either utilized by commercial or recreational fishers or serve as the prey of these species. Freshwater withdrawal also reduces the volume and perhaps timing of freshwater reaching estuarine environments, thereby potentially altering circulation patterns, salinity and the upstream migration of the saltwater wedge.

Recommended Conservation Measures:

1. New facilities that rely on surface waters for cooling should not be located in areas such as estuaries, inlets, heads of submarine canyons, rock reefs or small coastal embayments where fishery organisms are concentrated. New discharge points should be located in areas that have low concentrations of living marine resources, or they should incorporate cooling towers that employ sufficient safeguards to ensure against release of blow-down pollutants into the aquatic environment in concentrations that exceed state and/or federal limits established pursuant to state and/or federal NPDES regulations.

2. All intake structures should be designed to minimize entrainment or impingement of prey species. Power plant intake structures should be designed to meet the "best technology available" requirements as developed pursuant to Section 316b of the Clean Water Act.

3. Discharge temperatures should comply with applicable temperature limits established pursuant to state and/or federal NPDES regulations.

4. Mitigation should be provided for the net loss of habitat from placement of the intake structure and delivery pipeline.

References:

Helvey, M. 1985. Behavioral factors influencing fish entrapment at offshore cooling-water intake structures in southern California. Marine Fisheries Review 47(1) 18-26.

5. **AQUACULTURE:** The culture of estuarine, marine, and freshwater species in coastal areas can reduce or degrade habitats used by native stocks. The location and operation of these facilities will determine the level of impact on the marine environment.

   Adverse Impacts: Aquaculture operations may discharge organic waste and/or antibiotics from the farms into the marine environment. Wastes are composed primarily of feces and excess feed and the buildup of waste products into the receiving waters will depend on water depths and circulation patterns. The release of these wastes may introduce nutrients or organic materials into the surrounding water body and lead to a high biochemical oxygen demand (BOD) which may reduce dissolved oxygen, thereby potentially affecting the survival of many aquatic organisms in the area. Nutrient overloads at the discharge site can also favor one group of organisms to the detriment of other more desirable prey types such as polychaete worms.

   In the case of cage mariculture operations, cultured organisms may escape into the environment. Such operations may also impact the sea floor below the cages or pens. The composition and diversity of the bottom-dwelling community (e.g., prey organisms) due to the build-up of organic materials on the sea floor may be impacted. Growth of submerged aquatic vegetation, which may provide shelter and nursery habitat for a number of fish species and their prey, may be inhibited by shading effects.

Recommended Conservation Measures:

1. Facilities should be close-circuited and located in upland areas as often as possible. Tidally influenced wetlands should not be enclosed or impounded for mariculture purposes. This includes hatchery and grow-out operations. Siting of facilities should also take into account the size of the facility, the presence or absence of submerged aquatic vegetation, proximity of wild fish stocks, migratory patterns, competing uses, hydrographic conditions, and upstream uses. Benthic productivity should be determined by sampling prior to any operations. Areas of high productivity should be avoided to the maximum extent possible. Sampling design should be developed with input from state and Federal resource agencies.

2. Water intakes should be designed to avoid entrainment and impingement of native fauna.

3. Water discharge should be treated to avoid contamination of the receiving water, and should be located only in areas having good mixing characteristics.

4. Where cage mariculture operations are undertaken, water depths and circulation patterns should be investigated and should be adequate to preclude the buildup of waste products, excess feed, and chemical agents.

5. The rearing of non-native, ecologically undesirable species may pose a risk of escape or accidental release into areas adversely affecting the ecological balance. A thorough scientific review and risk assessment should be undertaken before any non-native species are allowed to be introduced.

6. Any net pen structure should have small enough webbing to prevent entanglement.

7. Mitigation should be provided for the areas impacted by the facility.

References:

British Columbia Ministry of Environment, Victoria, (Canada). Water Management Branch. 1990. Environmental management of marine fish farms.28 pp NTIS Order No.: MIC-91-00496/GAR.

6. **WASTEWATER DISCHARGE:** The discharge of wastewater from commercial activities including municipal wastewater treatment plants, power generating stations, industrial plants (e.g., pulp mills, desalination plants) and storm water from drains into open ocean waters, bay or estuarine waters can introduce chemical constituents or salinities potentially detrimental to estuarine and marine habitats. These constituents include pathogens, nutrients, sediments, heavy metals, oxygen demanding substances, hydrocarbons, and toxics. Historically, wastewater discharges have been one of the largest sources of contaminants into coastal waters. However, whereas wastewater discharges have been regulated under increasingly more stringent requirements over the last 25 years, non-point source/stormwater runoff has not been regulated to the same degree and continues to be a significant remaining source of pollution to the coastal areas and ocean. Changes in community structure and function, health and abundance may result due to these discharges. Many of these changes can be long-lasting.

Adverse Impacts: Wastewater effluent and non-point source/stormwater discharges may affect the growth and condition of groundfish, other species of fish, and prey species if high contaminant levels are discharged (e.g., chlorinated hydrocarbons; trace metals; polynuclear aromatic hydrocarbons, pesticides, and herbicides). If contaminants are present, their effects may be manifested by absorption across the gills or through bioaccumulation as a result of consuming contaminated prey. Outfall sediments may alter the composition and abundance of benthic community invertebrates living in or on the sediments. Due to bioturbation, diffusion, and other upward transport mechanisms that move buried contaminants to the surface layers and eventually to the water column, pelagic and nektonic biota may also be exposed through mobilization into the water column.

The use of biocides (e.g., chlorine, heat treatments) to prevent biofouling or the discharge of brine as a byproduct of desalinization can reduce or eliminate the suitability of water bodies for populations of fish species and their prey in the general vicinity of the discharge pipe. The impacts of chlorination and heat treatments, if any, are minimized due to their intermittent use and regulation pursuant to state and/or federal NPDES permit requirements. These compounds may change the chemistry and the physical characteristics of the receiving water at the disposal site by introducing chemical constituents in suspended or dissolved form. In addition to chemical and thermal effects, discharge sites may also create adverse impacts to sensitive areas such as emergent marshes, sea grasses, and kelp beds if located improperly.

Extreme discharge velocities of the effluent may also cause scouring at the discharge point as well as entrain particulates and thereby create turbidity plumes. These turbidity plumes of suspended particulates may reduce light penetration and lower the rate of photosynthesis (e.g., adjacent eelgrass beds or kelp beds) and the primary productivity of an aquatic area if suspension persists. Groundfish and other fish may suffer reduced feeding ability, especially if suspended particulates persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion.

Mass emissions of suspended solids, contaminants and nutrient overloading from these outfalls may also affect submerged aquatic vegetation sites including eelgrass beds and kelp beds. These beds are frequently utilized by groundfish and other fish species for shelter and protection from predators and for food by consuming organisms associated with these beds.

The byproduct of desalinated seawater is brine with a salinity about double that of seawater. The waste brine may be discharged directly to the ocean or discharged through sewage outfalls (where it may be diluted). Because of the short duration of operation, little is known about the toxicity of waste brine, but its potential impacts to early life stages of fish and their prey should be considered .

Storm water runoff, which can include both urban and agricultural runoff, is also a large source of particular contaminants to the marine environment affecting both water column and benthic habitats. These contaminants may find their way into the food web through benthic infaunal communities and subsequently bioaccumulate in numerous fish species.

Recommended Conservation Measures:

1. New outfall structures should be placed offshore sufficiently far enough to prevent discharge water from affecting eel grass or kelp beds. Discharges should be managed to comply with applicable state and/or federal NPDES permit requirements, including compliance with applicable technology-based and water quality-based effluent limits.

2. Benthic productivity should be determined by sampling prior to any construction activity related to installation of new or modified facilities. Areas of high productivity should be avoided to the maximum extent possible. Sampling design should be developed with input from state and Federal resource agencies.

3. Mitigation should be provided for the degradation or loss of habitat from placement and operation of the outfall structure and pipeline.

References:

Bay, S. and D. Greenstein. 1994. Toxic effects of elevated salinity and desalination waste brine. *In:* J. Cross (ed.) Southern California Coastal Water Research Project, Annual Report 1992-93, pp. 149-153. SCCWRP, Westminster, CA.

Environmental Protection Agency; Department of Commerce, National Oceanic and Atmospheric Administration. 1995. Coastal Nonpoint Pollution Control Program. EPA number: 950298D, 100 pages, July 7, 1995.

Ferraro, S. P., R.C. Swartz, F. A. Cole, and D.W. Schults. 1991. Temporal changes in the benthos along a pollution gradient: discriminating the effects of natural phenomena from sewage-industrial wastewater effects. Estuarine Coastal Shelf sei. 33:383-407.

Leonard, J.N. 1994. Ocean outfalls for wastewater discharges -- meeting Clean Water Act 403C requirements. Marine Technology Soc. '94, Conference Proceedings. Challenges and Opportunities in the Marine Environment, Washington, DC, 7-9 Sept. pp. 115-120.

Stull, J. K. and C. I. Haydock. 1989. Discharges and environmental responses: the Palos Verdes case. *In* Managing inflows in California's bays and estuaries. The Bay Institute, Sausalito, Calif. Pp. 44-49.

USEPA. 1993. Guidance for specifying management measures for sources of nonpoint pollution in coastal waters. Office of Water. 840-B-92-002. 500+p.

Raco-Rands, V. E. 1996. Characteristics of effluents from power generating stations in 1994. *In* M. J. Allen (ed.) Southern California Coastal Water Research Project, Annual Report 1994-95. SCCWRP, Westminster, CA, pp29-36.

7. **DISCHARGE OF OIL OR RELEASE OF HAZARDOUS SUBSTANCES**: Accidental spills of oil or the release of a hazardous substance into estuarine and marine habitats can create significant pollution events. These inadvertent releases occur during the production, transportation, refining and utilization of hazardous materials from both facilities and vessels.

   Adverse Impacts: Exposure to petroleum products and hazardous substances from spills or other unauthorized releases can have both acute and chronic effects on groundfish, other fish species, and prey organisms, and also potentially reduce the marketability of target species. Direct physical contact with discharged oil or released hazardous substances (e.g., toxics such as oil dispersants and mercury) or indirect exposure resulting from food chain processes can produce a number of biological responses in fish resources and their prey. Exposure can occur in a variety of habitats including the water column, sea floor, bays, and estuaries. Depending on the biological pathway involved, these biological responses may include death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions

(including malfunctions in reproduction), or physical deformations of fish that are important to commercial and recreational fishers.

Other issues related to the category include efforts to cleanup spills or releases that in themselves can create serious harm to the habitat. For example, the use of potentially toxic dispersants to break up an oil spill may adversely effect the egg and larval stages of most groundfish species.

Recommended Conservation Measures:

1. Containment equipment and sufficient supplies to combat spills should be on-site at all facilities that handle oil or hazardous substances.

2. Facilities should have a "Spill Contingency Plan" where required by applicable local, state or federal requirements, and employees identified in the plan as having responsibility for responding to a spill should receive appropriate training.

3. To the maximum extent practicable, storage of oil and hazardous substances should be located in an area that would prevent spills from reaching the aquatic environment.

4. Construction of roads and facilities adjacent to aquatic environs should include a stormwater treatment component that would filter out oils and other petroleum products.

References:

Armstrong, D. A., P. A. Dinnel, J. M. Orensanz, J. L. Armstrong, T. L. McDonald, R. F. Cusimano, R. S. Nemeth, M. L. Landolt, J. R. Skalski, R. F. Lee, and R. J. Huggett. Status of Selected Bottomfish and Crustacean Species in Prince William Sound Following the Exxon Valdez Oil Spill. IN: Exxon Valdez Oil Spill: Fate and Effects in Alaskan Waters, ASTM STP 1219, pp. 485-547, Peter G. Wells, James N. Butler, and Jane S. Hughes, Eds., American Society for Testing and Materials, Philadelphia, 1995.

California Department of Fish and Game. Quick approval process for dispersant use in waters off California. Unpublished, undated document. Person. Comm. from Michael Sowby, CDFG, Oil Spill Prevention and Response Office to Mark Helvey, NMFS, March, 1998.

Southern California Coastal Water Research Project. 1992. Hazardous spills in the Southern California Bight. *In:* J. Cross (ed.) Annual Report 1990-91 and 1991-92, pp. 29-38. SCCWRP, Westminster, CA. 92683.

8. **FISH ENHANCEMENT STRUCTURES**: The construction of fish enhancement structures, or the more common term of "artificial reefs", are a popular management tool employed by state and Federal governments and private groups. These structures have been used for centuries to enhance fishery resources and fishing opportunities and usually entail placing miscellaneous materials in ocean or estuarine environments void of physical or "hard-bottom" relief. While scientists still debate the unsettled argument of whether reefs attract and/or produce fish biomass, the proliferation of artificial reefs continues. This popularity results from increased demands on fish stocks by both commercial and recreational fishermen and losses of habitat productivity due to development and pollution. However, the introduction of artificial reef material into the marine or estuarine environment can also produce negative impacts.

   Adverse Impacts: The use of artificial reefs can adversely impact the aquatic environment in at least two ways. The first deals with the loss of habitat upon which the reef material is placed. Usually, reef materials are set upon flat, relatively barren sandy sea floor; such placement may bury or smother faunal and bottom-dwelling organisms at the site or even preventing mobile forms (e.g., benthic-oriented fish species) from utilizing the area. This effect has been shown in Hawaii.

   The second potential adverse impact results from use of inappropriate materials such as automobile tires or compressed incinerator ash that may degrade the marine habitat degradation. For example,

automobile tires may release toxic substances into the marine environment and may cause physical damage to existing habitat if they break free of their anchoring systems.

Recommended Conservation Measures:

1. Benthic productivity should be determined by sampling prior to any construction activity. Areas of high productivity should be avoided to the maximum extent possible. Sampling design should be developed with input from state and Federal resource agencies.

2. Prior to construction, an evaluation of the impact resulting from the change in habitat (sand bottom to rocky reef, etc.) should be performed.

3. Post-construction monitoring should be conducted to determine the effectiveness of the structures in actually increasing productivity of the targeted species.

References:

Buckley, R. M. 1989. Habitat alterations as a basis for enhancing marine fisheries. Calif. Coop. Oceanic Fish. Invest. Rep. 30:40-45.

Livingston, R. J. 1994. Environmental implications of establishment of a coal--ash reef near Cedar Key, Florida, United States. Bull. Mar. Sci. 55(2-3): 1344.

McGurrin, JM, R. B. Stone, and R. J. Sousa. 1989. Profiling United States artificial reef development. Bull. Mar. Sci. 44(2): 1004-1013.

Nelson, W. G., T. Neff, P. Navratil and J. Rodda. 1994. Disturbance effects on marine infaunal benthos near stabilized oil-ash reefs: Spatial and temporal alteration of impacts. Bull. Mar. Sci. 55(2-3): 1348.

Polovina, J. J. 1989. Artificial reefs: Nothing more than benthic fish aggregators. Calif. Coop. Oceanic Fish. Invest. Rep. 30:37-39.

9. **COASTAL DEVELOPMENT IMPACTS**: Coastal development involves changes in land use by the construction of urban, suburban, commercial, and industrial centers and the corresponding infrastructure. Vegetated areas are removed by cut-and-fill activities for enhancing the development potential of the land. Portions of the natural landscape are converted to impervious surfaces resulting in increased runoff volumes. Runoff from these developments may include heavy metals, sediments, nutrients and organics, including synthetic and petroleum hydrocarbons, yard trimmings, litter, debris, and pet droppings. As residential, commercial and industrial growth continues, the demand for water escalates. As ground water resources become depleted or contaminated, greater demands are placed on surface water through dam and reservoir construction or other methods of freshwater diversion. The consumptive use and redistribution of significant volumes of surface freshwater causes reduced river flows that can affect salinity regimes as saline waters intrude further upstream.

   Impacts: Development activities within watersheds and in coastal marine areas often impact habitat of groundfish and other fish species on both long-term and short-term scales. Runoff from development sites of toxics reduces the quality and quantity of suitable fish habitat by the introduction of pesticides, fertilizers, petrochemicals, construction chemicals (e.g., concrete products, seals and paints). Sediment runoff can also restrict tidal flows tidal elevations resulting in losses of important fauna and flora (e.g., submerged aquatic vegetation). Shoreline stabilization projects that affect reflective wave energy can impede or accelerate natural movements of sand and thereby impacting intertidal and sub-tidal habitats. Wetlands serve an important function for exporting nutrients and energy, as well as serving as fish nursery areas, and loss or reduction of this function results from both reduction of geographic size and by input material exceeding processing capacity. Reduced freshwater flow into estuaries and wetlands can reduce productivity and habitat quality for fish by impacting the extent and location of the mixing (or entrapment) zone.

Recommended Conservation Measures:

1. Prior to installation of any piers or docks, the presence or absence of submerged aquatic vegetation should be determined. Vegetated areas should be avoided. Benthic productivity should also be determined and areas with high productivity avoided. Sampling design should be developed with input from state and federal resource agencies.

2. The use of dry stack storage is preferable to wet mooring of boats. If that method is not feasible, construction of piers, docks and marinas should be designed to minimize impacts to the substrate and subaquatic vegetation.

3. Bioengineering should be used to protect altered shorelines. Natural stable shorelines should not be altered.

4. Filling of estuaries, wetlands, and bays for commercial enterprises should be curtailed.

References:

Baird, RC. 1996. Toward new paradigms in coastal resource management: Linkages and institutional effectiveness. Spagnolo, RJ; Ambrogio, E; Rielly, FJ Jr (eds). Estuaries, 19(2A): 320-335.

Drinkwater, KF and K.T. Frank. 1994. Effects of river regulation and diversion on marine fish and invertebrates. Aquat. Conserv.: Mar. Freshwat. Ecosyst. 4(2): 135-151.

McLusky, D.S., D. M. Bryant, and M. Elliot. 1992. The impact of land-claim on macrobenthos, fish and shorebirds on the Forth Estuary, eastern Scotland. Aquat. Conserv.: Mar. Freshwat. Ecosyst. 2 (3): 211-222.

Paul, J.F., K. J. Scott, A. F. Holland, S. B. Weisberg, J. K. Summers and A. Robertson. 1992. The estuarine component of the US E.P.A.'s Environmental Monitoring and Assessment Program. Papers from the First International Ocean Pollution Symposium, 28th April 1991--2nd May 1991. University of Puerto Rico, Puerto Rico, (Part Two). Chem. Ecol.7 (1-4): 93-116.

Rozengurt, M.A., I. Haydock, and B.P. Anderson. 1994. Running on entropy: The effect of water diversion on the coastal zone. 37th Conference of the International Association for Great Lakes Research and Estuarine Research Federation: Program and Abstracts., Buffalo, NY (USA). 166pp.

Turek, J. G., T. E. Bigford, and J. S. Nichols. 1987. Influence of freshwater inflows on estuarine productivity. NOAA Tech. Memo. NMFS-F/NEC-46. 26p.

U.S. Environmental Protection Agency. 1993. Guidance for specifying management measures for sources of nonpoint pollution in coastal waters. Office of Water. 840-B-92-002. 500+p.

10. **INTRODUCTION OF EXOTIC SPECIES**: Over the past two decades, there has been an increase in introductions of exotic species into marine habitats. Introductions can be intentional (e.g., for the purpose of stock or pest control) or unintentional (e.g., fouling organisms).

    Adverse Impacts: Exotic species introductions create five types of negative impacts (1) habitat alteration, (2) trophic alteration; (3) gene pool alteration, (4) spatial alteration; and, (5) introduction of diseases. Habitat alteration includes the excessive colonization of exotic species (e.g., San Diego bivalve and *Spartina* grass) which preclude endemic organisms (e.g., eelgrass). The introduction of exotic species may alter community structure by predation on native species (e.g., Japanese oyster drill, Chinese mitten crab, *Tilapia,* Oriental goby, striped bass) or by population explosions of the introduced species (e.g., Asian clam, green crab). Spatial alteration occurs when territorial introduced species compete with and displace native species. Although hybridization is rare, gene pool deterioration may occur between native and introduced species. One of the most severe threats to a native fish community is the introduction of bacteria, viruses, and parasites that reduce the quality of the habitat.

Recommended Conservation Measures:

1. Vessels should discharge ballast water far enough out to sea to prevent introduction of non-native species to bays and estuaries.

2. Exotic species should not be introduced for aquaculture purposes unless a thorough scientific evaluation and risk assessment is performed (see section on aquaculture).

3. Effluent from public aquaria displays, and laboratories and educational institutes using exotic species should be treated prior to discharge.

4. Avoid, to the extent practical, livestock grazing in areas with invasive, non-indigenous vegetation and the subsequent movement of such livestock to other areas.

References:

Kohler, C.C. and W. R. Courtenay, Jr. 1986. Introduction of aquatic species. Fisheries 11(2): 39-42. Proceedings of the Seventh International Zebra Mussel and Aquatic Nuisance Species Conference. 1997

11. **AGRICULTURAL PRACTICES**: Agricultural operations can result in the introduction of fertilizers, herbicides, insecticides, and other chemicals into the aquatic environment from the uncontrolled nonpoint source runoff draining agricultural lands. Additionally, agricultural runoff transports animal wastes and sediments into riverine, estuarine, and marine environments. Excessive uncontrolled or improper irrigation practices often exacerbate contaminant flushing.

    Adverse Impacts: The introduction of fertilizers, herbicides, insecticides, animal wastes and other chemicals into the aquatic environment, especially estuaries, can affect the growth of aquatic plants, which in turn affects groundfish and other fish, invertebrates and the general ecological balance of the water body. Pollutants associated with these products include oxygen demanding substances, nitrogen, phosphorous, and other nutrients; organic solids; bacteria, viruses, and other microorganisms and salts. Runoff transporting these pollutants and wastes may reduce habitat quality to the extent of creating unsuitable habitats for shelter, feeding, spawning and if conditions are extreme, result in fish kills.

Recommended Conservation Measures:

1. The use of pesticides, herbicides, and fertilizers in areas that would allow for their entry into the marine environment should be avoided.

2. Avoid, to the extent practicable, impacts to tidal wetland areas resulting from livestock.

References:

U.S. Environmental Protection Agency. 1993. Guidance for specifying management measures for sources of nonpoint pollution in coastal waters. Office of Water. 840-B-92-002. 500+p.

12. **LARGE WOODY DEBRIS REMOVAL:** Natural events (e.g., storms) and timber practices create situations where fallen trees end up in river systems and eventually work their way into estuaries and subsequently into coastal systems. This timber or "woody debris" plays a significant role in salt marsh ecology.

    Adverse Impacts: Woody debris is often removed before reaching estuarine and coastal destination for a variety of reasons including dam operations, aesthetics and commercial use of the wood. Reductions in woody debris inputs to estuarine and coastal ecosystems may affect the ecological balance. For example, large woody debris plays a significant role in benthic ocean ecology, where deep-sea wood borers convert the wood to fecal matter providing terrestrial based carbon to the ocean food chain. The continued dwindling supply of wood may jeopardize the ecological link between the forest and the sea.

Recommended Conservation Measures:

1. Remove woody debris only when it presents a threat to life or property. Leave large woody debris wherever possible. Reposition, rather than remove woody debris which must be moved.

2. Encourage appropriate state agencies to prohibit commercial removal of woody debris from rivers, estuaries and beaches.

3. Encourage appropriate state and Federal agencies to aid in the downstream movement of large woody debris around dams, rather than removal from the system.

References:

Maser, C. and J.R. Sedell. 1994. From the forest to the sea: the ecology of wood in streams, estuaries and oceans. St. Lucie Press, Delray Beach, Florida. 200 pp.

13. **COMMERCIAL RESOURCE HARVESTING**: The giant kelp forest canopy serves as nursery, feeding grounds and/or shelter to a variety of groundfish species and their prey. In addition, when kelp plants are naturally broken free of their holdfasts, the kelp (i.e., drift kelp) is carried by waves and currents along the bottom and down submarine canyons to deep-water habitats and in surface waters to beaches and rocky intertidal areas. Kelp detritus supports high secondary production and prey for many fishes the commercial harvest of giant kelp forests has been a thriving industry in California since 1910. Harvesting is undertaken by ships designed specifically for cutting the surface canopy no lower than 1.2 meters below the surface in a strip eight meters wide, much like a lawn mower. Regulations are imposed by the State of California to ensure that harvesting activities have a minimal impact on kelp forests. Kelp canopies cut according to this regulation generally grow back within several weeks to a few months.

Adverse Impacts: Kelp harvesting can have a variety of possible impacts on kelp forests and nearshore communities. For example, giant kelp is a source of food for other marine communities and unregulated harvest of kelp can potentially remove a substantial portion of this source. The kelp canopy also serves as habitat for canopy-dwelling invertebrates and has may have an enhancing effect on fish recruitment and abundance; these functions can be severely impeded by unregulated harvesting operations. Removal of the canopy can displace fish species such as young-of-the-year rockfishes. Extensive or permanent loss of kelp canopy could have adverse impacts on local fish recruitment and abundance.

Recommended Conservation Measures:

1. Continue regulation of kelp harvesting by appropriate state agencies to ensure minimal impacts on kelp forests.

2. Encourage research into the timing of fish recruitment to kelp canopies and the response of canopy dwelling juvenile groundfish to kelp harvesting operations in order to appropriately modify kelp harvesting regulations, to minimize potential adverse impacts to canopy habitat function.

3. Encourage development of harvesting methods to minimize impacts on kelp canopies such as the destruction of canopy-dwelling invertebrates and the loss of food and/or habitat to fish populations during harvesting operations.

4. Mitigation for unavoidable extensive or permanent loss of kelp canopy should be provided.

5. Creation of artificial reefs with attached kelp should be considered in cases where reefs are used for compensatory mitigation.

6. With the primary requirement for the existence of a kelp forest being hard substrata, efforts to prevent sedimentation and burial of this substrata by man-induced activities should be emphasized.

References:

California Department of Fish and Game 1995. Giant and Bull Kelp Commercial and Sport Fishing Regulations. Final Environmental Document.

Cross, J. N. And L. G. Allen. 1993. Fishes. *In* M. D. Dailey, D. J. Reish, and J. W. Anderson (eds.). Ecology of the Southern California Bight, Univ. Calif. Press, Berkeley, CA., pp.459-540.

Feder, H. M., C. H. Turner, and C. Limbaugh. 1974. Observations on fishes associated with kelp beds in southern California. California Department of Fish and Game, Fish Bull. 160. 144 pp.

Foster, M. S. And D. R. Schiel. 1985. The ecology of giant kelp forests in California: A community profile. U. S. Fish Wildl. Serv. Biol. Rep. 85(7.2) 152 pp.

Vetter, E. W. 1995. Detritus based patches of high secondary production in the nearshore benthos. Mar. Ecol. Prog. Ser. 120:251-262.

TABLE 1. Adverse Nonfishing Activities, Impacts and Conservation/Enhancement Measures for Pacific Groundfish EFH.

ACTIVITY	**IMPACTS** (Potential)	**CONSERVATION MEASURES** (Advisory)
1. Dredging	• Infaunal and bottom-dwelling organisms • Turbidity plumes • Bioavailability of toxics • Damage to sensitive habitats • Modify water circulation	• Curtail/minimize new dredging activities as practicable • Take actions to prevent impacts to flora/fauna • Geo-reference all dredge sites • Contaminant assays • Reference past/current dredging operations • Curtail sources of excessive sedimentation • Maintain seafloor contours as practicable • Curtail sloughing events • Avoid impacts of accessory equipment • Minimize turbidity • Compensatory mitigation obligations for significant impacts
2. Dredge Material Disposal/fills	• Infaunal and bottom-dwelling organisms • Turbidity plumes • Toxics becoming biologically available • Damage sensitive habitats • Modify current patterns/ water circulation • Loss of habitat function	• Consider upland: avoid fills in productive areas • Address cumulative impacts • Offshore disposal of dredge material in EFH to meet applicable quality standards • Identify direct and indirect impacts on EFH • Minimize areal extent of the disposal site • Geo-reference the site • Explore beneficial use of clean dredged material

TABLE 1. Adverse Nonfishing Activities, Impacts and Conservation/Enhancement Measures for Pacific Groundfish EFH.

3. Oil/Gas Exploration/Production	• Seismic energy release • Crushing, removal or burial of substrate • Discharge of exploratory drill muds and cuttings • Resuspension of fine-grained mineral particles • Composition of the substrate altered	• Avoid anchoring impacts • Avoid areas of high productivity • Provide mitigation • On-site containment equipment • Maintain "spill contingency plan" • Keep oil and hazardous substances from reaching the aquatic environment • Adequate shoreline barriers and passages
ACTIVITY	**IMPACTS**	**CONSERVATION MEASURES**
4. Water Intake Structures	• Entrapment, impingement, and entrainment • Loss of prey species	• Locate new facilities away from productive areas • Minimize entrainment or impingement of prey species per CWA 316b. • Discharge temperatures to meet applicable discharge limits • Mitigate net habitat losses
5. Aquaculture	• Discharge of organic waste from the farms • Impacts to the seafloor below the cages or pens	• Minimize water/habitat quality impacts • Avoid entrainment and impingement losses • Treat and mix water discharges • Preclude waste product buildups • Undertake risk assessment prior to introducing non-native species • Prevent entanglement of prey species. • Mitigate impacts

TABLE 1. Adverse Nonfishing Activities, Impacts and Conservation/Enhancement Measures for Pacific Groundfish EFH.

6. Wastewater Discharge	• Wastewater effluent with high contaminant levels • High nutrient levels downcurrent of these outfall • Biocides to prevent biofouling • Thermal effects • Turbidity plumes • Affect submerged aquatic vegetation sites • Stormwater runoff	• Avoid areas of high productivity • Mitigate as required for net habitat losses
7. Oil Discharge/ Hazardous Substances Release	• Direct physical contact • Indirect exposure resulting • Cleanup	• Maintain on-site containment equipment and supplies • On-site "Spill Contingency Plan" • Prevent spills from reaching the aquatic environment
8. Fish Enhancement Structures	• Loss of habitat • Inappropriate materials • Aggregation vs. production	• Avoid areas of high productivity • Evaluate impacts to existing habitat • Determine productivity of structures after construction
ACTIVITY	**IMPACTS**	**CONSERVATION MEASURES**
9. Coastal Development Impacts	• Contaminant runoff • Sediment runoff • Shoreline stabilization projects	• Shoreline construction should avoid productive areas • Use dry stack storage over wet mooring • Curtail fills in estuaries, wetlands and bays
10. Introduction of Exotic Species	• Habitat alteration • Trophic alteration • Gene pool alteration • Spatial alteration • Introduction of disease	• Vessels should take precautions to prevent non-native species introductions • Undertake risk assessment prior to introducing non-native species for aquaculture purposes • Effluents should be treated prior to discharge. • Avoid livestock grazing in areas with invasive, non-indigenous vegetation

TABLE 1. Adverse Nonfishing Activities, Impacts and Conservation/Enhancement Measures for Pacific Groundfish EFH.

11. Agricultural Practices	• Introduction of chemicals • Introduction of animal wastes	• Avoid migration of pesticides, herbicides and fertilizers aquatic environments • Avoid livestock impacts to tidal wetland areas
12. Large Woody Debris Removal	• Removal affects estuarine ecological balance • Removal affects benthic ocean ecology	• Leave or reposition large woody debris wherever possible • Eliminate commercial removal of woody debris from rivers, estuaries and beaches • Allow for downstream movement of large woody debris around dams
13. Commercial Resource Harvesting	• Permanent or temporary destruction to habitat • Impacts to organisms	• Avoid harvesting during periods of larval fish recruitment • Mitigate loss of kelp canopy functions • Monitor juvenile fish population response to harvesting • Prevent degradation of kelp beds • Create kelp reefs

11.10.5 Consultation Procedures - Nonfishing Impacts

The Magnuson-Stevens Act requires federal agencies undertaking, permitting or funding activities that may adversely affect EFH to consult with NMFS. Under section 305 (b)(4) of the Magnuson-Stevens Act, NMFS is required to provide EFH conservation and enhancement recommendations to federal and state agencies for actions that adversely affect EFH. However, state agencies and private parties are not required to consult with NMFS. EFH consultations will be combined with existing interagency consultations and environmental review procedures that may be required under other statutes such as the Endangered Species Act, Clean Water Act, the National Environmental Policy Act, the Fish and Wildlife Coordination Act, the Federal Power Act, or the Rivers and Harbors Act.

EFH consultation may be at either a broad programmatic level or project-specific level. Programmatic is defined as "broad" in terms of process, geography, or policy (e.g., "national level" policy, a "batch" of similar activities at a "landscape level", etc.). Where appropriate, NMFS will use a programmatic approach designed to reduce redundant paperwork and to focus on the appropriate level of analysis whenever possible. The approach would permit project activities to proceed at broad levels of resolution so long as they conform to the programmatic consultation. The wide variety of development activities over the extensive range of EFH, and the Magnuson-Stevens Act requirement for a cumulative effects analysis warrants this programmatic approach.

11.10.6 Research Needs

Many data gaps and research needs are readily apparent as a result of the efforts to identify EFH, fishing and nonfishing impacts to EFH, and conservation measures to protect, restore and enhance EFH. These findings reinforce and complement habitat research needs previously identified in the FMP and other documents such as the Council's Research and Data Needs document. For example, a very comprehensive list of research needs has been identified as a significant component of Oregon's Ocean Resources Management Plan (State of Oregon 1991); they often are applicable throughout the EEZ and most have not been met. Several recommended research needs for EFH are taken from this list and contributions received from the technical team and others interested in marine fish, fishery and habitat issues.

The following recommendations for research needs directly support implementation of the proposed recommendations in this amendment and provide for improved protection, restoration and enhancement of EFH for a healthy ecosystem and productive fisheries over the long term. The Council will integrate these recommendations into the Research and Data Needs document. The Council will emphasize research needs to better identify and preserve EFH for populations whose productivity may be seriously impaired as a result of habitat loss or degradation and for populations whose habitat needs are very poorly or not known. These recommendations are also based on the assumption that ongoing EFH activities will continue to gather and incorporate existing information that could not be incorporated to date. Also, research studies often can address multiple needs simultaneously and the list below is not intended to represent independent research efforts. Further, habitat is meant in the broad context of its physical, chemical and biological characteristics.

- Specifically identify habitat areas of particular concern: those rare, sensitive and vulnerable habitats (to adverse fishing and nonfishing effects). Identify associated life stages and their distributions, especially for species and life stages with level 1 (or no) information. Develop appropriate protection, restoration, and enhancement measures.

- Identify any existing areas that may function as "natural" reserves and protection measures for these areas.

- Map benthic habitats on spatial scales of the fisheries and with sufficient resolution to identify and quantify fish/habitat associations, fishery effects on habitat, and the spatial structure of populations. Mapping of the rocky areas of the continental shelf is critical for the identification of the rocky shelf and nonrocky shelf composite EFHs.

- Explore merits of harvest refugia as a potential management tool. Determine candidates, sites, and criteria for refugia; develop quantitative and qualitative methods to assess the effectiveness of the refugia; and develop methods to protect refugia from anthropogenic impacts.

Conduct experiments to assess the effects of various fishing gears on specific habitats on the West Coast and to develop methods to minimize those impacts, as appropriate. From existing and new sources, gather sufficient information on fishing activities for each gear type to prioritize gear research by gear, species, and habitat type.

- Explore and better define the relationships between habitat, especially EFH, and productivity of groundfish species. Improved understanding of the mechanisms that influence larval dispersal and recruitment is especially important.

- Evaluate the potential for incentives as a management tool to minimize adverse effects of fishing and nonfishing activities on EFH.

- Standardize methods, classification systems, and calibrate equipment and vessels to provide comparable results in research studies and enhance collaborative efforts.

- Develop methods, as necessary, and monitor effectiveness of recommended conservation measures for nonfishing effects. Develop and demonstrate methods to restore habitat function for degraded habitats.

Reference:

Oregon Ocean Resources Task Force. 1991. Oregon's Ocean Resources Management Plan. State of Oregon. Portland, Oregon. 202p.