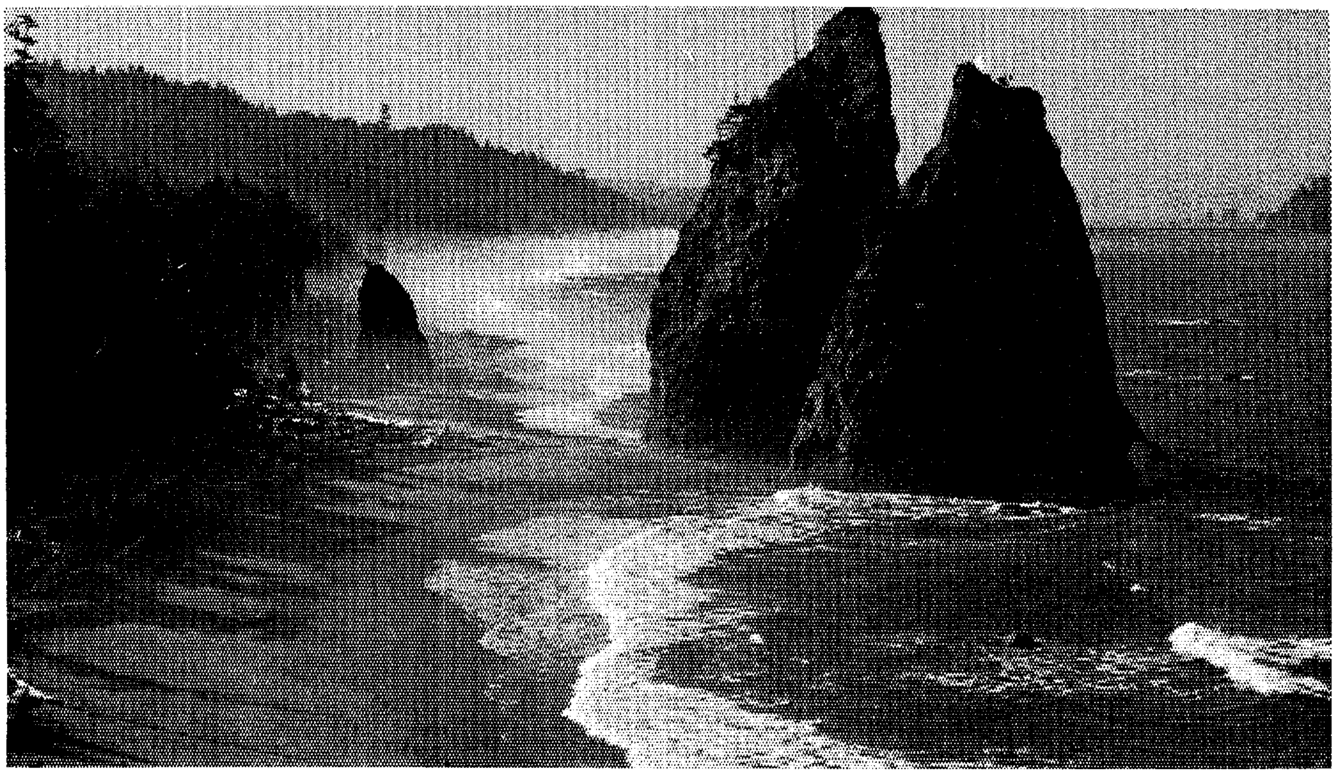
Olympic Coast National Marine Sanctuary

Final Environmental Impact Statement/Management Plan
Volume 1



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November 1993

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Sanctuaries and Reserves Division

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Sanctuaries and Reserves Division

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UNITED STATES DEPARTMENT OF COMMERCE

FINAL ENVIRONMENTAL IMPACT STATEMENT AND MANAGEMENT PLAN FOR THE OLYMPIC COAST NATIONAL MARINE SANCTUARY

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Title

Final Environmental Impact Statement and Management Plan for the Olympic Coast National Marine Sanctuary

Abstract

The National Oceanic and Atmospheric Administration (NOAA) proposes to implement the designation of marine and intertidal coastal waters adjacent to the Olympic Peninsula of Washington State, and the submerged lands thereunder, as a National Marine Sanctuary. The Final Environmental Impact Statement/Management Plan (FEIS/MP) differs from the Draft Environmental Impact Statement/Management Plan (DEIS/MP) in three significant ways. First, although the preferred boundary in the Strait of Juan de Fuca is at Koitlah Point both in the DEIS/MP and FEIS/MP, the study area has been expanded, pursuant to public comments, to include waters of the Strait of Juan de Fuca eastward to Observatory Point. Second, oil and gas development is prohibited within the Sanctuary. Third, as long as the permit exists authorizing the Navy to use Sea Lion Rock as a practice bombing target, NOAA is imposing a condition on the permit limiting access to the rock from November 1 through April 30. When, and if, the permit is revoked by the U.S. Fish and Wildlife Service (USFWS), no practice bombing in the Sanctuary will be allowed.

The Sanctuary boundary encompasses approximately 2,500 square nautical miles (8,577 km^2) of ocean waters, and submerged lands thereunder, over the continental shelf, from the United States/Canada international boundary to the southern boundary of the Copalis National Wildlife refuge. The boundary extends from Koitlah Point, near Neah Bay, due north to the United States/Canada border, then proceeds in a northwesterly direction to a point just north of Buoy Juliette where it intersects the Exclusive Economic Zone (EEZ). The boundary then follows the EEZ in a westerly then southwesterly direction where it intersects the 100 fathom isobath at latitude 48°14 46"'N, longitude 125°40'59"W. The boundary continues southeasterly in a straight line, approximating the 100 fathom isobath, to a point at latitude 47°57'13"N, longitude 125°29'13"W. There, it continues across the head of Juan de Fuca Canyon by continuing southeasterly in a straight line to a point at latitude 47°50'01"N, longitude 125°05'42"W. It then follows a straight line in a more southerly direction to a point at latitude 47°40'05"N and longitude 125°04'44"W. The boundary then approximates the 100 fathom isobath to 47°35'05"N and longitude 125°00'00"W. The boundary then continues in a straight line in a southerly direction, crossing the head of Quinault Canyon, to a point west of the mouth of the Copalis River at latitude 47°07'45"N, longitude 124°58'12"W. It then continues due east to the shoreline. The coastal boundary of the Sanctuary reaches to the mean higher high water line except when adjacent to either Indian reservations or State owned land, where it extends only to mean lower low water, cutting across the mouths of any rivers.

Part I of this (FEIS/MP) is the Executive Summary. It reviews the authority for Sanctuary designation, the goals of the National Marine Sanctuary Program, the purpose and need for designating a national marine sanctuary off the Olympic Peninsula, the socioeconomic consequences of designation, the manageability of the area, and a description of the Sanctuary designation process.

Part II of the FEIS/MP describes the study area used for determining a final preferred boundary alternative, including human uses, natural resources, and the existing resource protection regime. The area recommended for the proposed Sanctuary, boundary alternative 4 (approximately 2,635 square nautical miles), provides the habitat and setting for a distinctive assortment of living and non-living marine resources.

Part III examines the alternatives considered in developing the proposal to designate a national marine sanctuary off the Olympic Peninsula. These alternatives were considered in terms of achieving optimum protection for the ecosystem, improving scientific knowledge of the area, promoting public understanding of the value of the resources, minimizing overlap with existing political jurisdictions and minimizing any harmful effects to the area's economy. Based on these criteria, preferred boundary, management, and regulatory alternatives were selected.

Part IV of the FEIS/MP describes environmental and socioeconomic consequences associated with each alternative.

Part V describes the management plan for the Sanctuary. This plan is intended to ensure that all actions taken after designation will meet stated Sanctuary objectives. Management actions are considered in four program categories: (1) Resource protection; (2) Research; (3) Education; and (4) Administration.

Volume II of the FEIS/MP contains the appendices including the Response to Comments and Designation Document.

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FINAL ENVIRONMENTAL IMPACT STATEMENT AND MANAGEMENT PLAN FOR THE PROPOSED OLYMPIC COAST NATIONAL MARINE SANCTUARY

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LIST OF ACRONYMS

Acronym	Meaning
APA	Administrative Procedure Act
AGL	Above Ground Level
ARPA	Archeological Resources Protection Act
ASA	Abandoned Shipwreck Act
ATBA	Area to be Avoided
ATCAA	Air Traffic Control Assigned Air Space
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
COE	U.S. Army Corps of Engineers
CVTMS	Coordinated Vessel Traffic Management System
CWA	Clean Water Act
DEIS/MP	Draft Environmental Impact Statement/Management Plan
DWT	Dead Weight Ton
EEZ	Exclusive Economic Zone
EPA	Environmental Protection Act
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FDA	Food and Drug Administration
FE	Federal Endangered
FEIS/MP	Final Environmental Impact Statement/Management Plan
FMP	Fishery Management Plan
FT	Federal Threatened
IMO	International Maritime Organization
JCG	Joint Coordinating Group
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships
MBTA	Migratory Bird Treaty Act
MFCMA	Magnuson Fishery Conservation and Management Act
MOA	Military Operating Area
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MPA	Marine Preservation Association
MPPRCA	Marine Plastic Pollution Research and Control Act
MPRSA	Marine Protection, Research and Sanctuaries Act
MSRC	Marine Spill Response Corporation
NAS	National Academy of Sciences
NEP	National Estuary Program
NEPA	National Environmental Policy Act
NERRS	National Estuarine Research Reserve System
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NWIFC	Northwest Indian Fisheries Commission
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf

OMS	Washington State Office of Marine Safety
OPA 90	Oil Pollution Act of 1990
ORAP	Ocean Resources Assessment Program
PFMC	Pacific Fishery Management Council
PSVTS	Puget Sound Vessel Traffic Service
SAB	NOAA's Strategic Assessment Branch
SE	State Endangered
SEL	Site Evaluation List
SEPA	State Environmental Protection Act
SMA	Shoreline Management Act
SSC	Sanctuary Steering Committee
ST	State Threatened
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
WDCD	Washington Department of Community Development
WDOE	Washington Department of Ecology
WDF	Washington Department of Fisheries
WDNR	Washington Department of Natural Resources
WDOA	Washington Department of Agriculture
WDW	Washington Department of Wildlife
WSPA	Western States Petroleum Association

PART I: Executive Summary

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PART I: EXECUTIVE SUMMARY

I. INTRODUCTION

In accordance with Title III of the Marine Protection, Research, and Sanctuaries Act (MPRSA), as amended, 16 U.S.C. §§ 1431 et seq. (MPRSA), this FEIS/MP proposes the establishment of a national marine sanctuary off the Olympic Peninsula of Washington State to facilitate the long-term management, protection, understanding and awareness of its resources and distinctive attributes.

Title III of the MPRSA authorizes the Secretary of Commerce to designate discrete areas of the marine environment having special national significance as national marine sanctuaries so as to ensure comprehensive management, conservation and protection of their recreational, ecological, historical, research, educational, or aesthetic resources and quality. The U.S. Congress directed NOAA (P.L. 100-627, section 205) to designate the Western Washington Outer Coast (referred to herein as the Olympic Coast) as a National Marine Sanctuary.

II. The National Marine Sanctuary Program

Consistent with the mission of developing a system of National Marine Sanctuaries for the long-term benefit and enjoyment of the public, the following policies were established for the program by section 301(b) of the 1992 re-authorization of the MPRSA (P.L. 102-587):

1. to identify and designate as national marine sanctuaries areas of the marine environment which are of special national significance;

2. to provide authority for comprehensive and coordinated conservation and management of these marine areas, and the activities affecting them, in a manner which complements existing regulatory authorities;

3. to support, promote, and coordinate scientific research on, and monitoring of, the resources of these marine areas, especially long-term monitoring of these areas;

4. to enhance public awareness, understanding, appreciation, and wise use of the marine environment;

5. to facilitate to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of these marine areas not prohibited pursuant to other authorities;

6. to develop and implement coordinated plans for the protection and management of these areas with appropriated Federal agencies, State and local governments, Native American tribes and organizations, international organizations, and other public and private interests concerned with the continuing health and resilience of these marine areas;

7. to create models of, and incentives for, ways to conserve and manage these areas;

8. to cooperate with global programs encouraging conservation of marine resources; and

9. to maintain, restore, and enhance living resources by providing places for species that depend upon these marine areas to survive and propagate.

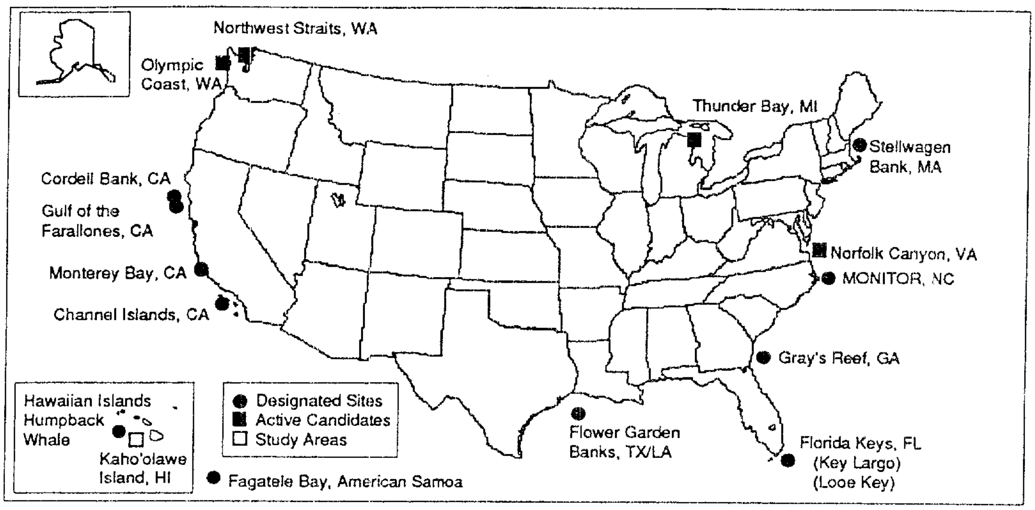
Thirteen National Marine Sanctuaries have been established since the Program's inception in 1972 (Figure 1):

1. The Monitor National Marine Sanctuary serves to protect the wreck of the Civil War ironclad, U.S.S. MONITOR. It was designated in January 1975 and is located 16 miles southeast

NOAA National Marine Sanctuary Program

Marine Sanctuary Designation Status

October 1992



Sanctuary Program Sites

Designated Sanctuaries

Stellwagen Bank, Massachusetts
USS Monitor, North Carolina
Gray's Reef, Georgia
Florida Keys, Florida
  Key Largo
  Looe Key
Flower Garden Banks, Texas/Louisiana
Channel Islands, California
Monterey Bay, California
Gulf of the Farallones, California
Cordell Bank, California
Hawaiian Islands Humpback Whale
Fagatele Bay, American Samoa

Active Candidates

Thunder Bay, Michigan
Norfolk Canyon, Virginia
Olympic Coast, Washington
Northwest Straits, Washington

Congressional Study Areas

Kaho'olawe Island, Hawaii

SEL Sites

Natural Resource Sites (1983)

Green Bay (Lake Michigan), Wisconsin
Apostle Islands/Isle Royale (Lake Superior), MI/WI
Western Lake Erie Islands, Ohio
Cape Vincent (Lake Ontario), New York
Nantucket Sound, Massachusetts
Mid-Coastal Maine
Virginia/Assateague Island, VA/MD
Ten Fathom Ledge/Big Rock, NC
Port Royal Sound, South Carolina
Florida Coral Grounds
Big Bend Seagrass Beds, Florida
Eastern Chandeleur Sound, LA
Baffin Bay, Texas
Cordillera Reefs, Puerto Rico
East End, St. Croix, Virgin Islands
Southeast St. Thomas, Virgin Islands
Cortes-Tanner Banks, California
Morro Bay, California
Heceta-Stonewall Banks, Oregon
Northern Mariana Islands, South Pacific
Southern Mariana Islands
Cocos Lagoon, Guam
Facpi Point, Guam
Papaloloa Point, American Samoa

Cultural Resource Sites (Proposed)

Manitou Passage (Lake Michigan), MI
Whitefish Point/Bay (Lake Superior), MI
Narragansett Bay, Rhode Island
Yorktown Fleet, York River, VA
Battle of the Atlantic/Cape Hatteras, NC
Douglas Beach, Florida
Tampa Bay, Florida
Apalachee Bay, Florida
U.S.S. Tecumseh/Battle of Mobile Bay, AL
Westernmost Aleutians, Alaska

Designation Process

National Marine Sanctuaries are chosen for their national significance, based on natural and human use values. For a site to be designated, it must first be placed on the Site Evaluation List (SEL). When named an Active Candidate, an Environmental Impact Statement and Management Plan is prepared. State governments and other agencies are consulted, and public meetings are held. Upon completion of this process, and with the approval of Congress and the state governor, the site is designated by the Secretary of Commerce as a National Marine Sanctuary.

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National Oceanic and Atmospheric Administration
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Figure 1. National Marine Sanctuary Designation Status.

of Cape Hatteras, North Carolina.

2. The Channel Islands National Marine Sanctuary, designated in September 1980, encompasses 1252 square nautical miles of offshore, nearshore and intertidal habitats roughly 20 nautical miles offshore of Santa Barbara, California. The waters of the sanctuary support breeding habitat for five species of seals and sea lions and thousands of seabirds. Over 20 additional species of whales and dolphins occur in the sanctuary. Large nearshore forests of giant kelp provide a nutrient rich environment for teeming populations of fish and invertebrates. Several endangered species inhabit the sanctuary including the gray, blue, humpback and sei whales, southern sea otters, Guadalupe fur seals, the California brown pelican and the California least tern. The ocean floor contains a wealth of prehistoric artifacts from the Chumash Indians and the remains of over 100 historic shipwrecks.

3. The Gray's Reef National Marine Sanctuary designated in January 1981, is a submerged live bottom coral reef located in 50-70 feet of water on the South Atlantic continental shelf 17.5 nautical miles east of Sapelo Island, Georgia. The Sanctuary encompasses 17 square nautical miles Gray's reef consists of limestone outcroppings and ledges up to six feet in height which support a host of sessile invertebrates. It is recognized as a highly productive and unusual habitat for a wide variety of species including corals, tropical fish, and sea turtles.

4. The Gulf of the Farallones National Marine Sanctuary, designated in January 1981, encompasses 948 square miles off the California coast just north of San Francisco. It provides a habitat for a diverse array of marine mammals, including California's largest breeding population of harbor seals, along with California sea lions and elephant seals. Several species of whales and dolphins live in or migrate through the sanctuary. The Farallones Islands are home to one of the largest concentration of breeding marine birds in the continental United States. Nurseries and spawning grounds for commercially valuable species of fish such as Dungeness crab, Pacific herring and rockfish are within the sanctuary.

5. The Fagatele Bay National Marine Sanctuary in American Samoa was designated in August 1986. This .25 square mile sanctuary surrounding an eroded volcano crater on the island of Tutuila, contains deepwater coral terrace formations that are unique to the high islands of the tropical Pacific. It serves as habitat for a diverse array of marine flora and fauna including the endangered hawksbill sea turtle and the threatened green sea turtle.

6. The Cordell Bank National Marine Sanctuary, designated in

May, 1989, encompasses 397 square nautical miles off the central California coast, contiguous with the northern boundary of the Gulf of the Farallones National Marine Sanctuary. Due to a rare combination of oceanic conditions and undersea topography, in a discrete well-defined area, Cordell Bank and its surrounding waters provide a highly productive marine environment for a rich variety of benthic organisms as well as fish, marine mammals and seabirds.

7. The Florida Keys National Marine Sanctuary was designated by the U.S. Congress, under the Florida Keys National Marine Sanctuary and Protection Act (P.L. 101-605), on November 16, 1990. The Act designated an area of coastal waters off the Florida Keys encompassing approximately 2600 square nautical miles. This area includes the world's third largest barrier reef. The purpose of this Act is to protect Florida's coral reefs, one of the most diverse ecosystems in the world, from harmful activities such as vessel groundings and pollution. Upon implementation of the Management Plan, Key Largo and Looe Key Sanctuaries, designated in 1975 and 1981, respectively, will be incorporated into the Florida Keys National Marine Sanctuary.

8. The Flower Garden Banks National Marine Sanctuary was designated in November 1991. The Sanctuary is partitioned into the East and West Flower Garden Bank. The East Flower Garden Bank component, encompassing 19.20 square nautical miles of ocean waters and submerged lands, is located approximately 120 nautical miles south southwest of Cameron, Louisiana. The West Flower Garden Bank, encompassing 22.5 square nautical miles of ocean waters and submerged lands, is located 110 miles southeast of Galveston, Texas. This site represents a complex, biologically productive reef community noted for outstanding fragile coral development and the only known oceanic brine seep on the continental shelf of the Atlantic Ocean. The banks lie on the extreme northern edge of the zone in which extensive reef development can occur.

9. The Monterey Bay National Marine Sanctuary was congressionally designated in September, 1992. The Sanctuary, approximately 50 miles south of San Francisco, encompasses an area of approximately 4,024 square nautical miles off the central California coast, approximately 50 miles south of San Francisco. Monterey Bay is California's second largest bay and one of the few major bays along the entire Pacific Coast. The bay's most significant feature is the Monterey Canyon, the deepest and largest submarine canyon incising the continental shelf of North America. The nutrient-rich waters of the Monterey Bay support extensive fish, invertebrate, seabird, and marine mammal populations. The area supports several endangered and threatened species of marine mammals such as the California Sea Otter. The

world's entire population of Ashy Storm-Petrels feed above the Monterey canyon during summer and fall months.

10. Stellwagen Bank National Marine Sanctuary was Congressionally designated in November, 1992. The Sanctuary encompasses 638 square nautical miles of Federal waters situated on and around the submerged Stellwagen Bank located 6.3 miles north of Cape Cod, Massachusetts. The Bank supports a seasonal abundance of several cetacean species, including the largest high-latitude population of humpback whales in the contiguous United States. Biologically productive Sanctuary waters also provide important feeding and nursery grounds for fin, minke, northern right whales and several smaller cetacean species. Commercially and recreationally fished since Colonial times, the Bank also supports a growing whalewatch industry.

11. The Hawaiian Islands Humpback Whale National Marine Sanctuary was Congressionally designated in November, 1992 pursuant to the Oceans Act of 1992. The primary purposes of the sanctuary are to protect humpback whales and their breeding habitat and to provide for the identification of marine resources and ecosystems of national significance for possible inclusion in the sanctuary. Other resources inhabiting the waters of the Sanctuary include several additional cetacean species (sperm, pilot, false killer, pygmy killer, melon headed, Pacific bottlenose dolphins, and many others), a majority of the Hawaiian population of juvenile and adult green sea turtles, the endangered leatherback and olive ridley sea turtles, and the highly endangered Hawaiian monk seal. There are a number of seabird colonies in the Sanctuary as well. The Sanctuary supports an extensive coral reef ecosystem and commercially valuable fisheries.

III. History of the Olympic Coast Proposal

The Olympic Coast, recognized for its rich natural resource potential and human resource values, was placed on the National Marine Sanctuary Program Site Evaluation List (SEL) in August, 1983 (48 FR 35568) (Figure 2). The re-authorization and amendment of the Act in 1988 directed the Secretary of Commerce to issue a notice of designation with respect to the Olympic Coast National Marine Sanctuary (as generally described in the Federal Register Notice of August 4, 1983) not later than June 30, 1990 (P.L. 100-627, section 205). In report language accompanying this legislation, Congress noted that the Olympic Coast possesses a unique and nationally significant collection of flora and fauna, and that the combination of rocky stacks, sea birds, marine mammals, and it's adjacency to the Olympic National Park merited the designation of the area as a national marine sanctuary (H. Rep. No. 4210, 100th Cong., 1st Sess., 1988).

NOAA conducted four scoping meetings in Washington State during April 10-13, 1989, to solicit public comments on the proposed sanctuary: Aberdeen, Port Angeles, Forks, and Seattle (45 FR 10398, March 13, 1989).

All interested persons were invited to attend, and asked to comment on readily identifiable issues, suggest additional issues for examination, and provide information useful in evaluating the site's potential as a sanctuary. A map of the study area was presented to depict the area under consideration for designation as a National Marine Sanctuary.

NOAA released the DEIS/MP in September, 1991. Six public hearings were held between November 6-20, 1991 at Port Angeles, Seattle, Olympia, Aberdeen, Seaview, and Washington, D.C. A total of 894 comments were received on the DEIS/MP. Appendix A contains a summary of the comments and NOAA's responses.

Pursuant to public comments, the FEIS/MP includes the Strait of Juan de Fuca eastward to Observatory Point in the study area of the proposed Sanctuary (Figure 4, p. II-4). The analysis of the Strait of Juan de Fuca as part of the preferred alternative is presented in Parts III and IV of the FEIS/MP. The inclusion of the Strait of Juan de Fuca in the preferred alternative of the Olympic Coast National Marine Sanctuary was rejected by NOAA due to the lack of: 1) public involvement in the process of considering the inclusion of the Strait within the Sanctuary boundary; and 2) an opportunity for NOAA and the public to analyze the Strait within the context of the boundary alternative for the proposed Northwest Straits National Marine Sanctuary. The estuaries of Grays Harbor and Willapa Bay are not included in the study area considered in the FEIS/MP.

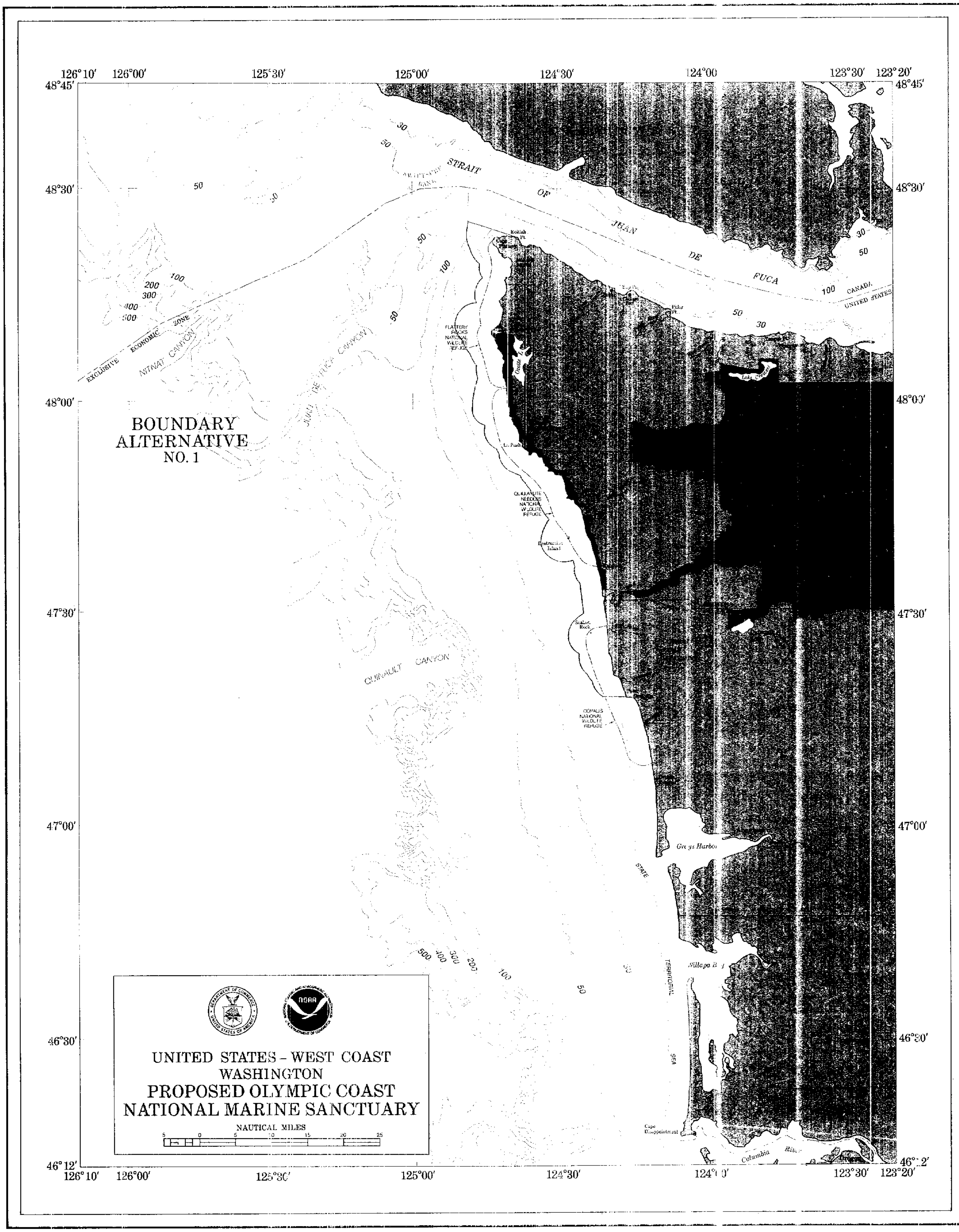

Figure 2. Sanctuary Study Site Identified in the Site Evaluation List.

IV. Purpose and Need for Designation

A. Introduction

The overriding objective of the Olympic Coast National Marine Sanctuary is to provide a comprehensive ecosystem-wide approach to natural and historical resource management. Sanctuary status will permit the implementation of a coordinated and comprehensive management plan resulting in better protection of ecological and historic resources. The preferred alternative would promote resource protection by:

* bolstering the existing resource protection regime;
* establishing a coordinated research program to expand our knowledge of the resources within the Olympic Coast Sanctuary and to provide the basis for sound management;
* establishing a broad-based education and interpretive program designed to improve public understanding of the sanctuary's importance as the habitat for a unique community of marine organisms;
* providing a comprehensive plan to protect this habitat.

Various agencies currently have responsibilities for specific activities or for particular natural resources in the area. No single government agency, however, monitors the cumulative effects of human activities in a comprehensive, system-wide manner. Additionally, more effort is needed to promote research and public education.

The designation of a national marine sanctuary in the waters off the Olympic Coast will create a system for assessing the overall impacts of current and future activities in the area. Sanctuary designation will ensure that it is given specific protection and consideration from an overall planning perspective. Further it will encourage careful review of proposals for potentially harmful activities. Monitoring and study of sanctuary resources will provide a greater understanding of both the area's needs and it's ecological balance, thereby providing a foundation for better management. Finally, a sanctuary program of public education/interpretation will promote greater sensitivity to the significance of the area's natural resources. Such a program in coordination with existing interpretive centers and other educational programs, can inform the public of the effects of human activities on marine resources.

Therefore, a forum of special management that provides research, resource assessment, education, coordination, long-term comprehensive planning, and additional protection is desirable in order to ensure that the extraordinary wealth of natural resources in the area is not jeopardized. Sanctuary designation will provide the opportunity to fill management gaps and enhance existing resource management systems.

B. Natural and Historical Resources

The sanctuary area is a highly productive, nearly pristine coastal environment that is important to the continued survival of several ecologically and commercially important species including invertebrates, fishes, marine birds, and marine mammals. The diversity and richness of marine organisms, and the contributions made by these organisms to the species migrating through the area, suggest that sanctuary designation will provide exceptional opportunities for scientific research in the areas of species interactions, population dynamics, and physiological ecology (Chelsea International Corporation, 1983). The sanctuary is representative of an ecosystem within the Oregonian biogeographic province characterized by rocky coastlines with pocket beaches, a narrow continental shelf incised by submarine canyons, and relatively clear water (Wolteira, 1992) (Figure 3).

The diversity of habitats that make up the sanctuary support a great variety of biological communities. This unusually large range of habitat types includes: offshore islands and rocks; intertidal pools; erosional features such as rocky headlands, seastacks and arches; interspersed exposed beaches and protected bays; protected inlets at river mouths; submarine canyons and ridges; the continental shelf, including broad shallow plateaus known as the La Perouse Bank (referred to as "the Plains"), and Swiftsure Bank; and continental slope environments.

The area is characterized by high biological productivity with abundant floral and faunal communities. During spring and summer months, prevailing northwesterly winds combined with the Coriolis effect (the tendency of moving matter to turn right in the northern hemisphere as a result of the Earth's rotation) cause the surface waters to be deflected and replaced with nutrient-rich bottom waters. This "upwelling" supplies nutrients that increase the productivity of the surface waters, especially when the phenomenon corresponds with periods of high solar radiation. Submarine canyons indent the shelf along the Washington outer coast and are sites of enhanced upwelling.

Numerous seastacks and rocky outcrops along the coast, coupled with a large tidal range and wave splash zone, provide a substrate for an extensive rocky intertidal community. The biological community of the intertidal zone is characterized by distinct horizontal bands of plants and animals that correspond to a range of physical and biological factors (e.g., wave intensity, predation, and tolerance to drying). The abundance of organisms and zonation in the rocky intertidal zone illustrates a readily apparent example of the region's productivity and diversity.

The area provides an essential habitat for a wide variety of marine birds and mammals, and is of special interest due to the large number of endangered and threatened species that live or

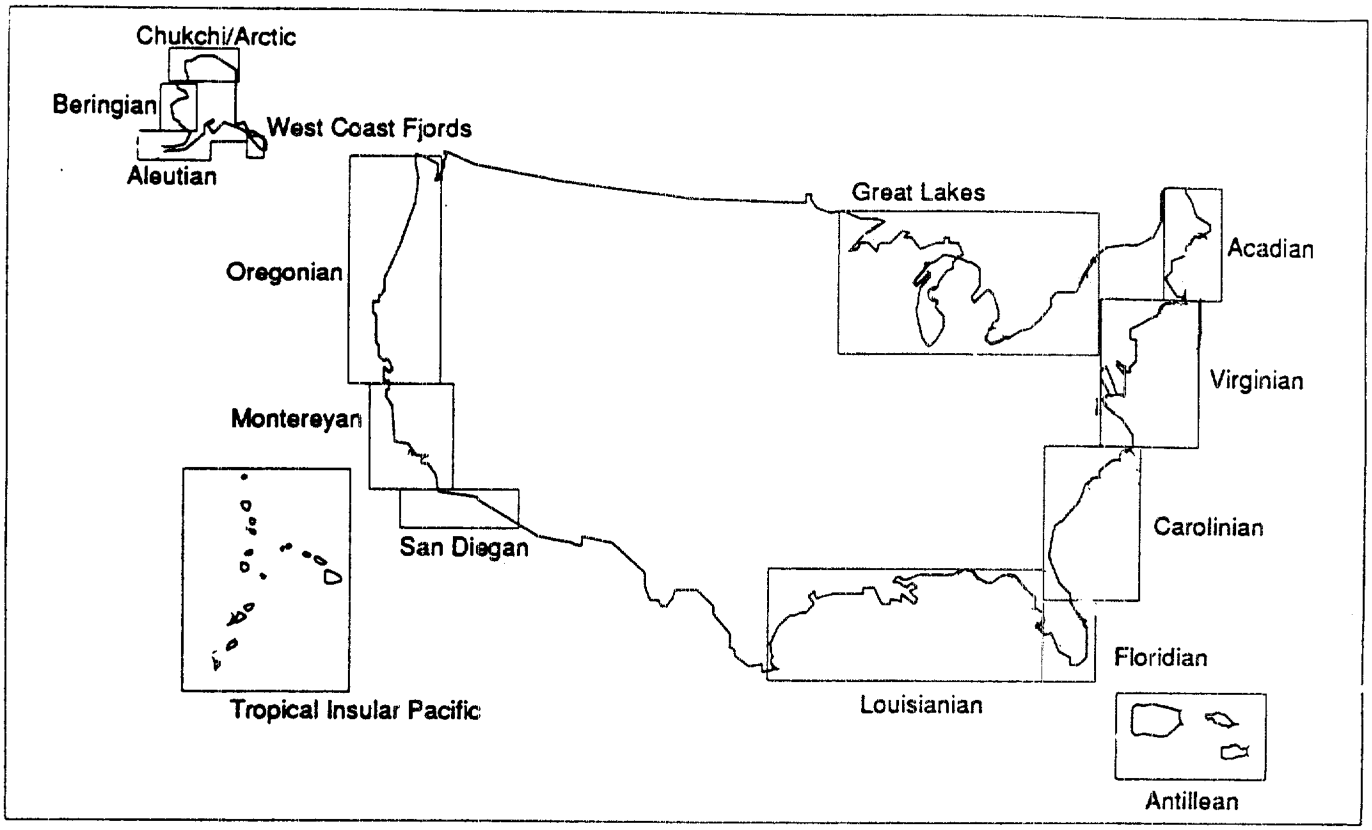

Figure 3. Biogeographic Provinces of the United States (Wolteira, 1992).

migrate through the region.

The seabird colonies of Washington's outer coast are among the largest in the continental United States. Over 87 species of marine birds have been sighted in the nearshore coastal area (Speich, et al., 1987), and at least 11 species have been observed feeding in or migrating over the nutrient-enriched waters of the continental shelf (Wahl, 1984). The region contains one of the largest populations of bald eagles in the continental United States. In 1985 there were 220 confirmed nesting pairs of threatened bald eagles in Western Washington (McAllister et al., 1986). In 1987 about 30 active nests were reported on the outer coast between Cape Flattery and Copalis Head (Speich, et al., 1987). Currently, there are 51 observed breeding territories in the coastal area, reflecting a trend of increasing success in reestablishing the bald eagle population in Washington state (WDW, 1993). Coastal rocks and islands provide important breeding, nesting and roosting areas for marine birds. One of the ten largest colonies of Rhinoceros auklets in the eastern Pacific Ocean occurs on Destruction Island (Speich, et al., 1987). Estimates of the total nesting seabird population along the Washington coast range from 108,530 breeding pairs (G. Tillet, pers. comm., in Strickland and Chasan, 1989) to 240,000 individuals (Wahl, 1984).

Twenty-nine species of marine mammals are reported to breed, rest within, or migrate through the Olympic Coast region. Marine mammals commonly found in the area include the California sea lion, northern (or Steller) sea lion, Pacific harbor seal, harbor porpoise, California gray whale, and sea otter. The sea otter, harbor seal, and harbor porpoise are the only marine mammal species known to breed in the region. Species which regularly migrate along the Washington coast include the northern sea lion, California sea lion, California gray whale, and northern fur seal.

The northern part of the coast is an important habitat for a reintroduced population of sea otters. Sea otters were hunted for their pelts during the late 19th century, and by the early 20th century the entire population had been extirpated from the Washington coast. In 1969 - 1970, 59 sea otters were brought from the Aleutian Islands and released at two locations along the Washington coast believed to have been population centers for original sea otter stocks. Today sea otters have expanded their range to include 70 km of the coast; and the present population is estimated to be 300 individuals (Bowlby, 1992).

The proposed Sanctuary supports a wide variety of fish and invertebrates that are of ecological, commercial, recreational and subsistence value. Five species of salmon migrate through the Sanctuary and concentrate over the Juan de Fuca Canyon where upwelling of nutrient rich waters during the summer months fuels a rich food web (Parmenter and Bailey, 1985). Steelhead and sea-run cutthroat trout also can be found in this area. Groundfish are concentrated on the banks surrounding the Juan de Fuca Canyon and along the edges of the continental shelf. Common species include halibut, flounder, lingcod, rockfish, among others. Pink shrimp and Dungeness crab are found in concentrations over the continental shelf as well. The Olympic Coast is recognized for its diversity of invertebrates. Diverse invertebrate communities can be found in all habitats within the study area including rocky intertidal, sand, and cobble. The most intensely studied invertebrate communities are those on Tatoosh Island off Cape Flattery.

Significant historical and cultural resources within and immediately adjacent to the Sanctuary include: Indian village sites, ancient canoe runs, petroglyphs, Indian artifacts, and numerous shipwrecks. Extensive archeological work oriented toward late prehistoric culture has been completed along the Washington coastline. A major archeological dig conducted at Ozette, near Cape Alava, uncovered an ancient village thought to be 2,000 years old. This excavation, which spanned 10 years, is considered to be one of the most significant in North America.

The intertidal zone supports some of the most diverse intertidal communities in the world. Tatoosh Island off Cape Flattery is one of the most intensely studied areas in the Sanctuary with respect to invertebrates.

The Olympic Coast is one of the few regions of the U.S. coastline that has remained undisturbed. Lack of roads, steep rocky cliffs, and restricted access by private owners and Indian tribes make accessibility difficult, contributing to the lack of shoreline development. Another special feature of the region is the unusual geology found along the Quinault reservation south of the Hoh River. An unusual mixture of rock types and formations, called the Hoh Milange, has been recognized by the Geologic Society of America as one of the most important geological areas in Washington state. In addition, the Washington State Shoreline Management Act (SMA) recognizes the Olympic Coast for its natural beauty and biological richness. The SMA states, "The outstanding natural qualities of its rugged shoreline features have been recognized as a national asset and will be managed in their natural state."

C. Present and Potential Uses

The human population along the outer coast is concentrated predominately on four Indian Reservations - the Makah, Quileute, Hoh, and Quinault. Tribal members use the proposed Sanctuary area for subsistence and commercial harvesting, and religious ceremonies. The presence of Indian tribes along the coast adds special cultural character and historical significance to the proposed marine sanctuary. Uses of lands in the coastal watersheds include commercial forestry, private development, and county and state recreation areas. Tourism, and commercial, tribal and recreational fishing and are important activities occurring in the proposed Sanctuary.

1. Fishing

The diversity and abundance of fish species along the coast is an important recreational and commercial resource for coastal residents. Salmon, bottomfish, and razor clams are the primary recreational fisheries. Commercial fisheries target primarily salmon, bottomfish, halibut, dungeness crab and pink shrimp. Recreational bottomfishing has increased in recent years. Black rockfish, lingcod, and yellowtail or olive rockfish are the most important bottomfish of the coastal area targeted by sport fishers. Recreational bottomfishing is concentrated primarily seaward of the entrance to the Strait of Juan de Fuca and in the coastal areas off Willapa Bay and Grays Harbor. Razor clam digging is a very popular recreational activity and many people travel to the coast specifically to harvest clams. The Quinault Indian Tribe also harvest razor clams on the beaches of the Quinault Reservation.

High concentrations of commercial fishing occur throughout the Strait and near the approach to the Strait over Swiftsure Bank and La Perouse Bank (commonly referred to as "the Plains"). Crab fishing occurs nearshore within 30 fathoms between the Hoh and Raft Rivers on the outer coast and between Pt. Grenville and the Columbia River. Pink shrimp trawling areas occur between the 50 and 100 fathom isobaths of the outer coast.

Washington's local (as opposed to the distant water fleet operating in Alaska) commercial fishing industry is important to the state's economy. Fishery resources harvested include five species of salmon, bottomfish, and shellfish (Dungeness crab and pink shrimp). Currently, many specific salmon fisheries (particularly the ocean troll fisheries for chinook and coho salmon) are controlled on the basis of "weak stock management." In weak stock management harvest limits are set to safeguard against over-harvest of the least viable individual stocks. This management regime has severely constrained harvest levels (NRC, 1988). Dungeness crab stocks have been historically unstable and harvests from 1986-1988 have been under the most recent 16 year average (NRC, 1988). The harvest of pink shrimp, also very cyclical in nature, has increased since 1986. The harvest of groundfish has declined considerably in 1988 from 1986 levels. Salmonids are still the most important coastal tribal fishery (Washington Department of Fisheries, in Butts, 1988); steelhead trout is more important for commercial purposes than other salmonid species for some of the coastal tribal communities.

Between 1985 and 1987 there was a decline of 375 fishing vessels (tribal and non-tribal combined) in Washington's local water fleet (including offshore waters, Columbia River and Puget Sound) (NRC, 1988). The decline is due to the withdrawal of approximately 372 salmon troll permits since 1985, permits which under the limited entry system cannot be reinstated. This is consistent with the long term trend in the fishery. Since 1975, the number of trolling permits issued has dropped by over 2,000 (NRC, 1988). The local water fleet is typified by small-scale operations with relatively small earnings per vessel. Between 1986-1988, ex-vessel revenues averaged between $54,000 and $69,000 per boat. Salmon gillnet, purse seine, and groundfish trawls earned the greatest ex-vessel value of all gear types in the local fleet, earning $46.3 million, $21.7 million, and 11.6 million, respectively.

2. <u>Recreation</u>

The Olympic National Park borders a large portion of the proposed sanctuary and is frequented by hikers and campers. Of the estimated 3.5 million annual visits to the Park, approximately one third visit the coastal area. Many people travel to the coast to watch the annual migration of California gray whales. Beaches and tide pools are used for research, educational, and interpretive activities. The pristine quality of the region provides a truly natural coastal and nearshore setting.

The proposed sanctuary offers the opportunity to coordinate research and interpretive programs with the Olympic National Park and the USFWS offshore National Wildlife Refuges. The Olympic National Park sponsors nature walks and other educational activities and also supports research projects on coastal habitats within the Park. Research could also be coordinated with universities which use a portion of the proposed sanctuary for field study and gathering baseline information.

3. <u>Marine Transportation</u>

Next to fishing, the predominant use of waters off the Olympic Coast is commodities transportation to and from port facilities in Puget Sound. Recent oil spills (in Alaska and off Grays Harbor) have heightened public concern over vessel traffic along the Washington coast. Contingency plans designed to respond to oil spills resulting from tanker accidents are being formulated. Tug boats with barges also carry hydrocarbon products along the coast. These shallow draft vessels are able to transit nearer to the rocky shoreline than tankers. The U.S. Coast Guard (USCG) is recommending to the International Maritime Organization (IMO) implementation of a 25 nautical mile Area To Be Avoided (ATBA) off the outer coast for all vessels and barges transporting hazardous materials.

4. Offshore Oil and Gas Development

Outer continental shelf (OCS) oil and gas leasing within the boundaries of the proposed sanctuary has been considered by the U.S. Department of Interior's Mineral Management Service (MMS). MMS had planned to conduct lease sale #132 in April, 1992 for exploration and development off the Washington and Oregon coasts. However, in June, 1990 President Bush announced a policy on OCS oil and gas activities which accepts the recommendation of the Secretary of Interior to delay Lease Sale #132 until a series of environmental studies are completed (expected to take 5 to 7 years); and direct that no leasing activity occur until after the year 2000, and then, only if studies show that development can be pursued in an environmentally safe manner. The 1992 Re-authorization of Title III prohibits oil and gas leasing and development within the boundaries of the Olympic Coast National Marine Sanctuary (P.L. 102-587).

5. Discharges and Disposal Activities

There are no permitted discharges within the boundaries of the proposed Sanctuary. Although the Makah Tribe have a permit to discharge primary treated sewage into the Strait, the treatment facility has been inoperable and the use of the discharge pipe has been terminated for a number of years. The greatest threat to the coastal resources of the Sanctuary from land-based discharges are from non-point source pollution resulting from timber operations within coastal watersheds.

The variety of human uses has not dramatically altered or damaged the resources of the outer coast. However, increasing development from tourism and other commercial enterprises has increased the potential for adverse cumulative effects on Sanctuary resources and water quality.

D. Adequacy of Existing Authorities to Manage the Area

Much of the coastal area adjacent to the Sanctuary is protected by Olympic National Park, the offshore wildlife refuges, wilderness areas, biosphere reserves, wilderness areas designated by the coastal tribes, state beach management plans, and county and state parks. The need for economic development within the watersheds draining into the Sanctuary will put increasing pressure on coastal resources, in terms of point and non-point source discharges, coastal development, increasing recreational pressures and increasing overflights.

While all of these uses are managed by specific agencies and authorities, there is no single authority charged with overseeing the numerous uses affecting the ecosystem of the proposed Sanctuary. There are no offshore areas designated to protect the valuable fish, and marine bird and mammal populations. With limited funding of existing programs, the coordination of resource protection and management programs is essential. The Olympic Coast National Marine Sanctuary could play an important role in such coordination. It is not the intention of the Sanctuary to duplicate existing regulations.

Currently, no institution addresses the range of significant questions concerning the interaction of resources and uses in the Sanctuary area. While a variety of organizations conduct research, there is no systematic coordination to ensure that information needs are properly addressed in a timely and adequate manner. Even if information becomes available through research projects, no institution is charged with applying that information to practical management issues such as regulation. Similarly, no agency attempts to monitor the health, stability and changing conditions of this valuable marine ecosystem. Resource assessment through gathering of baseline data and continued monitoring of environmental conditions are essential to assess the adequacy of the protection afforded these important resources. The status quo alternative (no sanctuary designation) would leave the protection of this area to the chance coordination of regulatory efforts of a number of agencies, and would forego opportunities for comprehensive management.

E. Benefits Derived From Sanctuary Status

The major benefit of the Sanctuary is the integration of important nearshore and oceanic marine resource zones and corresponding human activities into one management regime. Other benefits of designation include: (1) enhancement of research and monitoring; (2) promotion of public awareness of the marine ecosystem; (3) assistance coordinating of initiatives implemented by existing authorities; (4) formulation of long-range plans that respond to currently unforeseen threats; and (5) regulation of activities which either pose a current risk of causing significant damage or may later prove harmful as use of the area increases. Formal recognition of the species and habitat value of these waters should in itself focus additional attention on the resources of this area and thus encourage direct special attention to any future development plans.

Besides providing an ecologically diverse haven for many significant concentrations of living resources, the waters also support a number of socially beneficial human activities. These range from fishing, subsistence harvesting of intertidal invertebrates, nature observation, education, scientific research, national defense, vessel traffic, and law enforcement. To date, such activities have been pursued at low intensity levels. However, these and other potential human activities, (e.g., oil and gas development, possible dredge spoil disposal) are clearly capable of generating conflicts which could harm Sanctuary resources.

In short, the marine ecosystem's diverse resources and rich productivity make it an area of regional and national significance. The area deserves long-term protection to enhance and complement the protection already provided for some of its resources onshore, and for portions of the extreme nearshore zone. For example, the Department of Interior has jurisdiction over much of the coastal lands and offshore Islands. Additionally, the state has authorized establishment of the Olympic Center to examine the ecological linkages between terrestrial and marine ecosystems on the Olympic Peninsula. The tribes manage the coastal intertidal habitats adjacent to much of the Sanctuary.

Sanctuary designation can provide an excellent opportunity for establishing not only a coordinated Federal/State/Tribal management regime, but also would promote research and education efforts through integration of existing facilities, resources and programs. This type of coordination and focus, emphasizing land-sea interactions, could serve as a model for other coastal areas of the United States where local land issues and coastal zone problems have traditionally been separated from offshore marine issues with respect to management, and research and education efforts.

Sanctuary designation will improve resource protection by instituting new regulatory measures and by supplementing present surveillance and enforcement actions. The overall effect of these regulations will be beneficial. Title III of the MPRSA specifically provides in section 304(c) that NOAA may not terminate valid leases, permits, licenses or rights of subsistence use or of access existing as of the date of Sanctuary designation; but may regulate the exercise of such authorizations and rights consistent with the purposes for which the Sanctuary was designated.

Final regulations are proposed governing: hydrocarbon and mineral activities; discharges and deposits (both from within and outside of the Sanctuary boundary); overflights; alteration of or construction on the seabed; historical resources; and marine mammals, turtles and seabirds. Vessel traffic is in the scope of regulations. NOAA has proposed conditioning the Navy's existing permit from the Department of Interior to practice bomb Sealion Rock by prohibiting bombing activities during the critical breeding season - from March 1 through October 31. In addition, two final regulations are proposed to aid the enforcement of the other regulations: a prohibition on possession of resources which are prohibited from "taking" from within the Sanctuary, and on interference with enforcement operations. The exact regulations, including procedures for applying for permits are found in Appendix B.

1. Oil, Gas, and Mineral Activities

The resources and attributes of the Sanctuary - particularly sea otters, sea birds, pinnipeds that use haul-out sites, kelp forests and rocks along the outer coast, and the exceptional water quality of the area - are especially vulnerable to oil and gas activities. A prohibition on such activities within the Sanctuary would provide partial protection for the area. Only partial protection would be provided due to the remaining threat from oil and gas activities outside of the Sanctuary boundary and from vessel traffic, particularly oil tankers, transiting through and near the Sanctuary. See #5 below regarding mineral activities.

If oil and gas activities were allowed in the Sanctuary, such development, and construction of man-made structures, would disrupt the natural and aesthetic qualities of the area and be inconsistent with the purposes of the Sanctuary. Although certain man-made structures may be permissible in the future for limited purposes such as research or natural resource protection, the threats from oil and gas activities to Sanctuary resources and qualities warrant an absolute prohibition of oil and gas activities within the Sanctuary boundary. Threats include catastrophic events such as oil spills associated with blow-outs, rupture of pipelines or spills during the loading of tankers and long-term chronic events such as discharge of drilling fluids, cuttings and air emissions. Finally, due to the lack of offshore oil and gas activities thus far, the area would suffer aesthetic disturbances including the presence of offshore structures, the construction of shore facilities, and the transportation of personnel and equipment to and from the offshore rigs.

2. Discharges and Deposits into the Sanctuary and

3. Discharges and Deposits that Enter the Sanctuary and Injure a Sanctuary Resource or Quality

These prohibitions are necessary in order to protect the sanctuary resources and attributes from the harmful effects of land and sea-generated discharges from point sources from both within and outside the Sanctuary boundary. This provision complements the existing regulatory system, enhances the area's overall appeal, and helps maintain the present water quality of the Sanctuary. The regulations would prohibit disposal of dredge material within the Sanctuary.

There are currently no point-source discharges entering directly into the Sanctuary. Point source discharges (such as discharges from municipal waste water treatment, power, or industrial plants) into the Sanctuary require permits from Washington Department of Ecology (WDOE) or the Environmental Protection Agency (EPA) depending upon whether the point source originates from a non-tribal or tribal enterprise, respectively. Discharges permitted after the date of Sanctuary designation would be allowed provided the permit is certified by NOAA in accordance with Section 925.11. Municipal treatment plants would be required to have at least secondary treatment capabilities and tertiary or greater as appropriate or necessary depending on the risk to Sanctuary resources and qualities.

4. Moving, Removing, or Injuring Historical Resources

Historical resources in the marine environment are fragile, finite and non-renewable. This prohibition is designed to protect these resources so that they may be inventoried, researched and information so derived be made available to the public. This prohibition does not apply to moving, removing or injury resulting incidentally from kelp harvesting, aquaculture or traditional fishing operations.

5. Alteration of, or Construction on, the Seabed

The intent of this prohibition is to protect the resources and attributes of the Sanctuary from harmful effects of activities that may disrupt and/or destroy sensitive marine benthic habitats, such as kelp beds, invertebrate populations, fish habitats, and estuaries and marshes. Such activities include, but are not limited to, archeological excavations, drilling into the seabed, strip mining, laying of pipelines and outfalls, ocean mineral extraction (including but not limited to sand mining), and offshore commercial development.

6. Taking Marine Mammals, Sea Turtles, or Seabirds

The prohibition overlaps the Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA) and the Migratory Bird Treaty Act (MBTA) and empowers Sanctuary officials to enforce the provisions of these Acts. This regulation extends protection for Sanctuary resources by providing a greater deterrent by establishing civil penalties of up to $100,000 per taking. It includes all marine mammals, marine reptiles (turtles) and seabirds in or above the Sanctuary. Activities authorized or permitted pursuant to the MMPA, ESA, or MBTA are exempted from this prohibition.

7. Overflights

Flying motorized aircraft within one nautical miles seaward of mean high water within the Sanctuary and at less than 2,000 feet above the Sanctuary would be prohibited. This prohibition is consistent with the 2000 foot advisory over the adjacent Olympic National Park and USFWS refuges off the coast.

The area-specific prohibition on overflights below 2,000 feet (305 m) within one nautical mile seaward of all land boundaries is designed to limit the potential effects of noise, particularly as it might affect hauled-out seals and sea lions, sea otters and nesting birds along the shoreline and offshore rocks and islands of the Sanctuary.

NOAA recognizes that overflights are regulated under the Federal Aviation Regulations (FARs). Unlike FARs, however, sanctuary overflight regulations are intended to protect the living marine resources of the Sanctuary from disturbance by low-flying aircraft. The less-than-2000-foot overflight prohibition would not apply if the low overflight is necessary to: 1) respond to an emergency threatening life, property or the environment (this exception is true for the most of the other prohibitions as well); 2) valid law enforcement purposes; or 3) certain national defense activities.

8. Vessel Traffic

No Sanctuary vessel traffic regulations are planned at this time. Vessel traffic, however, is within the scope of regulations. The Strait of Juan de Fuca Cooperative Vessel Traffic Management System (CVTMS), vessel traffic separation schemes in the Strait of Juan de Fuca, and radar coverage from Tofino Vessel Traffic Service (covering a range of 60 nautical miles from the entrance of the Strait) already provide some safeguards for Sanctuary resources. NOAA is currently working with the USCG, the primary agency responsible for regulating vessel traffic, on the establishment of an ATBA from the shoreline to 25 nautical miles off the Olympic Peninsula. This would provide an additional measure to ensure protection of the Sanctuary. This measure is based on a determination of resources most at risk and vessel traffic practices most threatening to Sanctuary resources.

Despite existing regulations and management, NOAA recognizes the potential threat to the Sanctuary from vessel traffic. If the promulgation of additional vessel traffic regulations is deemed necessary, NOAA will pursue appropriate actions after consultation with the USCG, State agencies, and the IMO. Coordination among agencies is intended to focus ongoing efforts on the provision of adequate protection of Sanctuary resources and qualities.

9. Fishing/Aquaculture/Kelp harvesting

No sanctuary fishing or aquaculture regulations are proposed nor in the scope of regulations. Fish resources in the Sanctuary are already extensively managed by existing authorities. Fisheries management will remain under the jurisdiction of the WDF, Washington Department of Natural Resources (WDNR), National Marine Fisheries Service (NMFS) and the Pacific Fisheries Management Council (PFMC). Sanctuary prohibitions that may indirectly affect fishing activities have been written to explicitly exempt activities incidental to traditional fishing methods, aquaculture and kelp harvesting activities. Kelp harvesting is within the scope of regulations.

V. Socioeconomic Effects of Designation

The net environmental and socioeconomic effects of designating the Sanctuary and implementing the Sanctuary Management Plan and its regulations are anticipated to be positive. While such effects are difficult to quantify, one goal of the Sanctuary will be to maintain the high level of water quality, fisheries, aesthetics and tourism without causing adverse effects.

The final sanctuary regulations prohibit a relatively narrow range of activities. Under certain circumstances specific activities, otherwise prohibited, may be allowed. For example, prohibited activities may be allowed if: (1) the activity is done pursuant to a National Marine Sanctuary permit; (2) the activity occurs pursuant to a valid permit existing on the effective date of designation and the permit for the activity was certified by NOAA, or (3) a permit was applied for after Sanctuary designation and the proposer of the activity notifies NOAA of the proposed activity in within 90 days and NOAA approved the activity.

NOAA will keep additional administrative burdens to a minimum by coordinating closely with state and Federal regulatory and permitting agencies. Efforts will be made to avoid duplication and to review applications for a prohibited activity as quickly as possible.

A. Oil, Gas and Minerals

Estimates of potential lost revenue from the prohibition on oil, gas and mineral (e.g., sand and gravel) activities within the Sanctuary boundary are presented in Part IV ("Environmental Consequences of Alternatives"). Prohibiting oil, gas and mineral activities has positive socioeconomic effects that compensate for lost revenue. For example, the potential for environmental damage from oil spills or discharges will be reduced and the exceptional aesthetic quality of the area will be maintained. In addition, the proposed prohibition may alleviate or remove costs to local communities for developing on-shore facilities, and political/legal actions resulting from controversy regarding proposed oil, gas or mineral activities.

Unfortunately, it is not possible to quantify accurately the negative or positive socioeconomic effects of prohibiting OCS oil and gas activities. A National Academy of Sciences study (1989) on the "Adequacy of Environmental Information For Outer Continental Shelf Oil and Gas Decisions: Florida and California" found that "few data have been collected by MMS or anyone else to address the social and economic impacts of OCS activities." This conclusion has been reinforced by an MMS study (1991) entitled "Potential Effects of OCS Oil and Gas Exploration and Development on Pacific Northwest Indian Tribes: Final Technical Report", and an MMS study (1991a) entitled "Inventory and Evaluation of Washington and Oregon

Coastal Recreation Resources: Assessing Economic Impacts to Coastal Recreation and Tourism from Oil and Gas Development in the Oregon and Washington Outer Continental Shelf."

B. Discharges and Deposits

The regulation prohibiting discharges and deposits may require applicants for discharge permits to seek other areas of disposal or apply at least secondary treatment to discharges. All measures, terms and conditions will be done in consultation with the affected party and the appropriate management agency. The designation of dredge disposal sites is prohibited within the Sanctuary.

Overall, this regulation may impose additional costs by requiring the use of more expensive dredge disposal methods or dumpsites. Presently, the only planned dredging adjacent to the Sanctuary is at the Makah and Quileute Reservations. Both Tribes plan for upland disposal or beach or jetty nourishment using dredge spoils. The regulation could also result in additional costs if it were determined that a higher level of treatment or other, more expensive sewage disposal methods were preferable to disposal in the Sanctuary. It is difficult to predict accurately the economic impact of this regulation without analyzing specific proposals. This regulation adds further protection to Sanctuary resources beyond that afforded by existing legislation. The requirement for review and Sanctuary certification of permits will ensure that potentially harmful activities receive special consideration from the perspective of Sanctuary protection.

C. Alteration of or Construction on the Seabed

Dredging activities are not extensive within the sanctuary boundary; nevertheless, unrestricted alteration of, construction on, or drilling of the seabed represents a threat to marine resources. Foremost among adverse effects are increased turbidity levels, destruction, disruption or displacement of benthic and intertidal communities, and human intrusion into areas of marine bird and marine mammal population concentrations.

This regulation would enhance resource protection by reducing the presence and operation of large and noisy dredging machinery. Thus human intrusion upon marine wildlife, along with potentially adverse impacts on their food supplies, (e.g., benthic and pelagic fish resources), would be minimized. No economic impacts upon commercial firms are expected. Exemptions from the dredging prohibition would allow for installation of navigation aids, and harbor maintenance (although harbors are excluded from the Sanctuary boundary, and construction, repair, replacement or rehabilitation of docks and piers.

Mineral mining activities in the Sanctuary will be prohibited. Studies have shown that this activity may cause, among other impacts, acceleration of natural erosion of the seabed and adjacent areas, increased turbidity, and changes in water circulation. Mining activities also disturb benthic habitats that support whale feeding grounds, seabird foraging habitats and fishery resources (MMS, 1993).

D. Overflights

Overflights below 2000 feet are prohibited within one nautical miles seaward from the coastal boundary of the Sanctuary and within one nautical mile of each of the offshore wildlife refuges. The intent of this prohibition is to protect sensitive Sanctuary resources, such as nesting seabirds and mammals at haul out areas, from the disturbance effects of low-flying aircraft. Access to airports by commercial and recreational airplanes would not be affected. Takeoff and landings at local airports at Sekiu, Quileute, Neah Bay and Copalis Beach will be unaffected.

E. Vessel Traffic

There would be no economic effect on vessel traffic as a result of Sanctuary designation since NOAA is proposing no vessel traffic regulations. NOAA has considered vessel traffic regulation and the preferred alternative is not to regulate vessel traffic at the time of Sanctuary designation. Such regulation may include, but is not limited to: (1) routing of all, or certain classes of coast-wise domestic vessel traffic outside of the boundary of the Sanctuary, (2) prohibiting domestic oil barge traffic within the Sanctuary; (3) restriction of all large domestic vessels inbound to, and outbound from, designated port access route(s); and (4) designation of ATBA's for domestic vessels or other measures designed to protect the marine environment. NOAA has requested the USCG to submit a request for implementing an ATBA from the shoreline to 25 nautical miles off the outer coast for international and domestic vessels carrying hazardous materials. The 25 nautical mile boundary poses minimal disturbance to vessels as it is largely compatible with existing voluntary management measures followed by the shipping industry. Discussion of economic impacts of the ATBA proposed by the USCG to IMO are identified in Part IV of this document.

NOAA will maintain close communication with the USCG to evaluate the need for additional regulations regarding vessel safety and/or emergency response plans and equipment.

F. Fishing/Aquaculture/Kelp Harvesting

Implementation of the Sanctuary should have no adverse effects on the fishing industry. Moreover, Sanctuary protection of habitat and water quality by controlling both pollutants and disturbance of the seabed should be positive for maintaining healthy and productive fish stocks. Inclusion of kelp harvesting in the scope of regulation will ensure that the integrity of the kelp habitat is maintained. Protection of kelp beds will protect important fishery habitat which will benefit the fishing industry.

VI Manageability of the Area

Sanctuary designation offers increased opportunities for interpretation and coordination among programs due to the availability of proposed satellite facilities and immediate staffing. Full-time attention of the manager would be available for resource protection due to the immediate availability of research and education coordinators.

Management of the proposed Sanctuary would integrate and utilize all aspects of the program to provide for protection of the special values of this unique marine area. Research, education, coordination, long-term planning and necessary regulations are described in the enclosed management plan.

The management plan describes sanctuary goals and objectives tailored to the specific resources and uses of the area. The goals and objectives will provide all Sanctuary users with a framework for conserving resources and integrating uses compatible with the goals of the management plan. These management goals are broad and allow for flexible implementation of action plans to fulfill the stated goals. Each objective of the management plan represents a short-term measurable step towards achieving the broader management goals.

The sanctuary manager will promote coordination among all authorities concerned with sanctuary resources and will particularly stress consideration of the special value of the Sanctuary's living resources in the formulation of policies affecting the area. NOAA's contribution to the policy-making process of other agencies managing uses in the Sanctuary will be enhanced by the Sanctuary's comprehensive research and monitoring programs.

The management program for the Sanctuary will be developed and implemented by the on-site manager. This will be accomplished in conjunction with other Federal, state, local and tribal agencies in order to benefit from existing expertise and personnel, and to promote state, Federal, and tribal interagency coordination and cooperation. Existing agencies include, among others, the WDF; Washington Department of Wildlife (WDW); Washington Department of Community Development (WDCD); WDOE; WDNR; and Washington Department of Agriculture (WDOA); and the Makah, Hoh, Quileute and Quinault Tribes; Clallam, Jefferson and Grays Harbor Counties; the National Park Service; USFWS; USCG, NMFS; PFMC; and Canadian authorities.

A particularly useful mechanism for coordination will be a Sanctuary Advisory Committee (SAC). The SSC will include members from Federal, state, local and tribal agencies, as well as commercial and private interests, and the environmental community. The SAC will ensure an exchange of information and will advise the sanctuary manager on permit applications and certifications, research priorities, and regulations.

VII: Consultations

A. National Environmental Policy Act (NEPA):

This document is both a FEIS/MP for the Olympic Coast National Marine Sanctuary. Some of the section headings, and their order, are different from those frequently found in other environmental impact statements. To assist NEPA reviewers, the following table has been developed. Under the heading "NEPA Requirements" are listed those topics normally discussed in an EIS. The corresponding section of this document and the page numbers are provided in the other two columns.

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Purpose and Need for Action	Part I:	1
Alternatives		
Preferred Alternative	Part III:	1
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NEPA Requirement	Management Plan	Page
List of Preparers	Part VI................	1
List of Agencies, Organizations, and Persons Receiving Copies of the FEIS/MP	Part VII...............	1

B. Endangered Species Act (ESA):

NOTE: An informal Section 7 consultation has been completed. The following is the result of this consultation.

Pursuant to Section 7 of the ESA, the USFWS of the Department of the Interior, and the NMFS of the Department of Commerce, were consulted in the performance of the biological assessment of possible impacts on threatened or endangered species that might result from the designation of a National Marine Sanctuary off the Olympic Peninsula. The consultations confirmed that some 14 Federal Endangered (FE) and six Federal Threatened (FT) species are known to occur in the area. In addition, one Washington State Endangered Species (SE) and one Washington State Threatened Species (ST) are known to inhabit the sanctuary ecosystem. Consultations determined that Sanctuary designation is not likely to adversely affect these species. The species identified are:

1. Aleutian Canada Goose.......*Branta canadensis leucopareia* FE
2. American peregrine falcon.........*Falco peregrinus anatum* FE
3. Bald Eagle.......................*Haliaeetus leucocephalus* FT
4. Blue whale.........................*Balaenoptera musculus* FE
5. Brown Pelican.......................*Pelicanus occidentalis* FE
6. Fin whale...................................*B. physalus* FE
7. Gray whale.........................*Eschrichtius robustus* FE
8. Harbor Porpoise.........................*Phocoena phocoena* ST
9. Humpback whale.....................*Megaptera novaeangliae* FE
10. Steller Sea Lion.......................*Eumetopias jubatus* FT
11. Right whale..........................*Eubalaena glacialis* FE
12. Sei whale....................................*B. borealis* FE
13. Short-tailed albatross..................*Diomedea albatrus* FE
14. Snowy Plover..................... *Charadrius alexandrinus* SE
15. Sperm whale............................*Physeter catodon* FE
16. Leatherback Turtle...................*Dermochelys coriacea* FE
17 Loggerhead Turtle.........................*Caretta caretta* FT
18. Green Turtle...............................*Chelonia mydas* FT
19. Olive ridley........................*Lepidochelys olivacea* FT
20. Sacramento River Winter-Run Chinook Salmon.*O. tshawytscha* FT
21. Snake River Sockeye Salmon........................*O. nerka* FE
22. Snake River Fall Chinook Salmon............*O. tshawytscha* FE

C. Resource Assessment:

The MPRSA, as amended, requires a resource assessment report documenting present and potential uses of the proposed Sanctuary area, including uses subject to the primary jurisdiction of the Department of the Interior. This requirement has been met in consultation with the Department of the Interior and the assessment report is contained in Part II.

D. Federal Consistency Determination:

Section 307 of the Coastal Zone Management Act of 1972, as amended, requires that each Federal activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner that is, to the maximum extent practicable, consistent with the enforceable policies of approved state management programs. This requirement is being met through a Federal Consistency Determination made by NOAA to the WDOE that the designation of the coastal and offshore waters adjacent to the Olympic peninsula as a National Marine Sanctuary is consistent, to the maximum extent practicable, with Washington's Coastal Management Plan.

E. Fishery Regulations

Section 303 (b)(2)(D) of the MPRSA, as amended, requires consultation with the PFMC. During consultation, NOAA requested the PFMC to determine if additional fishery regulations were necessary with Sanctuary designation in accordance with Section 304(b)(5). PFMC responded that no additional regulations were necessary and that management responsibility regarding fishing activities should remain with existing authorities.

F. Other Federal and State Agencies and the U.S. Congress

The Secretary has consulted with the Committee on Merchant Marine and Fisheries of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate. In September, 1991 the Designation Prospectus for the Olympic Coast National Marine Sanctuary was provided to all members of each committee. The results of these consultations have been incorporated into the FEIS/MP.

The Secretaries of State, Defense, Transportation, and the Interior, the Administrator of EPA, and the heads of other Federal agencies were consulted and their comments were addressed by the FEIS/MP. Summaries of all written comments and comments made at the hearings are provided in Appendix A of the FEIS/MP.

Appropriate Washington State and local government agencies were consulted and their comments were addressed by the FEIS/MP.

Summaries of all written comments and comments made at the hearing are provided in Appendix A of the FEIS/MP.

Appropriate Tribal organizations and Indian Tribes were consulted and their comments were addressed by the FEIS/MP. Summaries of all written comments and comments made at the hearings are provided in Appendix A of the Feis/MP.

The comments of all other interested persons were addressed by the FEIS/MP and summaries of all written comments and comments made at the hearings are provided in Appendix A of the FEIS/MP.

PART II: THE AFFECTED ENVIRONMENT

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PART II: THE AFFECTED ENVIRONMENT

A. Regional Context

1. Sanctuary Study Area Location

A Western Washington Outer Coast site was included on NOAA's original Site Evaluation List (SEL) established in 1983 (48 FR 24296, May 31, 1983). This SEL consists of 29 marine sites with high natural resource values that were identified and recommended to NOAA by regional resource evaluation teams. The SEL Western Washington Outer Coast site extends from Duntze Rock (north of Tatoosh Island on the northwestern tip of the state of Washington), 90 miles (145 km) southward along the coast to Point Grenville. The offshore boundary is contiguous with the boundary established for the Washington Islands National Wildlife Refuge, 2 to 3 miles (3.2-4.8 km) offshore. The Sanctuary study site encompasses approximately 225 square miles (169 nm^2, or 576 km^2) (Figure 3, p. I-11).

The 1988 amendments to the MPRSA (PL 100-627, November 7, 1988), direct the Secretary of Commerce to issue a notice of designation with respect to the Western Washington Outer Coast (proposed herein as the "Olympic Coast") National Marine Sanctuary not later than June 30, 1990 (section 205). In report language accompanying this legislation (H. Rep. No. 4210, 100th Cong., 1st. Sess., 1988), Congress noted that the boundaries of the area identified in the SEL may fail to provide an adequate buffer, and directed NOAA to use the SEL boundaries only very generally as a point from which to embark upon a more detailed public review and comment process which would lead to the development of various boundary options. NOAA was directed by Congress to consult extensively with state agencies, local government officials, marine scientists, and the public in carrying out the designation process and establishing specific boundaries.

In response to the Congressional directive, NOAA met with several government officials and marine scientists, and conducted four public scoping meetings in Washington State during April 1989. NOAA was strongly urged by tribal, state and local governments, other Federal agencies, private interest groups, and citizens to expand the area to be evaluated for sanctuary designation; specifically, areas south of Point Grenville to the Columbia River, and offshore to the edge of the continental shelf (defined herein as the 100 fathom depth contour). The heads of submarine canyons incising the shelf, and a highly productive fishing area adjacent to the head of Juan de Fuca Canyon, known as "the plain", were recommended for study. It was also suggested that consideration be given to extending the northern sanctuary boundary to the international boundary between Canada and the United States to promote and facilitate a potential "international sanctuary" at some future time. Some comments on the Draft Environmental Impact Statement/Management Plan (DEIS/MP) issued in September 1991, suggested that an eastern boundary be established within the Strait of Juan de Fuca. The total study area for the proposed Sanctuary evaluated by NOAA is, therefore, quite extensive compared to the original SEL site description, and covers approximately 4,155 nm^2 (14,249 km^2) (Figure 4).

The Olympic coast extends for approximately 150 miles from Cape Flattery in the north, southward to Cape Disappointment at the mouth of the Columbia River. The southernmost portion of the coastline is characterized by estuaries, wetlands, long sandy beaches, and dunes. North of Point Grenville the coastline is more rugged and rocky with high cliffs and sea stacks.

The area selected by NOAA for inclusion in the proposed Olympic Coast National Marine Sanctuary (i.e., NOAA's "preferred boundary option") is similar to that proposed in the DEIS/MP with slight variations to the shoreward boundary (Figure 5). The preferred boundary extends from Koitlah Point northward across the Strait of Juan De Fuca to the U.S./Canada international boundary where it continues seaward to the 100 fathom isobath, and southward along the coast to the southern border of the Copalis National Wildlife Refuge off of Copalis Beach, thus incorporating the entire northern rugged, rocky coastline. This sparsely populated 135 mile stretch of coast remains one of the few relatively undeveloped and pristine coastlines in the United States. In waters adjacent to Federally owned lands, the boundary of the proposed sanctuary extends landward to the higher high water line, and across the mouths of rivers and streams. When adjacent to Indian reservations and State lands, the Sanctuary boundary extends to the lower low water line.

The seaward extent of the sanctuary boundary generally follows the 100 fathom isobath except where it cuts across the heads of the Juan de Fuca, Quinault and Nitnat Canyons. The northern boundary encompasses the productive fishing areas known as "the plain," and Swiftsure Bank. The total surface area of the sanctuary is approximately 2,500 nm^2 (3577 km^2).

Characteristic of the coastal area of the proposed Sanctuary are rugged headlands and cliffs; sea stacks and sea arches; tidepools; hundreds of small offshore islands, rocks, and reefs; and sand and cobble beaches. Nutrient-rich waters and diverse habitat types result in an abundance and diversity of marine species of algae, invertebrates, finfish, shellfish, birds, and marine mammals. Commercial and recreational fisheries for salmon, groundfish, razor clams, and dungeness crab within the area contribute to the economy of Washington state and the nation. Popular recreational diving sites are located throughout

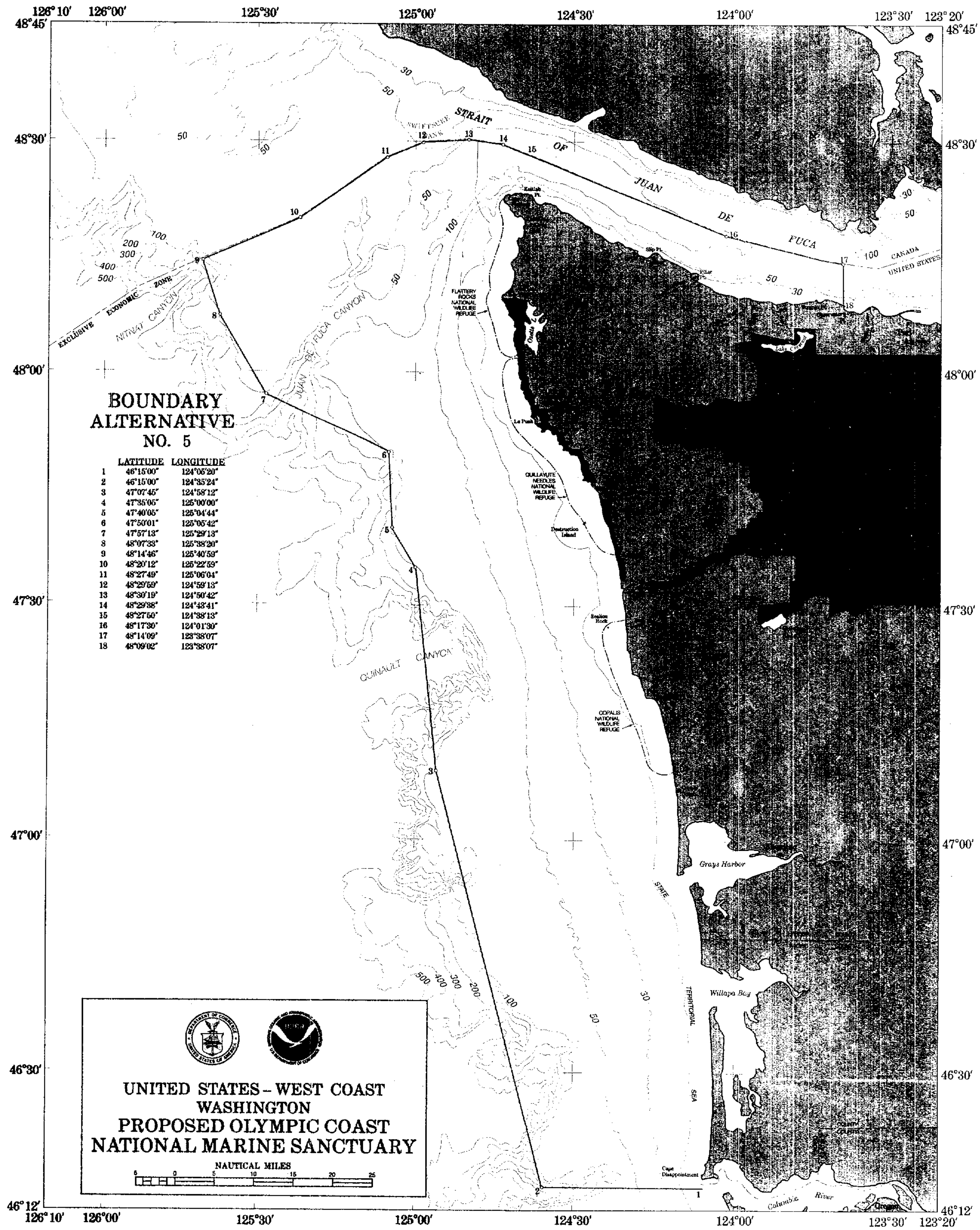


Figure 4. Study Area for the Proposed Olympic Coast National Marine Sanctuary.

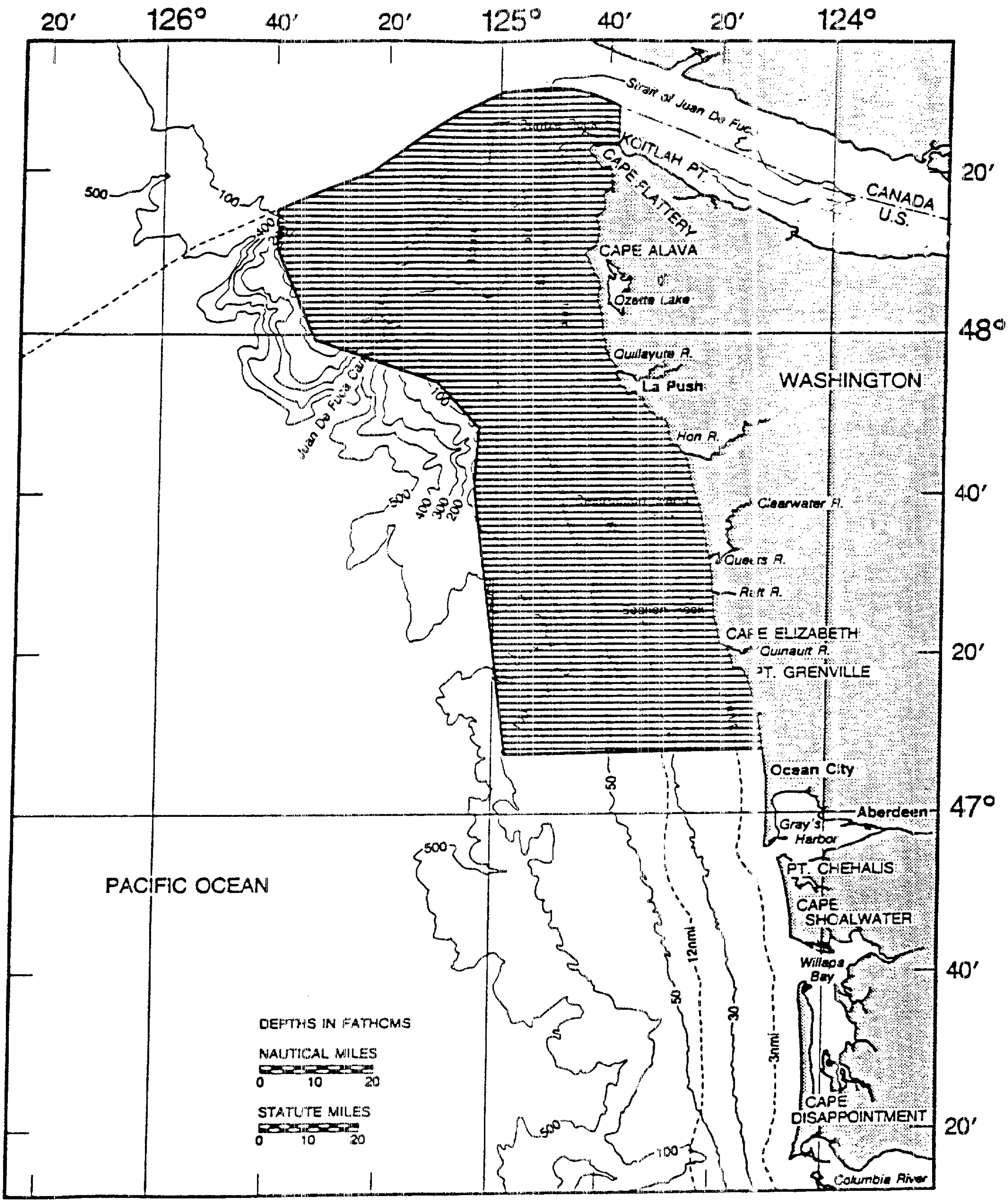


Figure 5. NOAA's Preferred Boundary Alternative.

the Strait of Juan de Fuca.

2. Socio-demographic Profile and Land Use

Most of the land area adjacent to the sanctuary study area is protected and sparsely populated. There are four Indian Reservations from Neah Bay to Moclips and more populated non-tribal communities bordering Grays Harbor and Willapa Bay. The land not encompassed by reservations or non-tribal communities on the outer coast, and offshore rocks and islands are largely protected by the NPS and the USFWS (both within the Department of Interior). Olympic Coast designations of national significance include migratory bird sanctuaries, wildlife refuges, wilderness areas, a Biosphere Reserve, and a World Heritage Site (Figure 6). Most of the remaining coastal lands along the outer coast not managed under Federal authority or within reservations are state public use areas (i.e., 74% of Clallam and Jefferson counties are under public ownership).

Small residential communities dot the Strait of Juan de Fuca between Neah Bay and Observatory Point including Joyce, Clallam Bay, and Sekiu. Public beaches abutting privately-owned land border much of the Strait resulting in few access points to the Strait. Clallam County has developed a park at Tongue Point and Observatory Point, and the Washington State Department of Natural Resources has developed a park at the Lyre River.

Population density in the counties adjacent to the study area is, and projected to remain low and relatively static (Appendix C, Figure 8). While the population of the State of Washington is expected to double from its 1960 level by the year 2010, the coastal counties in the northern extent of the study area, Clallam and Jefferson counties, are expected to increase by only 30 percent. Grays Harbor and Pacific counties, bordering the southern portion of the study area, are projected to increase even less, with some areas actually projected to experience a population decline, from -20 to 14 percent. The overall population density of the four coastal counties bordering the sanctuary study area is projected to be only between 0-49 persons per square mile by the year 2010 (Culliton et al., 1990).

The economy in the coastal region is inextricably linked to its natural resources, based primarily upon seafood, timber harvesting, pulp and paper production, and tourism. This is reflected in a number of socioeconomic indicators including a high reliance on manufacturing jobs compared to other coastal communities, high unemployment, low property values compared to those of the rest of the coastal U.S., and fewer construction permits. The tourist industry generates approximately $560 million annually from visits to the Olympic National Park. Of the estimated 3.5 million visits annually to the Park, approximately one third are to the coastline (SAB, 1984).

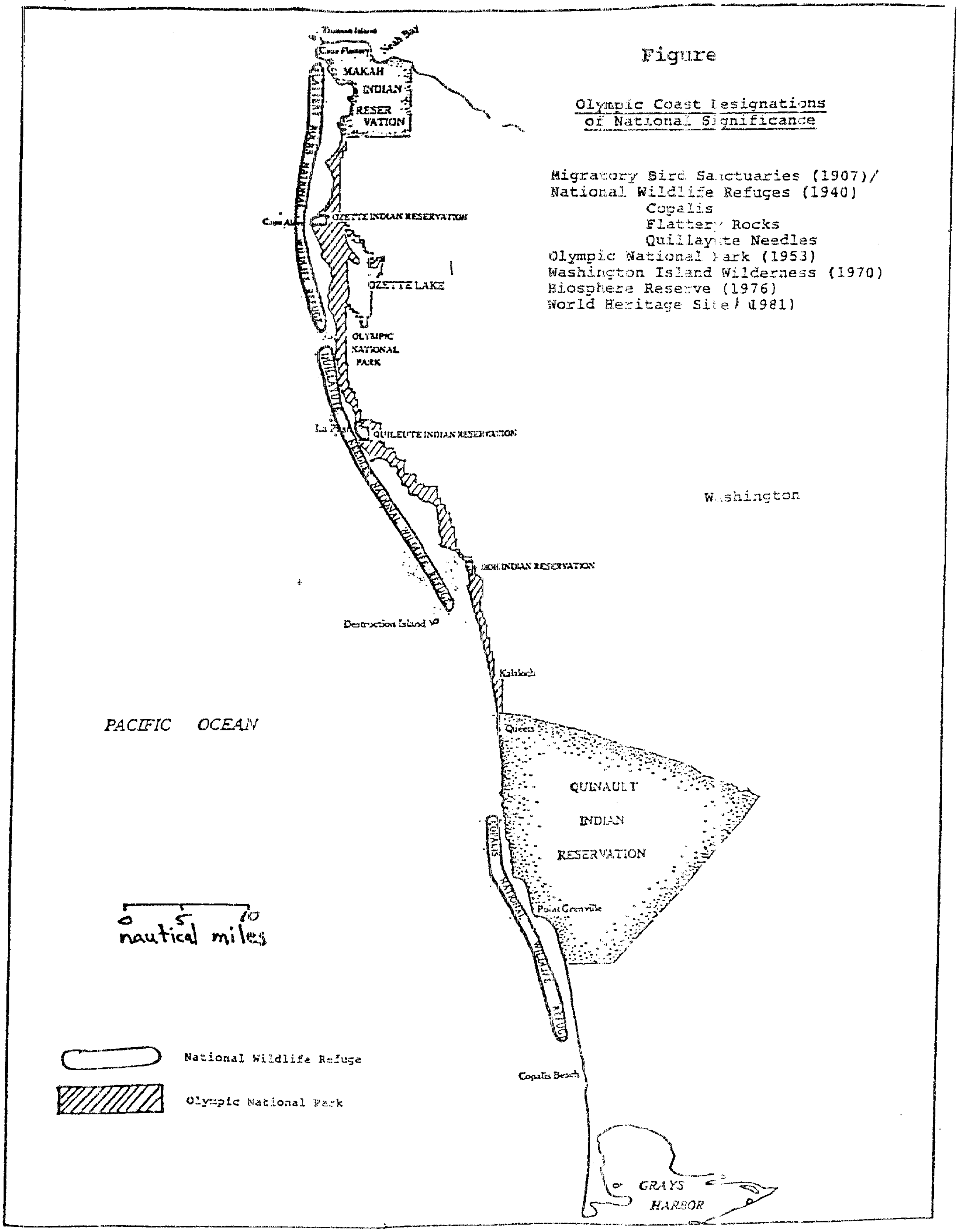


Figure 6. Olympic Coast Designations of National Significance.

Low population densities along the coast contribute to the relatively pristine nature of the outer coast and Strait of Juan de Fuca. Pollution sources such as agricultural and urban runoff, and domestic and industrial point sources are minimal. Likewise, a lack of shoreline development has enabled wildlife habitats to remain largely undisturbed. However, there are indications that excessive runoff resulting from timber operations are stressing coastal habitats.

Because of the presence of the Olympic National Park, forest lands dominate land use within all four coastal counties (Appendix C, Figure 1). Agriculture and wetlands are the next two most intensive land uses around Willapa Bay and Grays Harbor. Freshwater inflow into the proposed sanctuary watershed is relatively small compared to other areas of the contiguous West Coast. However, volumes of freshwater flow per square mile of drainage basin are high because the land, characterized by small drainage basins and steep terrain, experiences high rainfall (over 200 inches per year in some areas) (Rohmann, 1990).

Tribal Economies

Four Indian reservations are located on the outer coast of Washington State: 1) the Makah, located on the northwestern tip of the Olympic Peninsula; 2) the Quileute, located at La Push; 3) the Hoh, situated at the mouth of the Hoh River; and 4) the Quinault, located between Queets and Moclips. These four tribes are Federally recognized Indian Nations pursuant to the Steven's Treaties of 1855 which include the Treaty of Neah Bay (January 31, 1855. 12 Stat. 939) with the Makah Indians and the Treaty of Olympia (July 1, 1855. 12 Stat. 971) whose signatories include the Quinault, Quileute and Hoh Tribes (Appendix D).

The Ozette Reservation is a separate reservation inhabited historically by the Ozette Tribe. It is of cultural importance to the Quileute, Hoh and Makah Tribes, each of which now incorporate some Ozette ancestry, and each of which have historically fished and traded with the Ozette. Both the Quileute and Makah Tribes have asserted their right of access to the Ozette Reservation (Penn, 1992).

The following discussion presents: 1) an overview of the four Indian Tribes and their historical dependence on ocean resources; 2) the legal status of Treaty Tribes and their treaty-secured rights; and 3) current activities occurring on, or proposed for, the four Indian reservations. Description of the tribes and their legal status is extracted predominately from two Minerals Management Service publications (MMS, 1990; 1991) and by representatives of the respective tribes.

The Four Coastal Tribes and Historical Dependence on Marine Resources

Makah Indian Nation

The Makah Tribe differs from their Salish neighbors in that they are of Nooktan origin. Their main settlements at Neah Bay were set aside as a reservation pursuant to the Treaty of Neah Bay and subsequent Executive Orders, and they are governed under an Indian Reorganization Act constitution adopted in 1936. The Makah reservation is located on the northwestern-most tip of the Olympic Peninsula (Figure 7). It encompasses 44 square miles of land bounded by the Pacific Ocean to the west and the Strait of Juan de Fuca to the north. The Ozette Reservation, 10 miles south of Neah Bay is part of the Makah Reservation, with the Olympic National Park managing the contiguous shoreline between the two components of the Reservation.

Neah Bay is one of the largest and most accessible communities on the Olympic Peninsula with a year-round population of 1,400. It suffers from limited economic opportunities, and chronic and seasonal unemployment of over 16% and 50%, respectively (MMS, 1991). There has been a steady increase in the on-reservation portion of the population from 1960-1980 attributed partly to a higher birth rate, and expanded on-reservation economic opportunity subsequent to, and as a result of the Court's decision in United States v. Washington, 384 F. Supp. 312 (W.D. Wash. 1974), aff'd, 520 F.2d 676 (9th Cir. 1975), commonly referred to as the "Boldt Decision". As a result, the on-reservation Makah population age structure is younger than that of Washington State as a whole.

Historically, the Makah's relied on the marine resources for approximately three fourths or more of their diet which was comprised predominately of halibut and whale. Primary fishing and whaling grounds extended up to 50 miles seaward of Cape Flattery over La Perouse Bay and Swiftsure Banks. Other food fisheries included salmon, squid, skates, sea urchins, mussels, barnacles, crabs, sea slugs, periwinkles and limpets. Gadoid fish were consumed including true cod, lingcod, rockcod, sablefish, sculpins and rockfish. Porpoises, seals, sea-lions, otters, and seabirds were also hunted. Traditional salmon fishing was concentrated in the Sekiu and Hoko rivers just to the east of Neah Bay on the Strait.

After the 1880's, the Makah Tribe experienced dramatic changes in their economy. Increased exploitation of seals and halibut by American fishing fleets forced the Makah's to rely more heavily on salmon and other nearshore fishery resources. By 1942, fishing (approximately 1/3 for halibut) accounted for only a little more than 25 percent of the Makah's income. Today, marine resources are vital to the Makah Tribe for commercial and

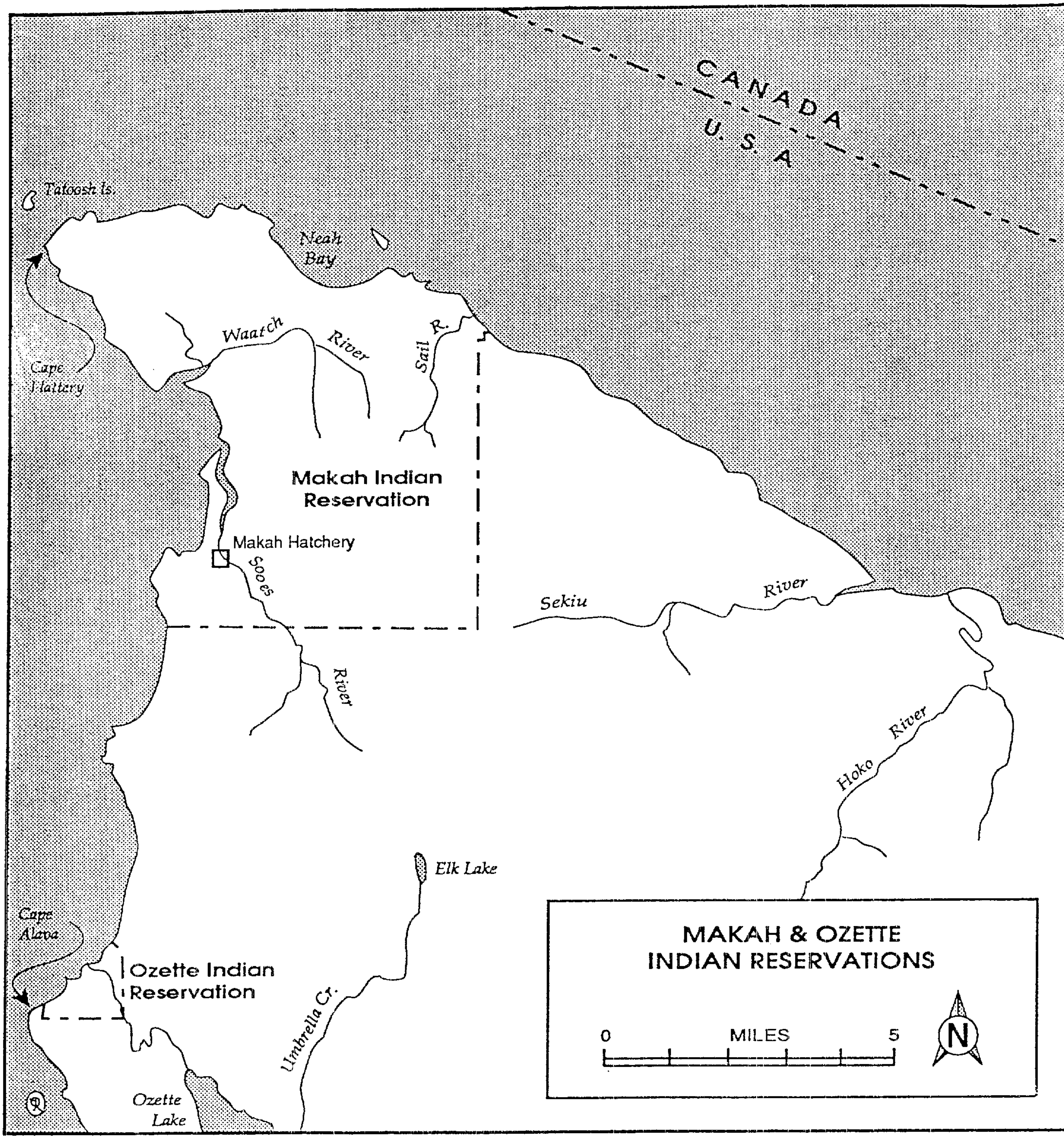


Figure 7. Makah Indian Reservation (MMS, 1991).

subsistence purposes. Over 60 percent of Tribal members actively fish and 75 percent of Tribal households are directly or indirectly dependant on fisheries for their economic survival. Many tribal members continue to harvest other marine resources, including shellfish and marine mammals for subsistence (MMS, 1991). A more complete list of ocean and coastal resources utilized by the Makah is presented in Appendix E.

Quileute Tribe

The Quileute Reservation is located approximately 36 miles south of Cape Flattery (Figure 8). Their reservation encompasses one square mile of land at La Push. Approximately 450 of the 723 persons enrolled in the Quileute Tribe in 1990 live on the reservation. The unemployment rate on the reservation is approximately 81 percent, with 92 percent of those employed earning less than $7,000 annually.

The Quileute are ethnically and linguistically distinct from their Tribal neighbors who are of Nooktan and Salish origin with two exceptions: 1) the Hoh, part of the Quileute Tribe until recent times, incorporates the same language and ethnic characteristics; and 2) the recently extinct Chinacum Tribe of the Olympic Peninsula and Port Townsend Area, was also known to have spoken essentially the same language as the Quileute Tribe (Penn, 1992). The Quileute language is one of only five languages in the world lacking nasal sounds. The Quileute and Hoh Tribes are closely related aboriginally, but have functioned increasingly as distinct legal entities since the early part of the century. Although the Treaty of Olympia provided for a single reservation for both the Quileute and Hoh Tribes, two small reservations were set aside for each by Executive Orders of September 11, 1893, and February 19, 1889, respectively. The Quileute adopted an Indian Reorganization Act Constitution in 1936, and the Hoh in 1969.

The main Quileute winter village was historically located at La Push. The Quileute harvested salmon, smelt, bass, ocean perch, cod, rockcod, redcod, lingcod, halibut, flounder and other flatfish, bullheads, rays, octopus, shark, herring, sardine, and sturgeon. They hunted hair and fur seals, sea lions, sea otters, porpoise, and whale, and gathered butter clams, razor clams, rock oysters, mussels, acorn and goose-neck barnacles, sea urchins, anemones, slipper-shells and crabs. Among the seabirds harvested were ducks, geese, white-crested cormorant, brandt, gulls, puffins, auklets, and loons.

As a result of increasingly restricted access to marine mammals and terrestrial resources such as deer and elk by Federal and state laws, the coastal tribes became more dependent upon fishing for commercial and subsistence purposes. By 1944, fishing accounted for approximately two thirds of the Quileute

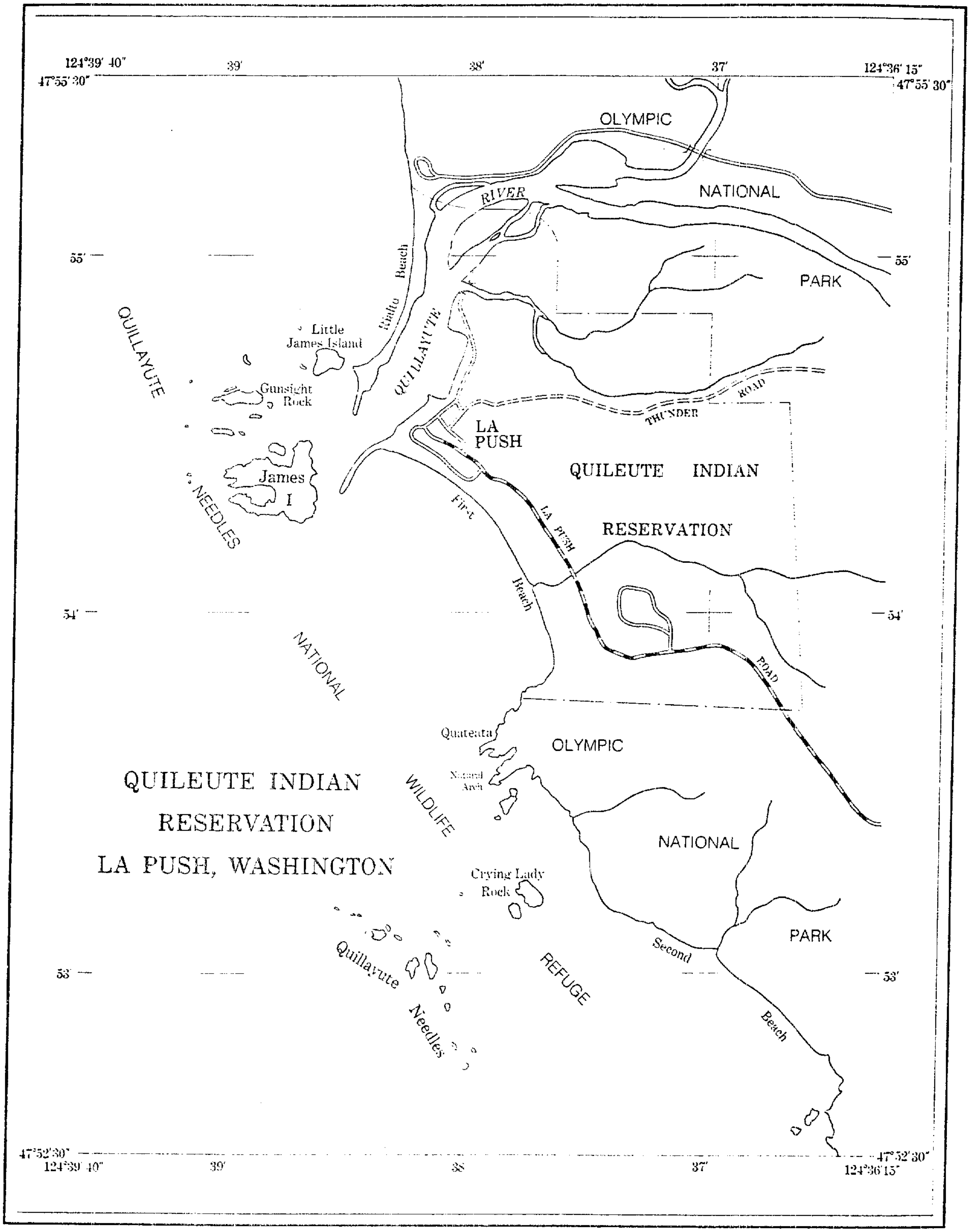


Figure 8. Location of the Quileute Indian Reservation (MMS, 1991).

Tribe's earned income, with the remainder derived from fur trapping, crafts, some cattle-raising and wage work, chiefly in logging and for the Forest Service. Resources currently harvested by the Quileute are listed in Appendix E. Shellfish and other shoreline resources play a year-round role in sustaining the Quileute people (MMS, 1991).

Hoh Indian Tribe

The main Hoh village is located at the mouth of the Hoh River on a small reservation encompassing approximately 480 acres (Figure 9). The reservation extends along the coast for about one mile. There is no protected harbor either at the river mouth or elsewhere on the reservation. According to a 1989 report by the Bureau of Indian Affairs, 94 of 120 persons enrolled in the tribe live on or near the Reservation. Unemployment is approximately 53 percent with 82 percent of employable persons earning less than $7,000 annually.

The Hoh historically harvested salmon halibut and black bass, clams and smelt. They also harvested whales near Destruction Island. Their current economic opportunities are bleak with most Hoh families subsisting from oceanic and coastal resources. Today, the Hoh consume more ocean and shoreline resources per household than any other Washington coastal Tribe. The resources upon which the Hoh depend are listed in Appendix E. Other economic activities occurring on the Hoh reservation include the production of native crafts and a limited amount of timbering.

Quinault Indian Nation

The Quinault Reservation was established by Executive Order in 1873. The Tribe functions under an Indian Reorganization Act constitution adopted in 1965. The reservation, encompassing approximately 200,000 acres extends 26 miles along the Pacific Coast (Figure 10). The two principle villages are Taholah and Queets. A third village on the reservation, Amanda Park, is populated by non-Indians. The total population on the Quinault reservation is approximately 2260 (MMS, 1991). The per capita income on the Quinault Reservation in 1988 was $3,182 compared to $7,446 in Grays Harbor County. Approximately 32.6 percent of families on the Quinault reservation are below the poverty level compared to 10.5 percent of families in Grays Harbor County (MMS, 1991).

The Quinault are speakers of Chinookan, Salish or Chemakuan. The present Quinault Reservation contains the ancient lands of two distinct tribes, the Quinault and the Queets. Historically, marine resources harvested were salmon, smelt and candlefish, halibut, cod, rock cod, sea bass, and soles, razor clams, mud clams, rock oysters, black-shelled mussels, slipper-shells, sea

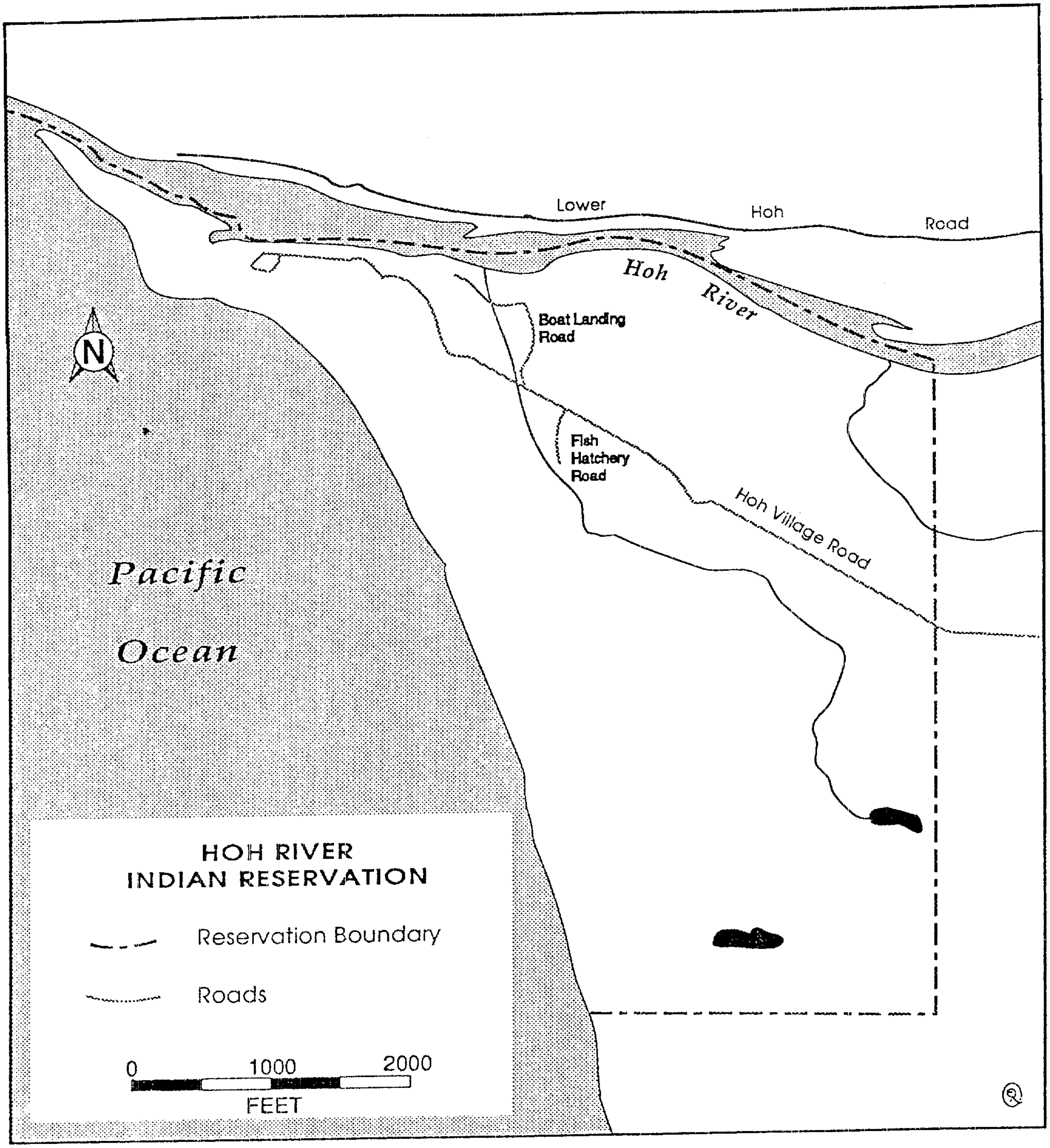


Figure 9. Location of the Hoh Indian Reservation (MMS, 1991).

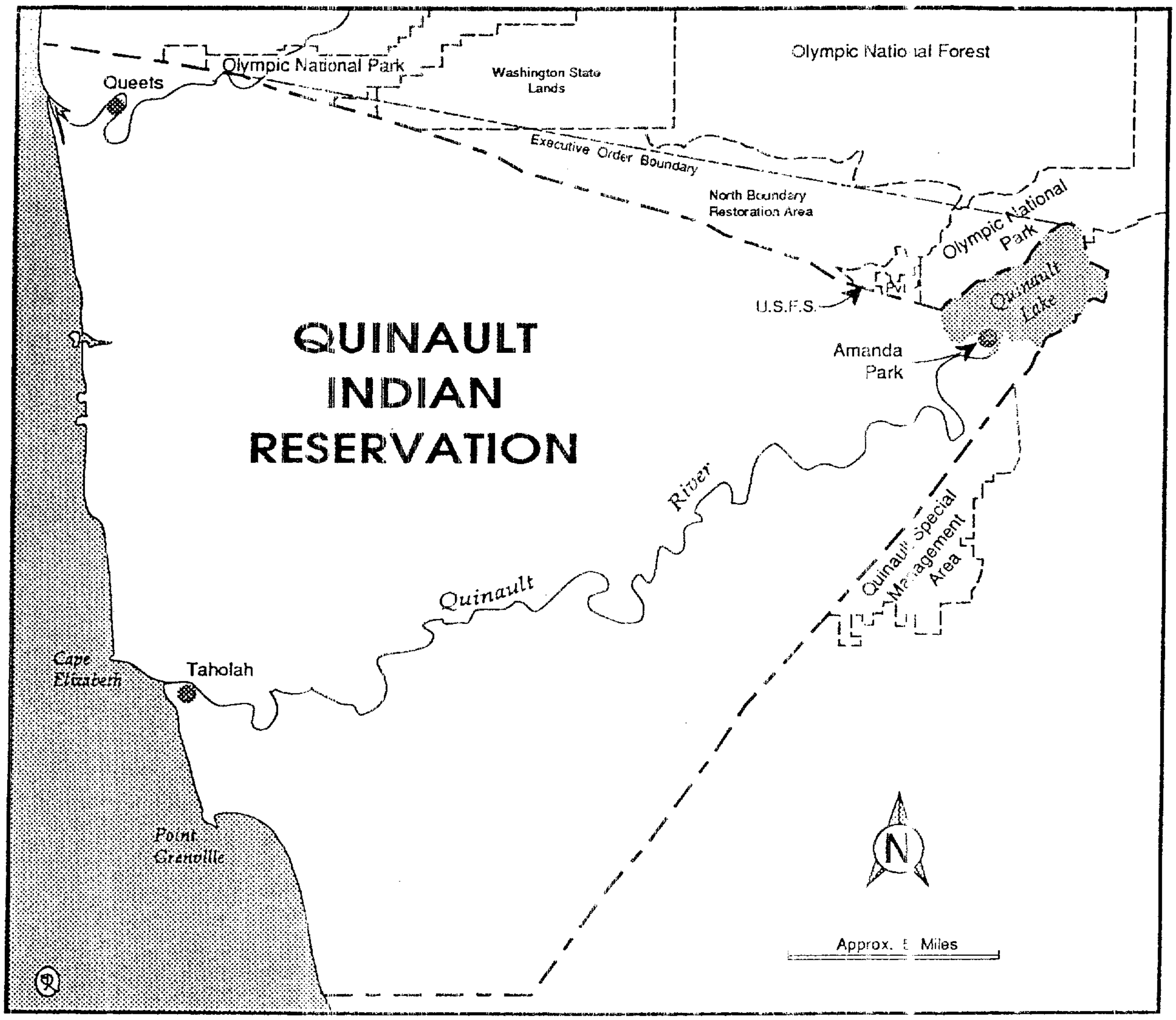


Figure 10. Location of the Quinault Indian Reservation (MMS, 1991).

anemones and crabs, flounders, herring, seals, sea lions, whales, and sea otters. Birds harvested included ducks, geese, gulls, and loons and their eggs. Seaweed was also harvested for food.

By the 1870's the Quinault were economically integrated into European society. They were engaged in a variety of wage-earning occupations such as seal hunting, and employed by oyster, fishing and logging companies. Today, salmon has become the commercial mainstay of Quinault fisheries, in addition to halibut, lingcod, black bass, other rockfish, smelt, flounder, perch, sturgeon and razor clams. A more complete list of ocean resources harvested by the Quinault is provided in Appendix E. Virtually every Quinault tribal member derives some benefit from the fishery resources through participation in ceremonies, distribution of fish within families, and sharing of fish among extended families and friends. The Tribe is pursuing a strategy of vertical integration to increase the benefit return from ocean resources. A seafood processing facility at Taholah depends both upon tribal catch and fish purchases from off-reservation suppliers.

Treaty Rights and Legal Status

The Tribes have a unique legal status under which they enjoy a collective interest in lands and natural resources quite different from the property rights accorded to others. By entering into treaties with the tribes, the United States accepted a fiduciary duty to protect all of the rights which the treaty secured, including marine hunting and fishing rights. There is "an extensive body of cases holding that when the federal government enters into a treaty with an Indian tribe..., the Government commits itself to a guardian-ward relationship with that tribe." Joint Tribal Council of Passamaquoddy v. Morton, 528 F.2d 370, 379 (1st Cir. 1975). This fiduciary duty, known as the federal trust responsibility, extends to all federal agencies. Pyramid Lake Paiute Tribe v. United States, 898 F.2d 1410, 1420 (9th Cir. 1990). In addition, it requires that federal agencies seriously consider and protect Indian rights and interests to the fullest extent possible. Northern Cheyenne Tribe v. Hodel, 12 Ind. L. Rptr. 3065 (D. Mont. 1985). The Federal government, however, is not obligated to provide particular services or benefits, nor to undertake any specific fiduciary responsibilities in the absence of a specific provision in a treaty, agreement, executive order, or statute. Havasupai Tribe v. U.S., 752 F. Supp. 1471 (D. Ariz. 1990), citing Vigil, 667 F.2d at 934; North Slope Borough v. Andrus, 642 F. 2d 589, 611 (D.C. Cir. 1980); Gila River Pima-Maricopa Indian Community, 427 F.2d 1194, 190 Ct.Cl. 790 (1970).

The Treaty of Neah Bay and the Treaty of Olympia expressly reserved, among other things, each Tribes' right to continue to fish in its "usual and accustomed fishing grounds and stations." The Treaty of Neah Bay differs from the Treaty of Olympia in that it secures for the Makah Indian Nation the "right of taking fish and of whaling or sealing at usual and accustomed grounds and stations..."(Article 4, Treaty of Neah Bay, 1855). The addition of whaling in the Treaty of Neah Bay addresses the Makah's historical dependence on whaling for subsistence, cultural and ceremonial purposes.

In addition to reserving the right to fish and whale at usual and accustomed fishing areas, the Treaties also secure the right of access to Tribal lands for the Treaty Tribes. Article 2 of each Treaty states that "...said tract shall be set apart, and so far as necessary surveyed and marked out for their exclusive use; nor shall any white man be permitted to reside upon the same without permission of the said tribe and of the superintendent or agent..." Thus, access to Tatoosh Island and the Ozette site by the Makah Tribe is secured by the Treaty of Neah Bay.

The post-treaty history of Northwest Indian fishing rights has been contentious and complex. With increasing exploitation of marine mammals, pinnipeds and fish by European settlers, the Treaty Tribes fought to maintain their treaty-secured right of access to marine resources in the courts. In 1905 the United States Supreme Court interpreted the Treaties securing the right of treaty tribes to fish to be "not a grant of rights to the Indians, but a grant of rights from them,--a reservation of those not granted." United States v. Winans, 198 U.S. 371, 384 (1905).

Aboriginal and treaty-secured rights can only be abrogated if there is "clear evidence that Congress actually considered the conflict between its intended action on the one hand and Indian treaty rights on the other, and chose to resolve that conflict by abrogating the treaty" United States v. Dion, 476 U.S. 734, 739-40 (1986). Regulations which restrict the exercise of treaty-secured hunting and fishing rights are lawful only if they: 1) are "reasonable and necessary" to "prevent demonstrable harm" to a harvested species or stock; and 2) are the least restrictive alternative for achieving this purpose. (United States v. Washington, 384 F. Supp. 312, 342, 415 (W.D. Wash. 1974), aff'd, 520 F.2d 676 (9th Cir. 1975).

Two significant legal decisions have addressed the extent to which state and Federal regulatory measures were justifiable for conservation purposes. In 1942 the United States Supreme Court struck down license fees for tribal members as unrelated to the conservation of fish, and hence contrary to the intent of the treaties. Tulee v. Washington, 315 U.S. 681 (1942). In 1974, the landmark "Boldt Decision" held that Indian tribes of Puget Sound and coastal Washington have the right to an opportunity to take up to 50 percent of the total number of harvestable salmonids, as well as the right to regulate their own fishers. United States v. Washington, 384 F. Supp. 312 (W.D. Wash. 1974), aff'd, 520 F.2d 676 (9th Cir. 1975). Non-salmonid fisheries may eventually be brought within the same legal regime because Indian tribes in Washington State have launched a challenge against the State's shellfish harvesting regulations (MMS, 1991).

Current and Future Activities

Current activities occurring on and/or planned for the reservations adjacent to the proposed study area include timbering, harbor development and maintenance, an increased emphasis on attracting tourism, and the preservation of culturally significant and wilderness areas. The tribes seek to promote economic development on the reservations to alleviate unemployment and poverty, enhance their ability to provide basic public services and facilities, and further the joint tribal-Federal goal of tribal self-sufficiency (MMS, 1991).

Timbering is an important economic activity on the Makah and Quinault Reservations, and to a lesser extent on the Hoh Reservation. The Bureau of Indian Affairs manages, as trustees for the Tribes, a substantial timber resource, under a sustained yield operating plan approved by the Tribal Councils. Revenues from sales of timber stands is an important component of the Makah and Quinault tribal government income. Most of the employment generated by the forestry resource is in logging and transportation, since most of the timber harvested on the reservation is transported to mills outside of the reservation (Pacific Rim Planner, Inc., 1980).

Harbor development and maintenance activities occur on the Makah and Quileute Reservations. The Makah Tribe undertakes maintenance dredging of Neah Bay every 10 to 20 years. The Tribe is also planning harbor improvements and expansion to develop a commercial marina along the central portion of the south shore of Neah Bay. The marina would accommodate 300 boats and would be dredged to a minimum depth of 28 feet mean lower low water. The volume of dredge spoil generated by the proposed marine expansion is estimated to be approximately 154,000 cubic yards of sand. Dredge spoil will be utilized for beach nourishment projects with excess spoils utilized or disposed of on land (Simmons, 1993).

Additionally, the mouth of the Quillayute River is dredged to maintain the channel by the U. S. Army Corps of Engineers. Pursuant to the Quileute Coastal Zone Management Plan (Hyas' Ya' Kolla', 1981) dredging of the navigation channel shall occur only between January 1 and March 31 of any year. Dredge spoils are routinely deposited on the north jetty and breakwater of the Port of La Push. All dredging is timed, and measures are undertaken to protect fish habitat of the Quileute Reservation. The port facility is in need of significant repair and upgrading. The Tribe has received a small grant from the state to assist in strategic planning for port improvements including bulk fuel storage, waste oil containment, solid waste removal and public rest rooms (Schaftlein, 1992).

Scattered areas on and off the Reservations are culturally significant to the Tribes. Property of cultural significance have an important role in the current community, but also may have historic significance to the Tribe's beliefs, customs and practices as well. These sites may be important if culturally significant events, activities or observances have occurred at the location, or if the user group designated a name to that particular place. These sites include ancient villages such as Ozette, burial grounds, ceremonial places for prayer, preparation and training, lookout places, etc...(Pascua, 1992). James Island and First Beach are particularly important to the Quileute Tribe as ancient burial grounds and areas of spiritual significance. The Hoh shoreline is a burial area for ancestors of the Hoh people. Destruction Island is also spiritually significant to the Hoh Tribe. In addition to areas set aside as culturally significant, the Makah Tribe has reserved over 1,000 acres of reservation land bordering the Pacific Coast as a wilderness area. The Quinault Tribe has set aside offshore rocks and islands as bird and wildlife sanctuaries. In addition, the estuarine habitats essential for salmon and wildlife are protected from development by policies set forth in the Quinault Coastal Zone Management Plan (Quinault Planning Commission, 1979).

Tourism holds future economic promise to the coastal tribes and is being strategically targeted as a way to alleviate the severe economic conditions prevailing on the reservations. The Quileute Tribe has a strong interest in tourism. La Push Ocean Park Resort provides a range of accommodations. Future efforts to accommodate tourism will emphasize providing food service, building additional tourist rental units, increasing winter tourism visitation rates, providing charter fishing services, and providing a museum/cultural center. During the tourist season, the tourist enterprises on the Quileute Reservation may bring the effective population of La Push to approximately 3,000 persons (Penn, 1992). The Makah Tribe is also targeting tourism, especially with their plans to expand and diversify the port of Neah Bay.

B. <u>Sanctuary Study Area Resources</u>

The study area of the Olympic Coast National Marine Sanctuary lies in the Oregonian biogeographic province (Figure 2, p. I-10) which extends from Cape Mendocino, California, north to Cape Flattery, Washington, including the Strait of Juan de Fuca. This province is characterized by a narrow continental shelf, mountainous shoreline and steep rocky headlands, interspersed with open sandy and pocket beaches, many small and few large rivers, and small estuaries with bay-mouth barriers. Waters in the Oregonian Province are cool and relatively clear with sea-surface temperatures ranging between 9°-11° in winter and 13°-15° in summer. Ocean waters are dominated by the California Current. This province is characterized by having the greatest volume of upwelling in North America from February to September resulting from the interaction of ocean currents, winds and the submarine canyons that indent the shelf, most notably, the Juan de Fuca Canyon. These environmental factors combine to produce highly productive nutrient-rich waters and abundant marine resources along the outer coast and in the estuaries of Grays Harbor, Willapa Bay and the Columbia River.

The proposed marine sanctuary supports a multitude of species of algae, invertebrates, birds, marine mammals, and commercially important finfish and shellfish. Federally listed endangered or threatened species such as the bald eagle, peregrine falcon, brown pelican, Aleutian Canada goose, short-tailed albatross (although not listed as endangered within the United States), northern (Steller) sea lion, and gray, blue, and humpback whales inhabit this coastal area and the adjacent mainland. The rocky headlands along the coast north of Point Grenville provide important habitat for a wide variety of seabird populations, while the offshore islands and rocks of the Flattery Rocks, Quileute Needles, and Copalis National Wildlife Refuges are important as haulout areas for California sea lions and northern sea lions, and roosting and nesting habitat for seabirds. The western Strait of Juan de Fuca serves as an important migration corridor for bird and fish species moving to and from the San Juan Island archipelago and Puget Sound. Salmon, groundfish (e.g., halibut, rockfish, cod, sablefish, whiting), and shellfish (crabs, razor clams, oysters) are the mainstays of commercial and recreational fisheries in the sanctuary study area.

1. Environmental Conditions

(a) Geology

The Pacific margin of the United States is the tectonically active edge of the North American crustal plate (composed mostly of continental crust) that has collided with and is overriding the sea floor of the Juan de Fuca oceanic crustal plate. The coastal margin is characterized by a narrow continental shelf, slope and rise, and is marked by earthquakes associated with geological faulting and volcanism (McGregor and Offield, 1986). The area of the proposed sanctuary is subjected to tectonic forces caused by the combined movements of the large Pacific and North America Plates and the smaller Juan de Fuca Plate (Figure 11). The altered sedimentary rocks of the Olympic Mountains and the volcanoes of the Cascade Range (Mount Saint Helens, for example) are the result of the convergence of these plates composed of oceanic and continental crusts.

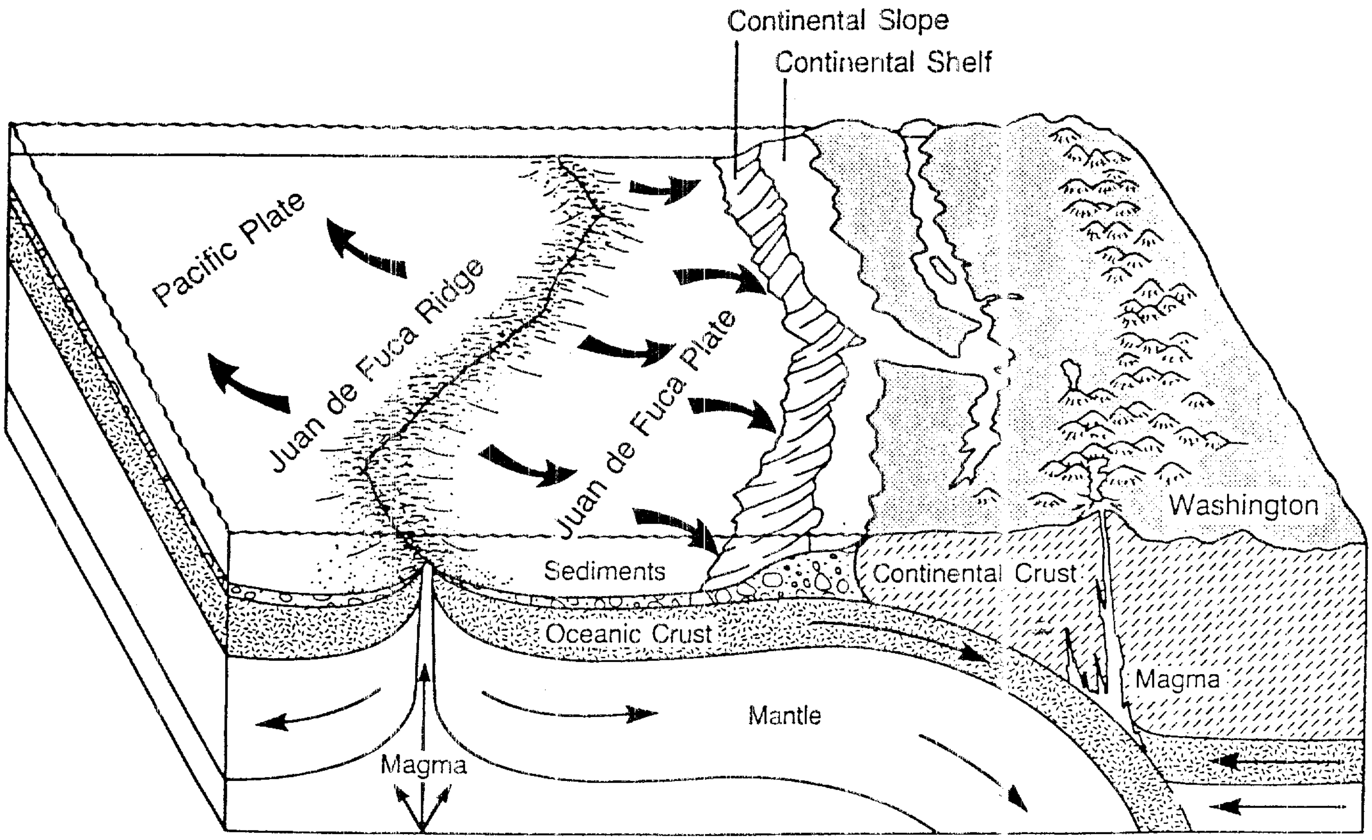


Figure 11. Plate Tectonic Structure of the Pacific Northwest Continental and Oceanic Region (Strickland and Chasan, 1989).

The continental shelf of the Washington coast is smooth and narrow, ranging in width from eight to forty miles (Washington State Dept. of Ecology, 1986). Submarine canyons incise the continental shelf and slope along the entire coast, and the heads of Juan de Fuca and Quinault Canyons are included within the proposed sanctuary (Figure 12). The continental slope consists of a steep and highly incised upper portion, and a more gently sloping lower portion which grades into the Cascadia Basin (Baker and Hickey, 1986). Although glacial deposits comprise the underlying relic sediments of the continental shelf, the Columbia River is the dominant source of modern sediments for the southern Washington Shelf (Nittrouer, 1978 in Baker and Hickey, 1986). The northern shelf is fed by sediments carried from the Strait of Juan de Fuca. Year-round bottom currents and winter storms transport much of this sediment north-northwest. The sediment accumulates on the shelf as a band of sandy silt with the inner shelf sandy and the outer shelf comprised primarily of silt and clay (Carson, et al., 1986). Much of this sediment is transported to and deposited in the Quinault Canyon where it gradually works downhill into the Cascadia Basin (Cutshell, et al., 1986). Overlying the bedrock along many areas of the coast are deposits of sand and gravel laid down by glacial streams during extensive glaciation of the Olympic Mountains during the Pleistocene Epoch some 17,000 to 70,000 years ago (Rau, 1973). Prominent gravel pockets lie off Cape Flattery, Grays Harbor, and the mouth of the Quinault River (Moore and Luken, 1979).

The uplifted broad coastal plain that forms the coast of Washington extends from Cape Flattery southward and includes two tidal inlets, Willapa Bay and Grays Harbor (Weissenborn and Snavely, 1968). Broad beaches, dunes, and ridges dominate the coastline from Cape Disappointment on the north side of the Columbia River mouth, to the Hoh River (Moore and Luken, 1979). The plain rises eastward and merges with the foothills of the Olympic Mountains. Wave action has eroded the plain through time and formed steep cliffs along the coast, except at river mouths. For most of the coast between Cape Flattery and Point Grenville these cliffs rise abruptly 50 to 300 feet above a wave-cut platform. This wave-cut platform, which normally extends about half a mile from shore, is nearly two miles wide west of Ozette Lake. Small islands, sea stacks, and rocks dot the platform's surface. Islands can be found in all stages of development from partially isolated promontories to true islands several acres in extent (op. cit.). The largest, Destruction Island, is 1.5 km long.

(b) Meteorology

The climate of western Washington is characterized by relatively mild winters and moderately dry cool summers. Most air masses reaching the coast originate over the Pacific Ocean and exert a moderating influence throughout the year. The

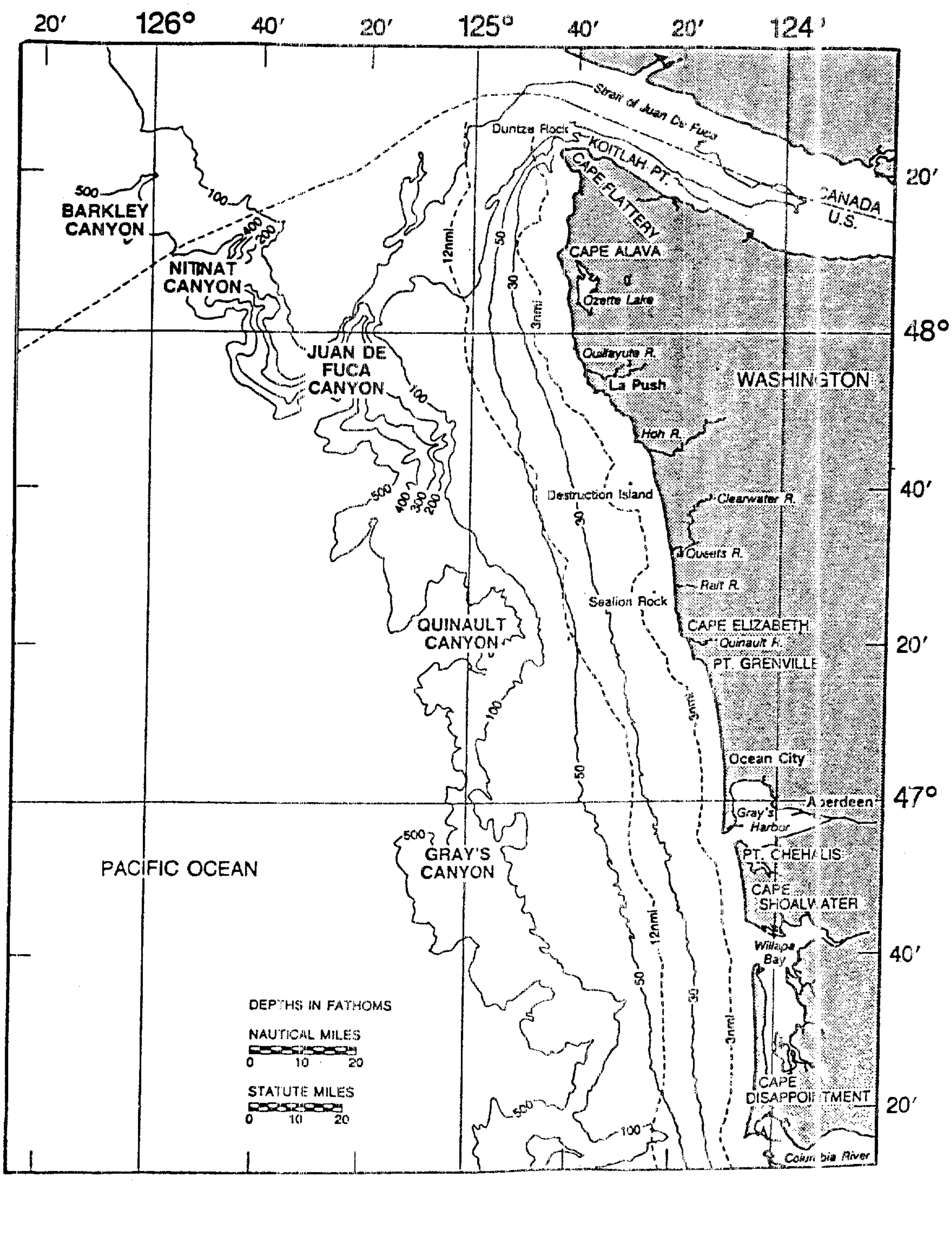


Figure 12. Bathymetry of the Olympic Coast Offshore Area and Submarine Canyons (Illustrations Unlimited, 1991).

climate is influenced by topography, location along the windward coast, prevailing westerly winds, and the position and intensity of high and low pressure centers over the North Pacific Ocean (Phillips and Donaldson, 1972).

In late spring and summer, westerly to northwesterly winds associated with the North Pacific high pressure system produce a dry season. In late fall and winter, southwesterly and westerly winds associated with the then dominant Aleutian low pressure system provide ample moisture and cloud cover for the wet season which begins in October. The rising and cooling of moist air along the windward slopes of the Willapa Hills and Olympic Mountains produces an area of heavy precipitation from the coast to the crests. Annual amounts range from 70 to 100 inches over the southern coastal plains and from 125 to 200 inches in the "rain forest" area on the western slope of the Olympic Mountains (op. cit.).

Afternoon temperatures near the coast during the summer are generally in the upper 60's (°F). In an average winter, maximum temperatures range from 38°F to 45°F and minimums from 28°F to 35 °F (op. cit.). The highest wind speeds recorded on the Washington coast reached 150 mph at North Head at the mouth of the Columbia River in January 1941, and 94 mph at Tatoosh Island in November 1942 (Oceanographic Institute of Washington, 1977, in Strickland and Chasan, 1989).

Ocean surface water temperature near the coast averages about 48°F in February, 52°F in May, 57°F in August, and 50°F in November. The range of seawater temperature is greater in shallow and protected bays along the coast. The temperature range offshore is slight throughout the year, thus inshore-offshore migrations of biota associated with seabed temperature changes (common in other coastal areas such as the mid-Atlantic) do not occur.

(c) <u>Waves and Currents</u>

The Washington outer coast is known for its rough seas and large waves. Extremes of wave height ranging from 15m to 29m have been recorded on and beyond the continental shelf (Strickland and Chasan, 1989). The height and direction of waves vary seasonally. During summer, waves are lower in height, predominately from the northwest, causing longshore currents and sediment transport to the south. In winter, waves are generally higher and from the southwest, causing northerly longshore currents and sediment transport (Ballard, 1964 in Terich and Levenseller, 1986). U.S. Army Corps of Engineers (COE) hindcast data for a station off Grays Harbor show nearshore wave heights to average about 4m during November through January with maximum heights of almost 8m during October through December. Wave heights on the outer shelf average almost 5m during December through January with a maximum of 11m in January (U.S. Army Corps of Engineers, 1988). The most severe wave conditions are caused by winter storms originating near Japan that move onto the U.S. Pacific coast. Storm winds ahead of warm fronts generate waves with significant wave heights up to 6-7m; winds associated with cold fronts generate waves of 8-10m significant height (Kachel and Smith, in press). Tsunamis, long-period sea waves produced by submarine earthquakes or volcanoes, occasionally strike the Washington coast. The Alaskan earthquake of 1964 produced a tsunami that reached a height of almost 4m at Seaview, Washington.

The oceanic current system off the coast of Washington is comprised of the California Current, Davidson Current, and California Undercurrent (Figure 13). The seasonal variation in the pattern of coastal circulation is the result of changes in direction of the dominant winds associated with large-scale atmospheric pressure cells over the Pacific Ocean.

The California Current flows southward beyond the continental shelf throughout the year. This current is approximately 1,000 km wide with a typical velocity of 10 cm/s. It brings low temperature, low salinity, high oxygen, and high phosphate subarctic water from high to low latitudes (Hickey, in press). The California Current is strongest in July and August in association with the dominant westerly to northwesterly winds.

The California Undercurrent, a narrow (20 km) subsurface countercurrent, flows northward along the upper continental slope with its core at a depth of about 200m. This current is also strongest in the summer with a mean velocity of about 10 cm/s. It brings warmer, more saline, low oxygen, low phosphate equatorial water from low to high latitudes (Hickey, 1979). A southward flowing bottom current (the Washington Undercurrent) flows deeper along the slope at about 400m depth during the winter.

During winter, the California current either moves offshore or is replaced by the near surface northward flowing Davidson Current. The Davidson Current flows over the slope and outer shelf during winter and early spring in association with the dominant southerly or southwesterly winds. It flows at a mean velocity of 20 cm/s and is associated with water masses with the same characteristics as the California Undercurrent.

Currents over the continental shelf tend to follow the seasonal pattern of the oceanic currents, but are also strongly influenced by local winds, bottom and shoreline configuration, and freshwater input (Strickland and Chasan, 1989) (Figure 14). General circulation over the shelf during winter is northward, driven by the southerly or southwesterly winds that predominate during that season. During the summer, northerly winds and

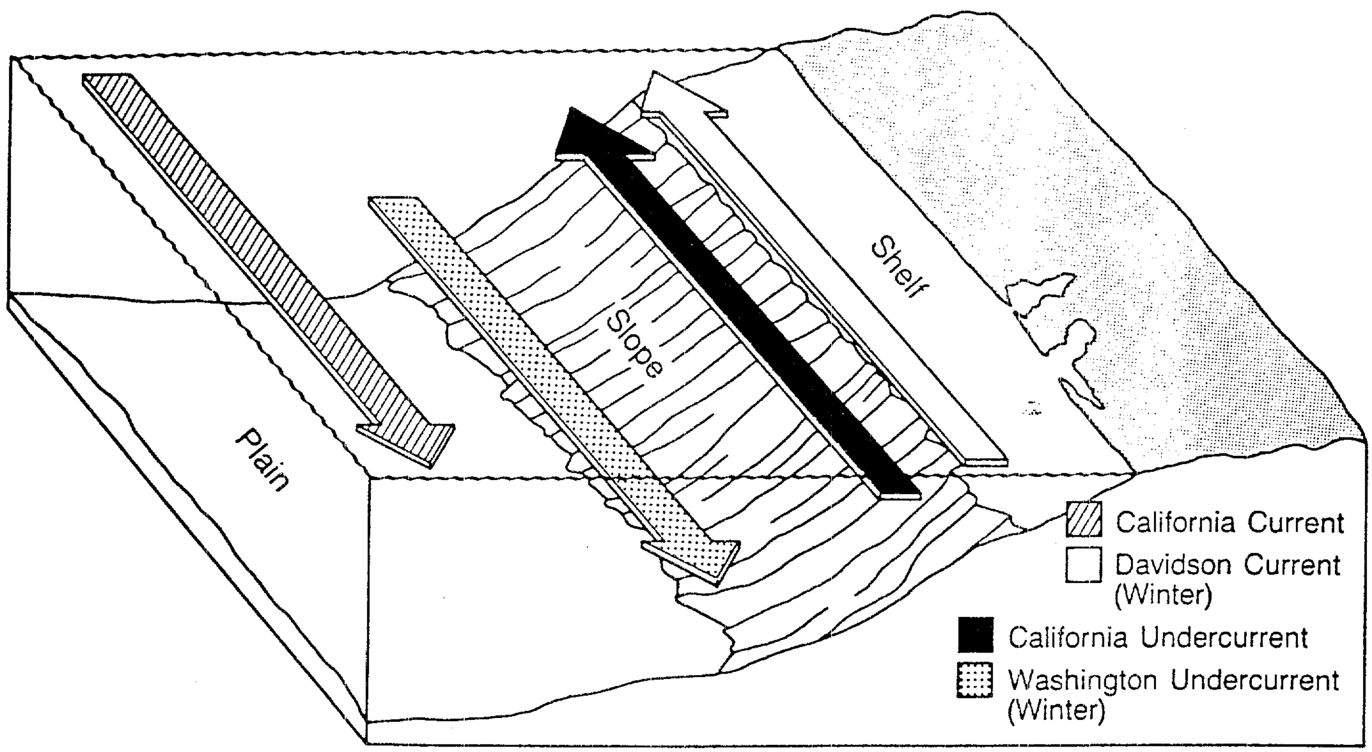


Figure 13. Oceanic and Continental Slope Surface Currents (Hicky, 1979).

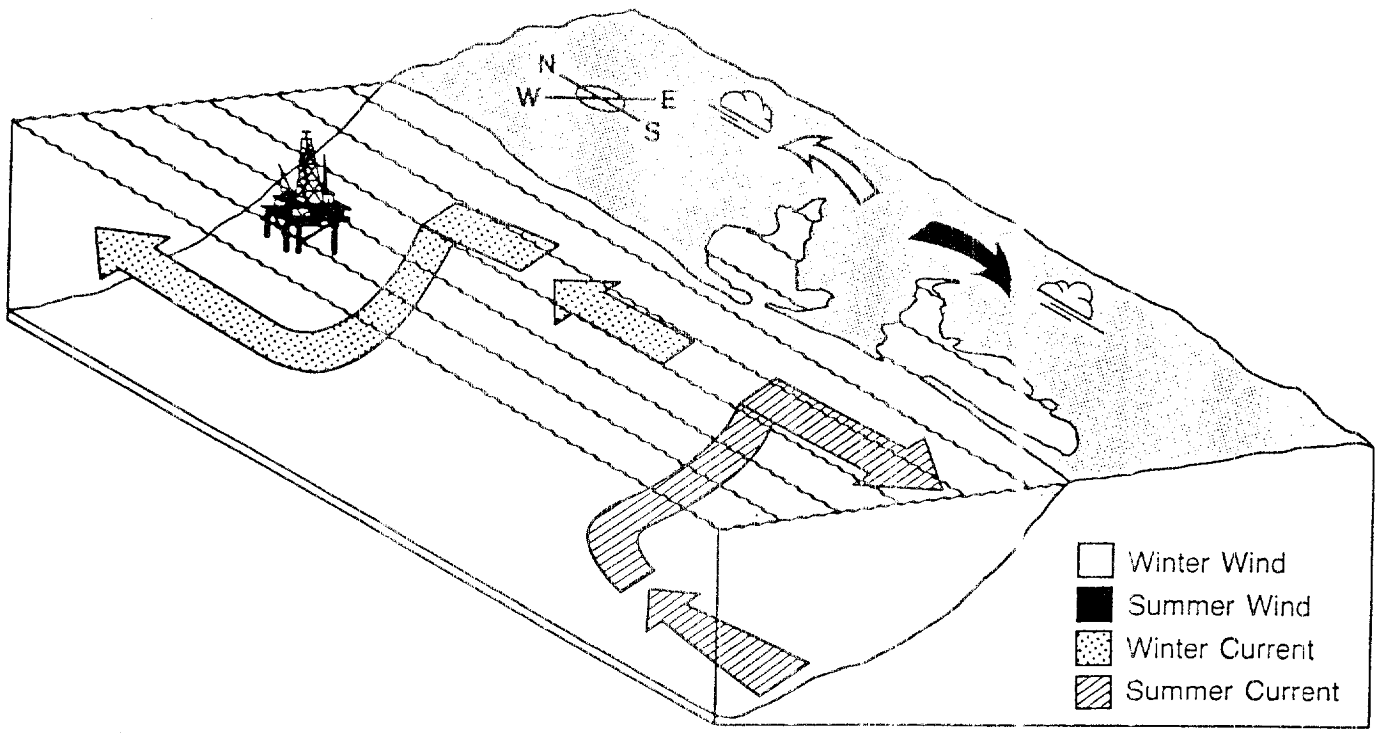


Figure 14. Simplified Mean Winter and Summer Current Patterns on the Washington Shelf. [Mean Flow along the bottom is northward in all seasons. Mean surface flow is southward in summer, accompanied by Coastal Upwelling of Deeper Water. Mean Surface Flow is northward in Winter, accompanied by Coastal Downwelling of Surface Water] (Strickland and Chasan, 1989).

associated upwelling produce a southward flow in the upper 100m. Current meter data (Hopkins, 1971; Hickey et al., 1986, in Ridge and Carson, 1987) show that, on the average, near-bottom currents move northward and slightly offshore over the entire year.

Both the strength and direction of the currents over the shelf are highly variable. Maximum mean surface current speeds of 17 to 20 cm/s in a southerly direction have been observed at 20-30m depth in mid-shelf between April and June. Local currents in the surface layer may show complete reversals over the course of a few days due to passing weather systems, or fluctuations over weeks or months due to large-scale events such as temperature/salinity anomalies or El Niño.

As currents flow south along the coast during spring and summer, a combination of northwesterly winds and the earth's rotation causes the surface waters to be deflected offshore. As these waters are moved offshore they are replaced with cold, nutrient-rich waters from below. This process of upwelling introduces the nitrates, phosphates, and silicates that are essential for the high phytoplankton production that forms the basis for the oceanic food chain. The majority of this upwelling occurs within 10-20 km of the coast with the strongest offshore flow in the upper 10m of the water column. The submarine canyons that indent the Washington shelf are sites of enhanced upwelling (Parmenter and Bailey, 1985). Water upwelled from the Astoria and Quinault canyons moves across the shelf and is uplifted into the near-surface layers in the nearshore zone (Hickey, in press). Water upwelled in the Juan de Fuca canyon reaches close enough to the surface that it mixes into the surface layer and provides a direct source of nutrients over the canyon system (Freeland and Denman, 1982, in Hickey, in press). Upwelling occurs into the Strait of Juan de Fuca via the eastern head of the canyon. Downwelling, or sinking of surface waters, occurs along the coast during winter when southwest winds cause the onshore transport of surface waters. Downwelling produces intrusions of offshore surface water into the Strait of Juan de Fuca.

Tides on the Washington coast and Strait of Juan de Fuca are semidiurnal mixed tides with two high and low tides each tidal cycle characterized by inequalities in heights of successive high and/or low tides. Tidal currents on the shelf may reach 10 cm/s. Near shore, where tides are influenced by flow in and out of estuaries, tidal currents may exceed the mean wind-driven currents. Tidal ranges along the coast are large, averaging about 3.5m, ensuring a rich intertidal community. At Port San Juan (Port Renfrew) on Vancouver Island, for instance, the highest tides reach a level of about 3.5m above mean lower low water (Kozloff, 1983).

The Columbia River is the largest river on the U.S. west coast and its large input of freshwater to the ocean affects the coastal waters of Washington and Oregon. A low-salinity surface plume is directed northward along the Washington coast by the prevailing currents in winter (Figure 15). The surface waters moving toward the coast hold the river discharge from the Columbia River near the shoreline and downwelling allows the water to migrate into the Strait of Juan de Fuca along the southern shore. Fresh water discharges from other rivers in the sanctuary study area are shown in Appendix C (Figure 2).

(d) Habitat Types

A marine ecosystem is a very complex and interconnected world with no hard lines of delineation between its various parts. Physical changes often occur gradually. Changes may include the shape and composition of the sea floor, depth, light intensity, salinity, temperature, biota, etc... Different combinations of these conditions form unique areas referred to as "habitats." Marine habitats are functional associations between places, water characteristics and living resources. The depth, surroundings, and species of a given area largely define the habitat for that area. A group of similar habitats forms an ecological "zone" and a unique combination of one or more zones forms an ecosystem.

A marine ecosystem has three broad regions that cut across zones and habitats. These regions are referred to here as "environments." The "littoral" environment is simply the tidelands or intertidal area. The "subtidal" environment is the sea floor from extreme low-tide to the edge of the continental shelf. The "neretic" environment is the water column over the continental shelf. These environments shape the form and function of all living marine resources.

The littoral and sublittoral environments (tidelands and floor of the continental shelf) are home to such invertebrate groups as polychaete worms, molluscs, arthropods, echinoderms, and crustaceans. In addition, these benthic environments harbor a wealth of marine plant life to include many varieties of kelp, surfgrass, and red, green, and brown algae. Marine vegetation is dependent upon quality and quantity of sunlight for growth and reproduction and is therefore confined to depths less than 55 fathoms (the euphotic zone). Therefore, non-planktonic species are most abundant in the nearshore thinning out as the sea floor progresses seaward to greater depth. Since the seaward limit of the preferred sanctuary boundary generally follows the 100 fathom isobath, all marine plant resources off the Olympic coast would be within the sanctuary boundary.

Organisms found in the neritic environment (the waters over the continental shelf) include phytoplankton, zooplankton, and most of the commercially important fish stocks (e.g., salmon,

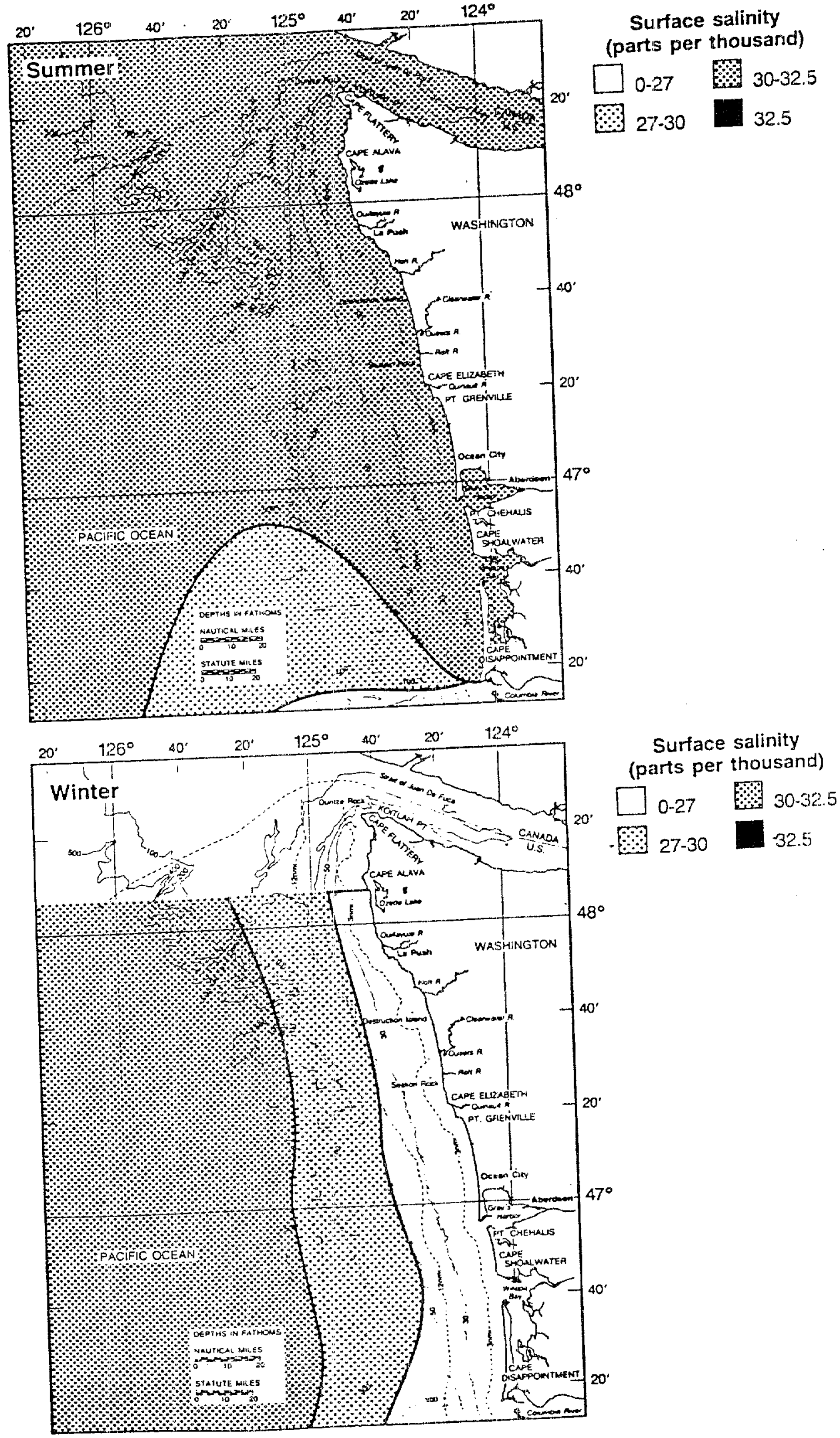


Figure 15. Generalized Position and Extent of Columbia River Freshwater Plume in Winter and Summer (Strickland and Chasan, 1989).

lingcod, sablefish, Pacific cod, and hake). Anadromous species are most present in the study area during outward juvenile migration and inland spawning migration. Marine birds such as shearwaters, alcids, storm-petrels, jaegers, and phalaropes feed throughout the study area. Marine mammals, including the northern and California sea lions, harbor seal, sea otter, California gray whale, harbor porpoise, and numerous other species of cetaceans are found in these coastal and offshore waters to varying degrees and at varying times.

As noted above, the littoral, subtidal and neretic environments weave through a series of bio-geographical zones. There are five such zones along the Washington coast: 1) the beach surf zone; 2) the rocky surf zone; 3) the above tide rocky shore zone; 4) the pelagic oceanic zone; and 5) the benthic oceanic zones. These zones run parallel to the shore and are defined by depth, bathymetry and sediment composition. Habitats within these zones are the basic marine communities discussed in this section.

The five zones and twelve associated habitats of the Washington coast extend seaward from the shore to the edge of the continental shelf. They range from turbulent rocky intertidal to deep and relatively placed sandy bottoms offshore. Each habitat is described separately in the pages that follow. Species lists for each habitat are arranged by trophic classification groupings in Appendix F. The pictorial descriptions and species lists are reprinted from a report prepared for the U.S. Fish and Wildlife Service (Procter, et al., 1980).

i. **Beach Surf Zone**

The beach surf zone is a dynamic environment with constantly shifting sands caused by wave action and longshore transport (Figure 16). The beach surf zone is characterized by two habitat types: 1) beach surf-unprotected; and 2) beach surf-protected. The sandy beaches of the northern outer coast of Washington are pocket beaches, nestled between resistant headlands. Beach surf habitats have much lower productivity and diversity than rocky habitats, but may be the sole support for certain species (eg. razor clam, Dungeness crab, and spawning surf smelt). Most organisms, such as polychaete worms, bivalve mollusks (including razor clam), isopods, and amphipods, burrow in the sand. Sand dollars, shrimps, purple olive snails, and Dungeness crabs live on the sandy bottom. Fishes found in this habitat include the staghorn sculpin, flounder, sand lance, and various species of sole and surfperch. Shorebirds and some terrestrial birds also forage in these areas.

Beach Surf-Unprotected Habitat

Unprotected beach habitat areas are interspersed along the

BEACH SURF ZONE

GENERAL COMMENTS	Extensive beach/dune complexes occur from the Southern Washington coast southward along the Oregon Coast to Cape Blanco. Smaller beaches and strand communities are associated with headland complexes all along the coast. The Beach Surf Zone is a high energy area with shifting substrate and limited species diversity. The Above Tide Beach and Dune Zone are unstable and subject to water and wind erosion as well as flooding.
TOPOGRAPHY AND SOILS	There are only small changes in elevation within the zone but the changes are very important due to tidal cycles in the beaches and water table relationships in the dunes. Predominant dune soils include the Westport and Netart series. Westport soils are typically found in recently stabilized slightly weathered sand. They are a poorly developed soil and are a member of the mixed mesic family of Typic Udipsamments (U.S.D.A., 1975A). Soils are nutrients poor and become saline near the beach (Ranwell, 1972).
CLIMATE	Marine influences strongly modify climatic conditions, especially on the immediate coastal strip. The climate is mild with small variations in temperature. Mean temperature for January ranges between 5 to 8°C (41 to 47°F) and between 13 to 16°C (55 to 61°F) for July. Snow and heavy freezes are infrequent. Winters are wet and cool with occasional storms generating heavy precipitation and strong winds (90-100 MPH winds can be expected to occur once every 100 years) (U.S.D.A., 1975A). Microclimate changes are dramatic in dunes (Ranwell, 1972).
HYDROLOGY	Precipitation averages between 200 to 300 cm (78 to 118 inches) with the bulk falling between November and April. Frequent summer fogs and subsequent fogdrip compensate for summer hydration stress. The soils are highly permeable. Recharge of ground water and surficial waters is directly from precipitation. The deflation plain and marshes are subject to annual inundation during winter. The water table is usually very close to the surface on the deflation plain but is subject to seasonal variations. If ground water removal is greater than recharge, salt water intrusion frequently occurs.

ZONE B HABITAT TYPES

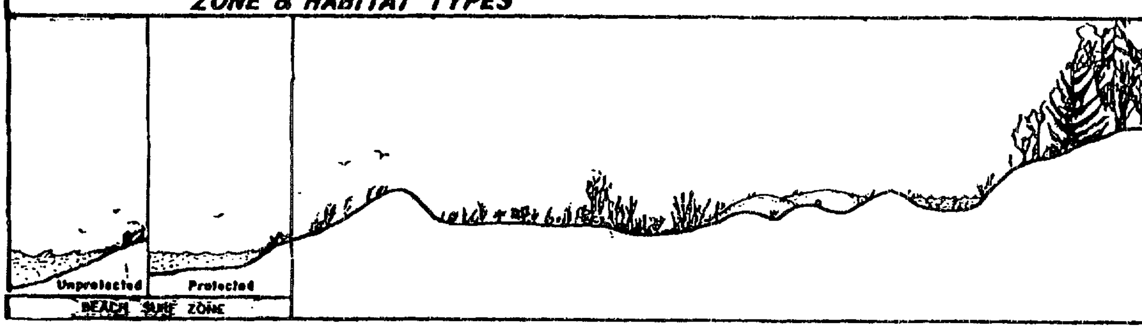


Figure 16. Beach Surf Zone Environment (Procter et. al, 1980).

Olympic coast as pocket beaches between rocky shores and headlands (Figure 17). This habitat becomes distinctly more prevalent south of Point Grenville. These beaches receive direct wave energy that sometimes "armors" the beach with gravel, cobbles or a mix of both. This armoring is often seasonal, affected by changes in tide levels, winds, currents and other oceanographic and atmospheric conditions. Changing conditions may also simply add or subtract sand, altering the slope and elevation of the beach. As the substrate sediments shift, flora and fauna must be able to endure the alterations or move to new areas to survive. Thus, species composition and dominance may fluctuate at different times of the year.

Beach Surf-Protected Habitat

Protected beach habitats occur along the Olympic coast as pocket beaches between rocky shores and headlands (Figure 18). These areas are shielded from direct wave force by close proximity to headlands or protection behind offshore reefs, sea stacks, or islands. Protected beaches are more stable than unprotected beaches and are more likely to retain a consistent substrate composition. Less scouring from waves allows finer sediments (sand and organic matter) to settle on the seafloor.

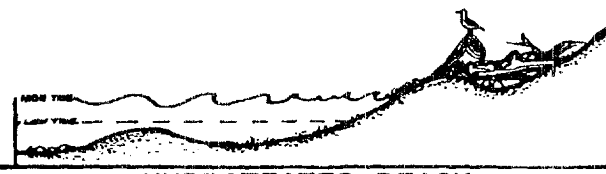
Boulder and cobble fields are often found lying on sandy bottoms in the protected coves of the northern Olympic coast (e.g. Cape Alava and Cedar Creek). They support a much greater diversity of organisms than the sandy intertidal areas. These unique conditions support rocky-shore organisms found on large boulders, protected-shore organisms occurring in the lee of large rocks, and soft-sediment organisms living in the substrate beneath cobbles and boulders (Dethier, 1988). Algae and many invertebrates such as hardshell clams, crabs and other crustaceans, polychaete worms, and sea squirts are found in this habitat.

ii. Rocky Surf Zone

The rocky surf zone is found on rocky substrate between the lowest tidal level and the highest tidal level (Figure 19). Organisms living in this zone must be able to withstand periodic desiccation, high temperature and light, low salinities, and strong wave action (Nybakken, 1982). In the northeastern Pacific, intertidal zones of the most wave-beaten shores receive more energy from the breaking waves than from the sun (Leigh, et al., 1987). High wave energy enhances the productivity of intertidal organisms by providing space for habitation as species are eroded away, and by increasing the capacity of algae to acquire nutrients and use sunlight.

The rocky surf zone of the outer coast of the Olympic Peninsula includes some of the most complex and diverse shores in

Beach Surf Zone
A Unprotected Beach



UNPROTECTED BEACH

Habitat Description
Open ocean beaches are exposed to surf action all year. As a result of waves and associated currents, the sands are continually in motion parallel to the coast and offshore or onshore depending on the season. Summer movement is toward the south and onshore; winter movement is to the north and offshore. Because of pounding waves and shifting sands this is a rigorous environment as reflected by the reduced standing crops and low diversity. Diatom community in surf zone water column is distinct from that beyond the breakers. Habitat extends from driftwood on berm seaward to breaker depth and includes the foreshore and nearshore. Logs and other debris are stranded behind the berm.

Food Web
Lower beach macrofauna (burrowing in sand) depend primarily on surf zone phytoplankton. Meiofauna (living on and between sand grains) depend mainly on dissolved organic matter and microdetritus filtered from sea water by sand. Beach wrack at and above high tide line is food source for scavengers such as beach hoppers.

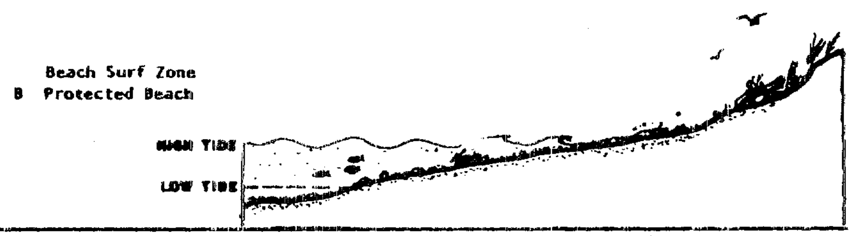
Characteristic Flora
Surf zone water column often dominated by one species of diatom, Chaetoceros armatum, associated with Asterionella socialis (Lewin and Mackas, 1972).

Characteristic Fauna
Invertebrates: razor clam, mole crab, purple olive snail, nereid worms, blood worm, shrimp, mysids, amphipods, isopods.

Fish: surf perch, starry flounder.

Birds: gulls, sanderling.

Figure 17. Beach Surf Zone Habitat-Unprotected (Procter et. al., 1980).



PROTECTED BEACH

Habitat Description
Low energy beaches associated with headlands and behind protective barriers (e.g. offshore reefs). More organic material in sand than on the unprotected beaches. Beaches not as subject to erosion and hence provide a more stable habitat for the more diverse fauna found on protected beaches than on beaches subject to the pounding surf. Habitat includes foreshore and near-shore. Driftwood and beach wrack are stranded behind the berm.

Food Web
Detritus plays a major role in the food web. Additional primary contributions come from the phytoplankton complement of the ocean water. Detritivores and omnivores are fed upon by several invertebrate carnivores, which in turn are fed upon by birds.

Characteristic Flora
No significant primary production occurs.

Characteristic Fauna
Invertebrates: isopods, amphipods, beach hopper, spionid worms, phoronids, Dungeness crab, hermit crab.

Fish: surf perch, flatfish.

Birds: shorebirds and gulls.

Figure 18. Beach Surf Zone Habitat-Protected (Procter et. al., 1980).

HEADLANDS & ROCKY ISLANDS	
GENERAL COMMENTS	Headlands are marine/terrestrial ecotones typical of open rocky coasts. They are stressful, high energy environments. Coastal islands occur all along the coast except in the vicinity of the Columbia River mouth. Many support important sea bird colonies and hauling areas for marine mammals. Intertidal areas are subject to severe physical and chemical conditions. Some Oceanic habitats (e.g. Surfgrass) overlap with the Rocky Surf Zone.
TOPOGRAPHY AND SOILS	Headlands are typically steep and precipitous. Soils are generally local in origin and derived from basalt north of Cape Blanco and of sedimentary material south of the Cape. Cliffs can drop directly into the marine system to moderate depths. Slumping of cliffs is the sediment source for many local beaches.
CLIMATE	Climate is maritime with fluctuations of temperature and precipitation muted. Mean temperature ranges between 5° and 8°C (41 to 46°F) for January and between 14° and 16°C (57 to 61°F) for July. Snow and heavy freezes are atypical. Winters are wet and cool with occasional storms generating heavy precipitation, extreme tidal ranges, and strong winds. Strong winds frequently break off trees and carry salt spray inland which strongly influences the makeup of the habitat.
HYDROLOGY	The three major water inputs to the Above Tide area are winter precipitation, salt spray, and summer fog drip. Fresh water aquatic habitats are uncommon. Discharge is usually directly into the ocean. Waves are concentrated on headlands, and local currents can be severe.

ZONE & HABITAT TYPES

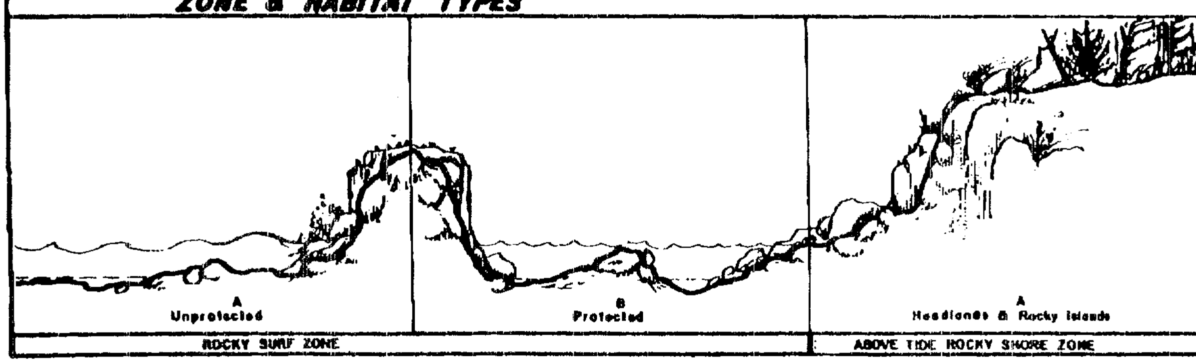


Figure 19. Rocky Surf Zone (Procter et. al., 1980).

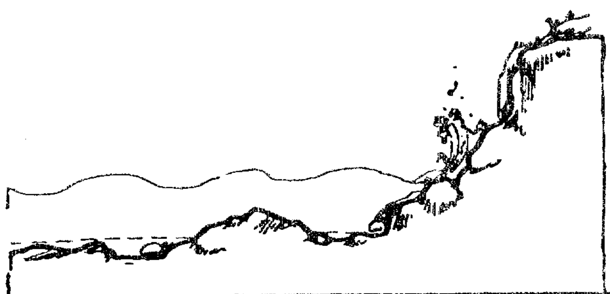
the United States (Dethier, 1988). Dethier estimates that the rocky intertidal area of this section of coast contains at least 130 plant species (2 vascular plants, 5 or more lichens, and over 120 algae) and 180 animal species (mostly invertebrates) (Appendix C). Two habitats are present in this zone, distinguished from one another primarily by differences in wave energy.

Variation in the degree of exposure to environmental factors can create marked zonation patterns within rocky surf habitats (Foster, et al., 1988). These visually distinctive bands of organisms are the result of wave action intensity at varying tide levels, tolerance of organisms to air and sunlight, and the presence or absence of predators (Steelquist, 1987). Within each rocky surf habitat are four vertical bands (or "zones"-this term should not to be confused with ecological zones): a splash zone, and upper, middle, and lower intertidal zones. The splash zone receives the spray from the surf during high tide and is covered with water only during storms. Algae, lichens, limpets, and periwinkles are residents here. The upper intertidal area is flooded during high tides. Barnacles, snails, mussels, seaweeds, and crabs frequent the rocks while shrimp, sculpin, and other fishes swim in the tidepools. The middle intertidal area is inundated more regularly and contains more biota than the higher zones. Predominant animals include mussels, sea stars, snails, worms, crabs, whelks, chitons, and rock scallops. The lower intertidal zone is exposed to the air only during the lowest tidal stages. It has a greater biological diversity than the other three zones. Typical organisms include starfish, anemones, octopi, sea urchins, sea cucumbers, and nudibranchs.

Sand-impacted rocky areas occur where rocky outcrops lie adjacent to or in the middle of high-energy sand beaches. Rocky surfaces that are scoured or periodically buried by sand require organisms living there to be tolerant of the burial and resistant to the scouring. Tolerant animals include the cloning anemone and several genera of chitons and tube worms.

Rocky Surf-Unprotected Habitat

Exposed rocky surf habitats vary from steep bedrock found on promontories and sea stacks, to flat benches dotted with tidepools (Figure 20). Only the most wave-tolerant organisms such as gooseneck barnacles and sea palms can survive on the steep bedrock. These areas receive full, direct wave force that produces a continuous erosional process. The sediment from this scouring action is sorted and deposited on nearby pocket beaches. Species in this environment are quite resilient and typically find protection within hard shells cemented to the rocks or by inhabiting available crevices.



ROCKY SURF - UNPROTECTED

Habitat Description
This zone is characterized as a high energy environment. Both plant and animals living in this zone must be able to withstand the force of the pounding surf. Many of the organisms must also be adapted to extreme temperatures and salinity variability, as well as exposure to fresh water rain conditions. This habitat is coincident with part of the near-shore Kelp habitat and of the Surfgrass habitat of the oceanic Vegetated Benthic Zone.

Food Web
The food chains are quite short (often with only three trophic levels) and include at least the following modes of feeding: planktonic foods extracted by filter feeders; macroalgae harvested by the grazing animals; bacteria and periphyton eaten by other grazers. Predators are from both the terrestrial and marine realms.

Characteristic Flora
Macroalgae are the most visible flora. Important genera include Ulva, Fucus, Postelia, Iridophycus, Corallina, Lamanacia, and Lithothamnuim. A surfgras (Phyllospadix scouleri) is the principal vascular plant. Benthic diatoms are probably important. Distinct intertidal benthic zonations are found.

Characteristic Fauna
The mussel, Mytilis californianus, and the goose barnacle, Mitella polymeris, are characteristic and important species. These species form a biotic substrate which provides the necessary habitat for many other species. The predacious starfish, Pisaster orchraceus, is also characteristic.

Figure 20. Rocky Surf Habitat-Unprotected (Procter et. al., 1980).

Rocky Surf-Protected Habitat

The protected rocky surf habitat is a broad wave-cut terrace or an area where the force of waves is reduced by offshore rocks or sea stacks (Figure 21). Lower wave action and less spray enable different species of plants and animals to live here than on the exposed coast. Barnacles, turban snails, periwinkles, as well as surfgrasses are abundant in this more protected habitat.

iii. Above Tide Rocky Shore Zone

Though this habitat is landward beyond the sanctuary boundary, it is extremely important to the nearshore ecosystem (Figure 22). It provides critical stationing and nesting areas for marine birds as well as pupping and haulout sites for marine mammals. Human modifications to this habitat can have drastic effects on the local ecology by altering sediment loading or creating conditions that allow predator access to previously isolated areas. Most headlands and rocky islands of the outer Olympic coast and western Strait of Juan de Fuca are protected within Federal, state, or tribal lands.

iv. The Pelagic Oceanic Zone

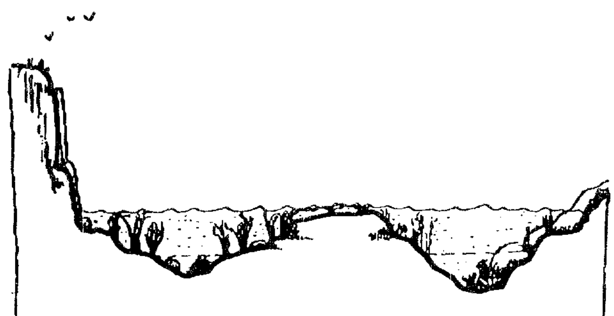
The oceanic zones in the Sanctuary study area are divided into two major categories: 1) the pelagic zone - comprising the water column; and 2) the benthic zone - comprising the seafloor and waters one meter above (Proctor, et al., 1980) (Figure 23). The pelagic and benthic zones each have habitats that are characterized by the presence or absence of light. The pelagic zone can be divided into the euphotic and disphotic zones, and the benthic zone into vegetated and non-vegetated zones.

The euphotic and disphotic habitats together comprise the pelagic oceanic zone. These are the largest spatial habitats within the marine ecosystem, and they support plankton (sea drifters), and nekton (free swimmers). Seabirds thrive in the euphotic habitat, and many dive to impressive depths for food. Within the context of this report, the pelagic zone is synonymous with the neritic environment discussed at the beginning of this section.

Euphotic Pelagic Habitat

The depth of the euphotic layer is determined by the distance that light penetrates the water column (Figure 24). This boundary is continually in flux and is affected by factors such as latitude, season, cloud cover, turbidity, sea state, and time of day. This is the layer of the ocean where phytoplanktonic production occurs and is a great feeding area for many species.

Rocky Surf Zone
B Protected
Headlands and
Rocky Islands



ROCKY SURF -PROTECTED

Habitat Description
The wave energy in this region is lower than for unprotected headlands, but is high enough so that almost no fine sediments and very little sand occurs. The organisms must be adapted to the extremes in temperature and salinity characteristic of this environment. Vertical zonation is very pronounced. Parts of two oceanic Vegetated Benthic Zone habitats coincide with this habitat; they are Surfgrass and nearshore Kelp.

Food Web
The food web consists of three rather short and distinct food chains, as were characteristic of the unprotected coast. Surfgrass becomes much more prevalent in this area and the associated community is important.

Characteristic Flora
Surfgrass (Phyllospadix torreyi and P. scouleri) is important. Attached macroalgae are abundant in this region.

Characteristic Fauna
Most of the species found in the unprotected outer coast are also found in this region, but some added forms are also apparent. The various sea anemones (Auttroplewra spp.) are especially notable. Various sea stars and brittle stars also occur.

Figure 21. Rocky Surf Habitat-Protected (Procter et. al., 1980).

Above Tide Rocky
Shore Zone
A Headlands and
Rocky Islands

ABOVE TIDE - HEADLANDS & ROCKY ISLANDS

Habitat
This habitat occurs on steep topography, shallow soils, and non-erosive substrate above the previously described salt spray zone and seaward of the coastal forests. Islands are small and are usually within ten miles of shore.

Food Web
On terrestrial habitats, browsing components of the food web are typical. The food web on islands is limited. However, islands provide a base from which sea birds and marine mammals exploit marine food sources.

Characteristic Flora
Vegetation is low lying, gradating from herbacious plants nearest the coast (seaside plantain, red fescue, thrift, seawatch, vetch) to shrubs (thimbleberry, salal, Suksdorf sage, Nootka rose) and finally to inland forest typically dominated by Sitka spruce and western hemlock.

Characteristic Fauna
Mammals: black-tailed deer, Townsend's mole, vagrant shrew, California sea lion, northern sea lion, sea otter, gray fox.

Birds: storm-petrels, western gull, California gull, common murre, pigeon guillemot, auklets, other alcids, black oystercatcher, cormorants. Many of the islands are intensively used by colonial sea bird nesters.

Figure 22. Above Tide Rocky Shore Zone (Procter et. al., 1980).

OCEANIC ZONES

GENERAL COMMENTS	In neritic zone (near shore, over continental shelf), Northeastern Pacific surface waters (upper 200 m) mix with runoff and upwelling deeper ocean waters. Runoff recharges nutrient supply during winter. Spring diatom bloom rapidly depletes this supply, but upwelling continually replaces limiting nutrient, chiefly nitrate, sometimes also silicate (Anderson, G. C., 1972). Annual rate of production is over 300 gC/m^2, more than 6 times the average productivity of the whole ocean, including neritic zone (Curl, 1970).
BATHYMETRY AND SEDIMENTS	Continental shelf relatively flat and featureless. Slopes steeper near shore and outer edge than in wider central area. Slopes steepen and shelf narrows from north to south. Recent sands lie inshore, muddy sediments seaward. Relict sands exposed at places along outer edge. Rocky banks occur irregularly, often associated with headlands. Thickness of sediments is in dynamic equilibrium, accreting in summer, eroding in winter (Bourke et al., 1971; Kulm et al., 1975).
CLIMATE	Small seasonal variation in temperature means range only 4°C (39°F). Large differences in wind and precipiation; prevailing winter winds are southwesterly, bringing storms to the coast; summer winds are mostly from the northwest at speeds usually lower than in winter. About 80% of the annual precipitation occurs from October to March. Shore station precipitation data overestimates rainfall at sea by a factor of 2 to 4 (Elliott et al., 1971). Dense fogs, related to upwelling of colder waters, occur most frequently from midsummer to fall, averaging 3 to 8 days per month (DIW, 1977).
HYDROGRAPHY	Salinity of surface waters varies widely, from 20 to 34°/oo, altered by runoff and upwelling. Runoff lowers surface salinity to <32.5°/oo. Upwelling increases surface water salinity to >32.5°/oo in summer. Water temperature varies from a mean high of 17.7°C (64°F) to a mean low of 7.6°C (46°F), but annual mean temperature range is only 5°C (41°F), from 14°C (57°F) in summer to 9°C (48°F) in winter. Both highest and lowest temperatures occur in summer during upwelling (Bourke et al., 1971).

ZONE & HABITAT TYPES

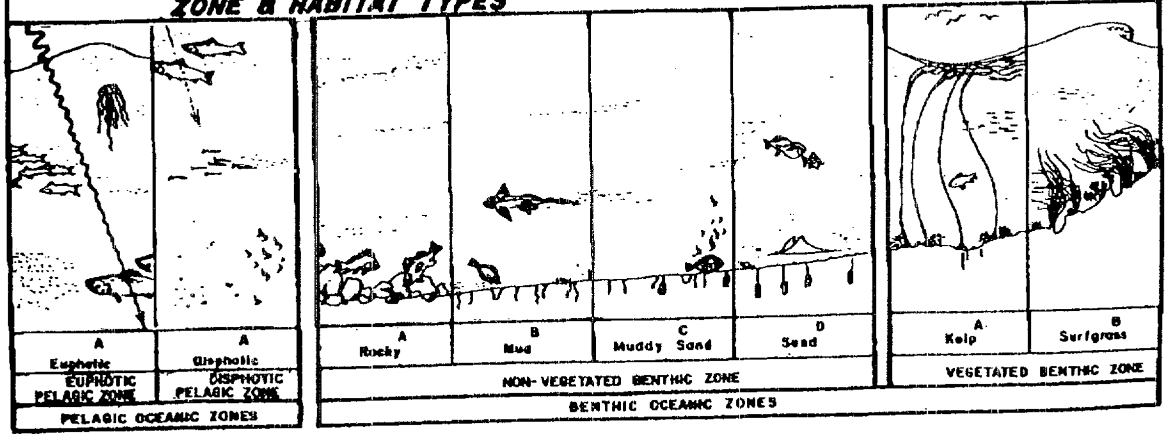
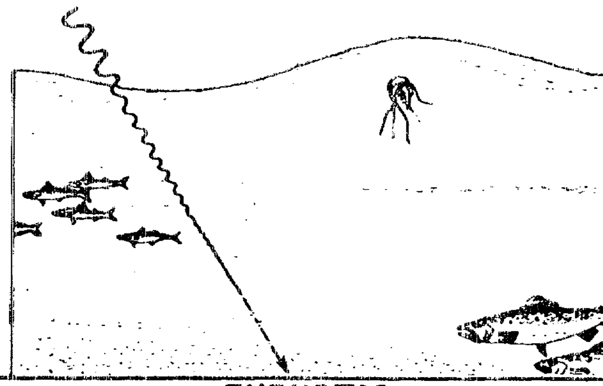


Figure 23. Pelagic Oceanic Zone (Procter et. al., 1980).

Pelagic Oceanic
Zones
Euphotic Pelagic
Zone
A Euphotic



EUPHOTIC

Habitat Description
This habitat is the upper layer of neritic ocean water which is supplied with sunlight sufficient for the photosynthesis of plants, i.e. down to compensation depth. All net production of organic matter in the oceanic pelagic environment occurs in this habitat. Depth of this layer varies seasonally and locally, generally ranging between 20 to 80 meters (60 to 260 ft) deep (Sverdrup et al., 1942; Small et al., 1972). In winter, low primary production is balanced by grazing, maintaining dependent populations. In spring, diatom blooms indicate high primary production temporarily exceeding consumption. At night, many carnivores from deeper waters (disphotic zone) invade this habitat to feed.

Food Web
Primary productivity is provided by phytoplankton. Grazing food chains are predominant. Herbivorous crustaceans, principally copepods and euphausids, dominate the second trophic level; jellyfish, fishes, and shrimp are important consumers at the third trophic

Food Web, continued
level (Pearcy, 1972). Suspended detrital material may enter food web through microplankton.

Characteristic Flora
Phytoplankton: diatoms are generally predominant in shelf waters, with dinoflagellates showing increased abundance in late summer and fall.

Characteristic Fauna
Zooplankton: copepods, euphausids, medusae, salps, shrimps, chaetognaths, ctenophores, amphipods.

Nekton: lantern fish, anchovy, saury, squid, salmon.

Sea birds: common murre, western gull, sooty shearwater, Cassin's auklet, cormorants.

Mammals: baleen whales (gray whale), killer whale, porpoises, California sea lion, northern sea lion, northern fur seal.

Figure 24. Euphotic Pelagic Habitat (Procter et. al., 1980).

Disphotic Pelagic Habitat

Below the euphotic layer is the dark sphere known as the disphotic zone (Figure 25). The disphotic layer is the depth at which photosynthesis ceases in marine plants due to insufficient light energy. At night, the disphotic zone may extend from the sea floor to the sea surface to encompass the entire water column. As light penetrates through the water column, it is absorbed and scattered by water properties, particles and organisms (Duxbury and Duxbury, 1989). A twilight state exists at the boundary of the euphotic and disphotic zones. Blue and green wavelengths of light may penetrate into the disphotic zone but quickly fade to darkness. Zooplankton inhabit this habitat in large number during the day and migrate upward during the night to feed on the abundant phytoplankton in the upper layer.

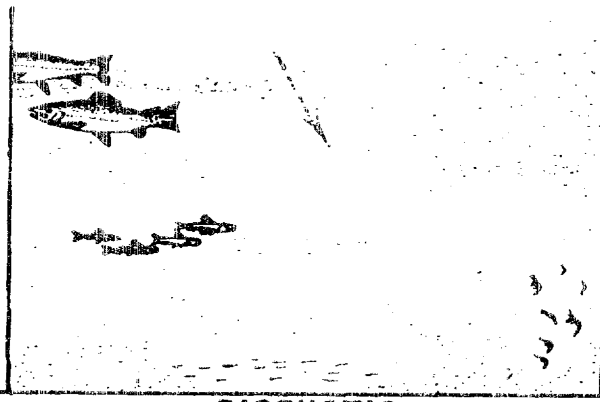
v. Benthic Ocean Zone

The benthic oceanic zone encompasses all submerged lands of the continental shelf. It is divided into two sub-zones distinguished by the presence or absence of light. The vegetated benthic zone coincides with rocky habitats and exists where light is sufficient for photosynthesis in attached marine plants. Two habitats (kelp forests and surfgrasses) exist in this zone. The non-vegetated benthic zone is completely devoid of plant life and is classified by changes in the sediments on the sea floor. Four different habitats are present in the non-vegetated benthic zone including the rocky, mud, muddy sand, and sand (Figures 26-29).

Kelp Forests (Vegetated Benthic) Habitat

Kelps are large brown algae (Order Laminariales) that attach to rocky substrates and grow to the surface in water depths from about 2m to 20m (Figure 30). The floating portions of these plants form dense canopies on the sea surface. Kelp forests form one of the world's most productive habitats. They provide critical habitat for encrusting animals such as sponges, bryozoans, and tunicates, as well as for juvenile fish, algae, abalone, and many other invertebrates. Fish associated with kelp beds include lingcod, kelp greenling, cabezon, various rockfishes and perch species, wolf eel, and red Irish lord. Kelp provides a food resource for fish, and for grazing and detritus-feeding invertebrates such as sea urchins and isopods. Sea otters depend on kelp beds for both food and shelter. Kelp beds also serve as resting areas for some birds such as gulls and herons. They also reduce wave action and currents shoreward of the beds, creating a sheltered environment for intertidal plants and animals, and reducing inshore erosion on beaches (WDOE, 1980b).

Pelagic Oceanic
Zones
Disphotic Pelagic
Zone
A Disphotic



DISPHOTIC

Habitat Description
Deeper, dark, daytime location of pelagic carnivores that migrate vertically each day in response to light. These animals form vertically compressed layers (called scattering layers because of their effect on sonar transmissions) during daylight but rise toward the surface, spreading out vertically to feed throughout the upper layer (euphotic zone) during the night.

Food Web
Grazing and detrital food chains based on primary production in euphotic zone above. Local transfers are primarily between third and fourth trophic level.

Characteristic Flora
None. Phytoplankton, sinking through this zone, are very sparse and unproductive.

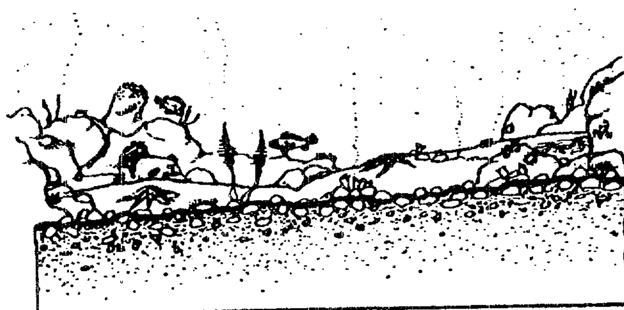
Characteristic Fauna
Zooplankton: euphausiid (*Euphausia pacifica*), shrimp (*Sergestes similis*).

Nekton: lantern fishes (*Diaphus theta*, *Stenobrachius leucopsarus*, and *Tarletonbeania crenularis*).

Mammals: baleen whales.

Figure 25. Disphotic Pelagic Habitat (Procter et. al., 1980).

Benthic Oceanic
Zones
Non-vegetated
Benthic Zone
A Rocky



ROCKY

Habitat Description
Rocky bottom, below compensation depth but often higher than the surrounding shelf, occurs in scattered banks at various distances offshore all along the coast. The rough, irregular terrain has more wave and current activity, little finer sediment. These areas are generally avoided by trawl fisheries.

Food Web
Primarily detrital food chains based on production in overlying waters. Some demersal fish also feed periodically in euphotic zone grazing food chains.

Characteristic Flora
Only phytoplankton which sinks to the bottom from the photic zone. No primary production.

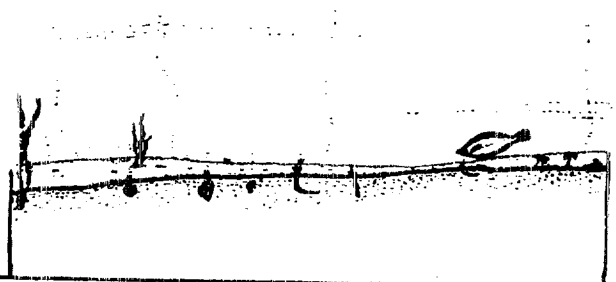
Characteristic Fauna
Attached invertebrates: barnacles, sea anemones, bryozoans, tube worms, hydroids, corals, and tunicates.

Unattached invertebrates: starfish, crabs, shrimp, hermit crabs, nereid worms, nudibranchs, and snails.

Fish: halibut, rockfish.

Figure 26. Rocky Non-Vegetated Benthic Habitat (Procter et. al., 1980).

Benthic Oceanic Zones
Non-vegetated Benthic Zone
B Mud



MUD

Habitat Description
Marine soft bottom communities where most of the sediment grains are less than 0.062 mm in diameter form a major portion of the offshore region at depths between 100 and 200 m. These level bottom communities contain a much more abundant and diverse community than the level bottom sandy substrates and can be composed of fine grained silts and clays but most often are mixed with either relict or terrigenous sands. They are thought to be very stable environments with diverse benthic populations which serve as major feeding areas for demersal fish and shrimp.

Food Web
The food web of this system is dependent on detritus both from the production in overlying waters and to a lesser extent from terrigenous sources. Detritivores, scavengers, and carnivores are important links in this system.

Characteristic Flora
Due to a paucity of light, few plants are found in this region.

Characteristic Fauna
Primarily infaunal and epifauna invertebrates and demersal fish.

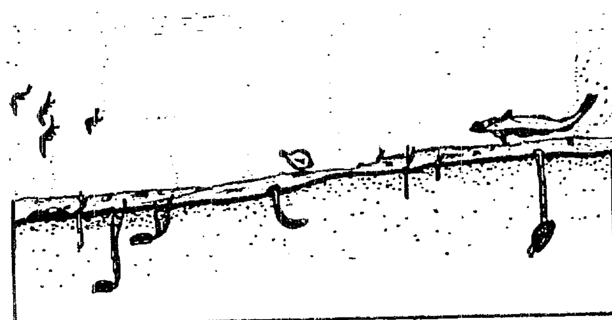
Infauna: sea urchin (Brisaster), bristleworms (Sternaspis), snails.

Epifauna: shrimp (Pandalus), brittle stars (Ophiura), sea urchin (Allocentrotus).

Fish: Dover sole, arrowtooth flounder, sablefish.

Figure 27. Mud Non-Vegetated Benthic Habitat (procter et. al., 1980).

Benthic Oceanic Zones
Non-vegetated Benthic Zone
C Muddy Sand



MUDDY SAND

Habitat Description
This habitat is intermediate between sand and mud bottoms (50-75% of grains greater than 0.0625 mm in diameter). Muddy (finer) sediments accumulated during summer are mixed into the sandier substrate by the burrowing-feeding activity of benthos before winter storms resuspend them. There is more organic matter in the sediment here than in the sandy bottom, less than in a mud bottom.

Food Web
The food web of this habitat is dependent on detritus both from the production in overlying waters and to some extent from terrigenous sources. Detritivores, scavengers, and carnivores are important.

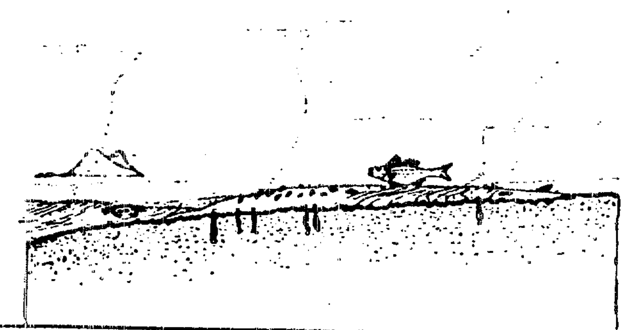
Characteristic Flora
Due to a paucity of light, there is no plant production in this habitat. Some heterotrophic diatoms may persist.

Characteristic Fauna
Infauna: clams (Macoma elimata), polychaetes (Nephtys sp., Sternaspis fossor), and amphipods (Paraphoxus variatus).

Epifauna: sea cucumber (Stichopus), urchins (Allocentrotus), shrimp (Pandalus), starfish (Lurida), snails (Polinices).

Figure 28. Muddy Sand Non-Vegetated Benthic Habitat (Procter et. al., 1980).

Benthic Oceanic Zones
Non-vegetated Benthic Zone
D Sand



SAND

Habitat Description
This is the smooth, relatively hard bottom area seaward of the surf zone and beyond the immediate influence of breaking waves and longshore currents. Current activity is regular and fairly strong, though not as strong as in rocky areas. The bottom sediment is sand (75% or more of grains are larger than 0.0625 mm in diameter) similar to that on the beaches but significantly more stable. As a result of the greater stability, lack of wave breaking action, and more organic material than on beaches, populations are larger and there are more species than in the beach habitat. This habitat gradually grades into the muddy sand bottom habitat as the water deepens to the west. Relict sand patches occur along outer shelf.

Food Web
The energy for the habitat comes from phytoplankton in the overlying waters and from the detrital material which continually rains down from above or is introduced from nearby estuaries. Many of the important organisms are detrital feeders and components of the food web are relatively simple.

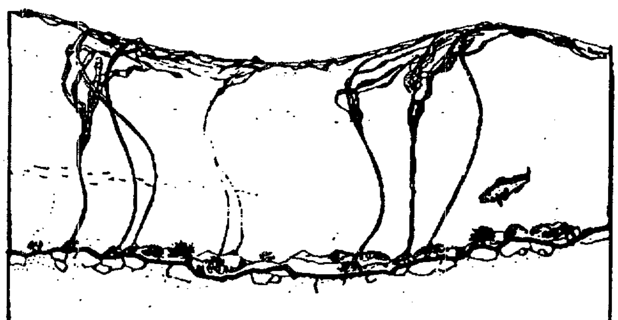
Characteristic Flora
There are no primary producers on the substrate because of the reduced light level over most of this environment. Diatoms in the phytoplankton enter from the euphotic zone, and may concentrate near the bottom.

Characteristic Fauna
Invertebrates: polychaete worms, gammaridian amphipods, Slota's razor clam, Dungeness crab, gastropods, and sand dollars.

Fish: English sole, Pacific sanddab, butter sole, skates, and dogfish.

Figure 29. Sand (Non-Vegetated) Benthic Habitat (Procter et al., 1980).

Benthic Oceanic
Zones
Vegetated Benthic
Zone
A Kelp



KELP

Habitat Description	Characteristic Flora
Kelps occur in what is called the Protected Outer Coast. They persist on rocky reefs subject to occasionally severe wave action and tidal currents. Kelps range from extreme low water (ELW) to a depth of about 40 feet (13 m). **Food Web** Productivity is dominated by the kelps and their associated algal flora. The food web is dominated by grazing organisms. Detrital components of the food web are present, but of secondary importance.	The typical kelp habitat is multilayered, being composed of canopy, unstory, turf, and crustose layers. The canopy is made up of Nereocystis luetkeana (bull kelp). The understory is made up of several kelps, notably Pterygophora californica, Alaria marginata, Laminaria saccharina, Laminaria setchelli, and Egregia menziesii. The turf layer is made up of filamentous and thallose red algae. The crustose layer is largely made up of Kildenbrandtia and Lithophyllum. **Characteristic Fauna** Invertebrates: a variety of sea urchins, limpets, chitons, starfish, crabs, snails, amphipods, isopods. Fish: copper, brown, quillback, and black rockfishes, lingcod, kelp greenling.

Figure 30. Kelp Habitat (Procter et. al., 1980).

Surfgrasses (Vegetated Benthic) Habitat

A common surfgrass species, phyllospadix scouleri, ranges from Vancouver Island to southern California (Figure 31). It also appears on the exposed shores of the San Juan Islands. Though not a true grass, phyllospadix does produce flowers and is closely related to the grass family. Surfgrass does not root, but attaches to rocks by tenacious fibers. It offers cover and concealment for many organisms while releasing oxygen to nearshore waters. Phyllospadix can survive low-tide exposure in pools or channels with minimum water levels. It becomes a valuable haven to invertebrates and other intertidal species seeking shade from the sun during low tide (Kozloff, 1983).

2. Natural Resources

The natural resources of the Washington outer coast are the result of the environmental conditions previously described. The geology, winds and other meteorological factors, oceanic and nearshore currents, and diversity of habitats all contribute to the wealth of natural resources present. The living natural resources which will be protected by sanctuary designation include numerous species of plankton, algae, invertebrates, fishes, seabirds, and marine mammals.

For comparative purposes, the entire sanctuary study area was divided into seven subareas in the DEIS/MP to allow for the analysis of the distribution of living marine resources (Figure 32). An eighth region (subarea 1a) has been included in this FEIS/MP beyond the original seven due to evidence that the coastal ecosystem continues several miles into the Strait of Juan de Fuca. Coastal, geomorphological, oceanographic and/or political features were used to delineate these subareas.

***Subarea 1** encompasses a relatively shallow offshore plateau known as "the plain", and the head of Juan de Fuca Canyon. The eastern boundary extends due north from Koitlah Point to the U.S./Canada international boundary. The northern edge follows the international boundary westward to the 100 fathom isobath. The western edge transects the head of Juan de Fuca Canyon and then generally follows the 100 fathom isobath. The surface area is approximately 753 nm^2 (2583 km^2).

***Subarea 1a** includes an area within the Strait of Juan de Fuca that exhibits decidedly oceanic characteristics by its biological dynamics, oceanographic properties, bathymetry and coastal geology. This area was studied in a separate review to determine where oceanic properties of the outer coast cease to dominate the marine environment in the Strait. The area boundaries were established in accordance with the findings of the review. The analysis of the Strait of Juan de Fuca ecosystem can be found in Appendix E. The western boundary of subarea 1A

Benthic Oceanic
Zones
Vegetated Benthic
Zone
8 Surfgrass

SURFGRASS

Habitat Description	Characteristic Flora
Surfgrass occurs on rocks on protected outer coast from Alaska to Baja California. It is most common from Monterey to southern Vancouver Island. It is found from the intertidal to 7 meters deep and is associated with *Fucus*. **Food Web** Surfgrass along with several species of kelps are responsible for most of the primary productivity. Some coastlines have beaches dominated by surfgrass; others have a mixture of surfgrass and benthic algae. Principal components of the food web are detrital.	Surfgrass (*Phyllospadix* spp.) predominates. *Ulva* (sea lettuce), *Iridaea cordata*, *Rhodomela laux*, *Calliarthron tuberculosa*, and *Odonthalia floccosa* are common as understory plants. Diatoms, *Simthora* (a red alga), and *Petalonia* (a brown alga) are found on the leaves. Commonly associated kelps are: *Alaria*, *Laminaria*, and *Egregia*. **Characteristic Fauna** Invertebrates: nereid worms, isopods, amphipods, snails, limpets, copepods, crabs, starfishes, and sea urchins. Birds: black brant. Fish: coho juveniles.

Figure 31. Surfgrass Benthic Zone (Procter et. al., 1980).

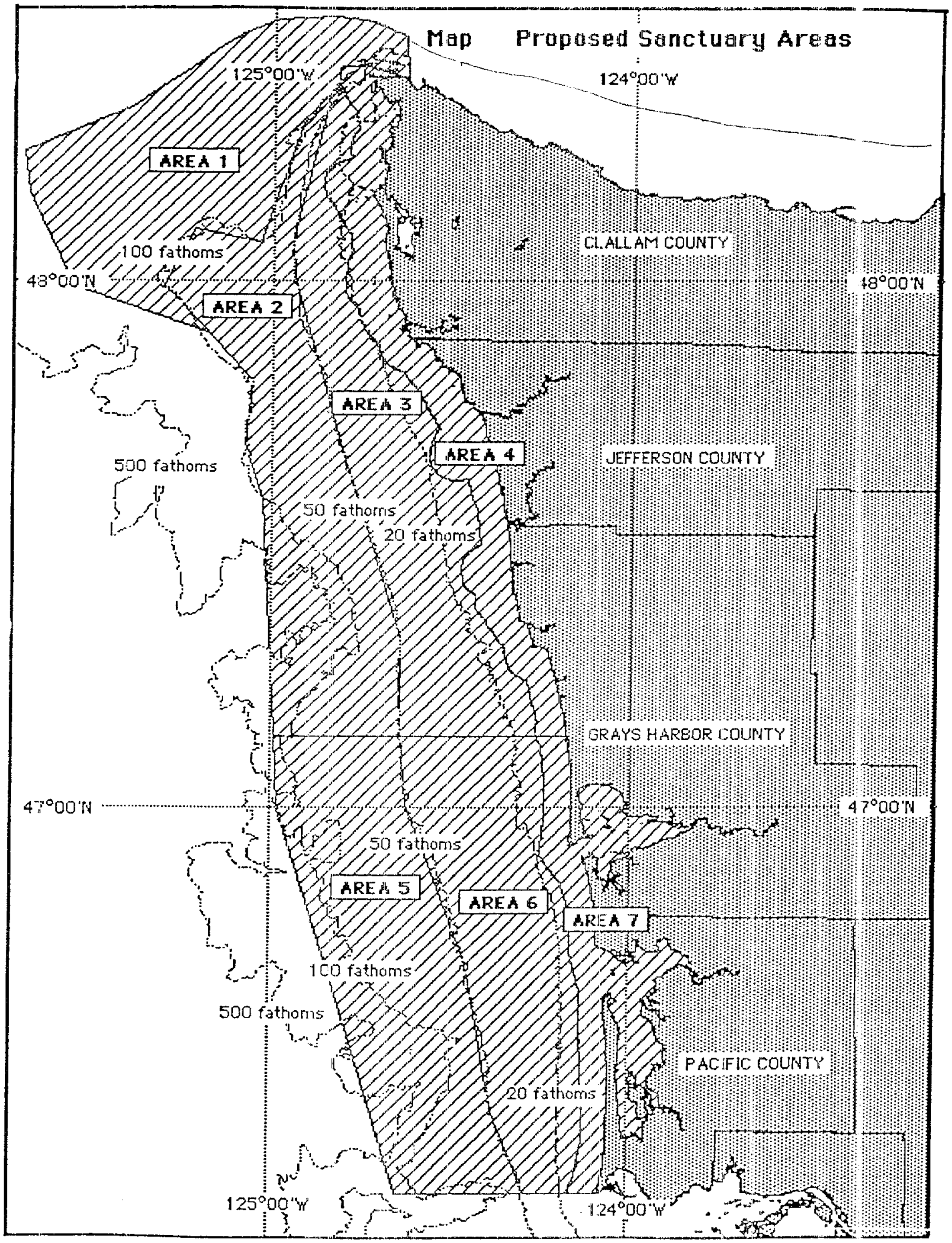


Figure 32. Sanctuary Study Subareas (SAB, 1990).

is contiguous with subarea 1 and extends due north from Koitlah Point to the U.S./Canada international boundary. The international boundary in the Strait serves as the northern edge of the subarea. The eastern boundary extends due north from Observatory Point to the international boundary. The surface area is approximately 255 nm^2 (873 km^2).

***Subarea 2** lies above the outer edge of the continental shelf, is generally bounded east and west by the 50 fathom and 100 fathom isobaths respectively, and includes the head of the Quinault Canyon. The southern edge follows a line which extends due west from the southern tip of Copalis National Wildlife Refuge where coastal geomorphology changes from broad sandy beaches, to a rugged, rocky coastline with pocket beaches. The surface area is approximately 791 nm^2 (2712 km^2).

***Subarea 3** represents the mid-shelf area, from the 50 fathom isobath in the west to the state's limit of jurisdiction (3nm) in the east. The southern edge follows a line which extends due west from the southern tip of Copalis National Wildlife Refuge where the coastal geomorphology changes from broad sandy beaches, to a rugged, rocky coastline with pocket beaches. The northern boundary encompasses the Juan de Fuca Canyon head to a point west of Cape Flattery. The surface area is approximately 669 nm^2 (2296 km^2).

***Subarea 4** is equivalent to the sanctuary boundary proposed in the original SEL. It generally extends from the mean high water line to the seaward extent of the territorial sea (3 nm). The northern boundary arcs around Cape Flattery and terminates at Koitlah Point. The southern boundary is formed by an east/west line at the southern tip of the Copalis National Wildlife Refuge (NWR). The surface area is approximately 392 nm^2 (1346 km^2).

***Subarea 5** represents the outer edge of the continental shelf between the 50 fathom and 100 fathom isobaths; and includes the head of Grays Canyon. The northern edge follows a line that extends due west from the southern tip of Copalis NWR. The southern boundary follows a line that extends due west from Cape Disappointment at the mouth of the Columbia River. The surface area is approximately 820 nm^2 (2813 km^2).

***Subarea 6** represents the mid-shelf area, from the 50 fathom isobath to the state's limit of jurisdiction (3nm). The northern edge follows a line that extends due west from the southern tip of Copalis NWR. The southern boundary follows a line that extends due west from Cape Disappointment at the mouth of the Columbia River. The surface area is approximately 690 nm^2 (2366 km^2).

***Subarea 7** extends seaward to the state limit of jurisdiction (3 nm). It includes the estuarine areas of Grays

Harbor and Willapa Bay. The northern edge follows a line that extends due west from the southern tip of Copalis NWR. The southern boundary follows a line that extends due west from Cape Disappointment at the mouth of the Columbia River. The surface area is approximately 286 nm^2 (981 km^2).

NOAA's Strategic Assessment Branch (SAB) analyzed each subarea to determine its relative significance for selected species of invertebrates, fishes, marine birds, and marine mammals (subarea 1a was not included in this analysis). Individual species were assigned scores for each subarea based on their relative distribution and density. It was not necessary to assign special scoring points for endangered and threatened species since distribution of each species within the study area is scored relative to the entire population of that species for the EEZ of the contiguous U.S. west coast. Thus, a subarea may be significant to a species that is present only rarely, such as the sperm whale. One or two sightings of a species with a small population base would establish a high score.

The scores are presented in a series of tables (Appendix C, Tables 3 through 9) that allow the reader to compare subareas according to selected assemblages of marine fauna. While these tables do not provide an exhaustive list of species for each subarea, they do exemplify the general biological character of each region. The results of this analysis are used in developing and evaluating boundary options for the Sanctuary, as well as assessing the potential impacts of human activities occurring in the area.

(a) Plankton

Phytoplankton production on the Washington continental shelf is high. The upwelling of nutrient-rich waters into the surface layers, which is enhanced by the Juan de Fuca Canyon, supports the production of these microscopic plants which form the basis for the oceanic food chain. High productivity in the spring and summer coincides with the periods of coastal upwelling. The almost continual replenishment of nutrients (especially nitrogen) into the surface waters during the time of year when solar radiation is high, and days are long, is responsible for the continually high phytoplankton standing stocks and rates of production characteristic of this region (Perry, et al., in press).

Diatoms are the primary component of the phytoplankton. Dinoflagellates are also an important component and it is blooms of these single-celled plants that cause the outbreak of red tides in Washington. One of the dinoflagellates (*Gonyaulax catenella*) contains a powerful neurotoxin that causes paralytic shellfish poisoning and shellfish bed closures. While most surf-swept sandy beaches are areas of low phytoplankton occurrence, the sand beaches of the southern portion of the outer coast have such a large persistent population of diatoms in the surf that the water is colored a conspicuous brown (Lewin, in press). The razor clam relies on the surf-zone dwelling diatom (Chaetoceros armatum) as its principal food source in area 4 and 7. The population of razor clams is so abundant that it accounts for over 70% of the recreational harvest of razor clams on the west coast (Schink, et.al., 1983; SAB, 1990).

Unlike phytoplankton, which are limited to the euphotic zone (approximately the upper 100m), zooplankton occur at all depths and can undertake daily vertical migrations of up to several hundred meters. A variety of zooplankton such as ciliates, copepods, euphausiids, and pelagic tunicates feed upon phytoplankton. In turn, zooplankton are an important food source for fish and other organisms, including whales. A large standing stock of zooplankton resides in an area from 5 nautical miles (10km) to 16 nautical miles (30km) off the coast (primarily within areas 3 and 6) during the summer. Copepods are the dominant group of zooplankton in terms of biomass (Landry and Lorenzen, in press). Euphausiids and copepods are the main food source for adult pelagic fishes. Most marine fish and shellfish species have planktonic eggs and larvae; these form an important part of the zooplankton at certain times of the year.

(b) Benthic Algae

Both microalgae and macroalgae are abundant and diverse on the outer coast. Over 120 species of algae have been identified in the rocky intertidal areas of the outer coast of the Olympic National Park (Dethier, 1988). Microalgae are primarily composed of benthic diatoms which are found as thin coatings on rocks or living within the sediment. These diatoms are an important part of the "algal film" forming diatom slicks on rocks and providing a principal food source for many grazing animals such as gastropods and chitons (McConnaughey, 1970). Marine lichens are found as thin veneers on rocks in the highest intertidal areas on exposed rocky areas.

Macroalgae are seaweeds that grow attached to a firm substrate from the intertidal region down to as deep as 40m, thus occurring primarily in areas 4 and 7. The seaweeds are composed of three main phyla: red algae (Rhodophyta), brown algae (Phaeophyta), and green algae (Chlorophyta). Kendrick and Moorhead (1987) present a summary of the algal species found, or expected to occur, at three intertidal sites along the coast of the Olympic National Park. The authors also discuss using two species of algae (Fucus distichus, and Endocladia muricata) as potential indicators of recreational impact on the intertidal communities of the National Park.

The red algae are the most diverse of the macroalgae in terms of number of genera (about 115) and species (at least 265) in the Pacific Northwest (Waaland, 1977). In intertidal and shallow subtidal areas, red algae often occupy the understory of the larger kelps. Less common in the exposed areas of the outer coast, green algae inhabit the more protected marine and estuarine areas in Washington. These algae reside primarily in tidepools and rocky intertidal areas. Brown algae include the largest marine plants and are probably the most important macroalgal group in terms of primary productivity and direct economic value (Gardner, 1981). Brown algae vary from the large kelps to the less conspicuous forms that encrust rocks or form filaments on other algae. The Pacific Northwest coast supports the highest diversity of kelps in the world (Dayton, 1985). Two species of brown algae dominate the extensive kelp forests of the outer coast: the bull kelp (<u>Nereocystis leutkeana</u>) which is found in relatively protected waters; and the giant kelp (<u>Macrocystis intergrifolia</u>) which prefers more exposed areas (Steelquist, 1987). Macrocystis beds extend into the Strait of Juan de Fuca to Crescent Rock. Some of the most proliferous macrocystis beds in the state are found in the Strait.

Algae play an important role in the functioning of the entire coastal ecosystem. Beside being a direct food source for animals, algae (especially kelps) produce large amounts of dead plant material (detritus) which is the basis for the detrital food web. Duggins <u>et al</u>. (1989) showed that growth rates of benthic suspension feeders are two to five times as high at kelp-dominated islands as at those without kelp beds. Algae provide important habitat for many animals and function as nursery and spawning areas for small fish. Sea otters and many species of fish closely associate with giant kelp forests.

(c) <u>Invertebrates</u>

Many factors determine the distribution, species composition, and abundance of the invertebrate fauna. The seafloor geology, types of rocky substrate or unconsolidated sediments, offshore currents and circulation patterns, exposure to waves, water depth, Columbia River low salinity plume, and presence of mammal predators all influence the niches occupied by the various species. The upwelling off the coast brings cold, nutrient-rich water to the nearshore zone where it nourishes high marine plant productivity. This provides food and habitat for invertebrates that suspension feed or graze on algae (Dethier, 1988).

The rocky intertidal habitat supports the widest array of invertebrate species (Ricketts <u>et al</u>., 1985). Invertebrate species found during surveys along the coast of Olympic National Park are listed in Appendix G. Representative invertebrates include sponges, bivalves, isopods, amphipods, shrimp, barnacles, bryozoans, sea urchins, sea cucumbers, and sea stars.

Invertebrates residing in the boulder and cobble areas are diverse and consist of organisms living on and around the rocks and the soft sediment beneath them. Different species dominate in this habitat than in the rocky intertidal areas. Invertebrates living in the sediment under the rocks include the mud shrimp (Upogebia), mud dwelling brittle stars, and several species of clams and polychaete worms. Invertebrates living on or under boulders and cobbles include barnacles, limpets, amphipods, isopods, sea snails (Lacuna and Tegula), several species of crabs, the sea squirt Clavelina, and various species of edible clams (butter clams, littleneck clams, and horse clams).

Invertebrates found in sandy intertidal areas are less diverse than in other habitats, but some species may be found in large numbers. For example, Dethier (1988) discovered great quantities of amphipod crustaceans and polychaete and nemertean worms at several sites on the outer coast. The amphipod Euhaustorius was found in densities up to 10,670 individuals/m^2. Densities of the bloodworm Euzonus reached almost 7,000/m^2. Other invertebrates present include razor clams (Siliqua), isopods, mysids (opossum shrimp), sand dollars, purple olive snails, several species of clam (eg. Macoma secta and Tellina bodegensis), and Dungeness and mole crabs.

Invertebrates associated with kelp beds include many encrusting varieties such as sponges, bryozoans, and tunicates. Other invertebrates include amphipods, copepods, euphausiids, numerous species of crabs, sea urchins, shrimps, sea stars, brittle stars, periwinkles, limpets, sea snails, sea slugs, scallops, and abalone.

Squid, octopi, jellyfish, salps, heteropods, shrimp, and euphausiids are some of the macro-invertebrates found in the pelagic environment. Numerous larval invertebrates are also found there during their planktonic stages of development.

Thus, both the coastal and offshore areas are important to invertebrates depending on whether the invertebrates are sedentary or pelagic. The significance of selected invertebrate species to each of the 7 areas within the study area is shown in Appendix C (Tables 3 and 4). Two observations are apparent: areas 4 and 7 stand out as the most significant of all seven zones; and four invertebrates are particularly significant within the study area: 1) Pacific oyster, 2) ocean pink shrimp, 3) Dungeness crab, and 4) razor clam. Pacific oyster, Dungeness crab, and ocean pink shrimp landings from the areas under consideration for sanctuary status had combined landed values in 1987-88 of over $25 million (about 85% of the statewide totals for harvests off Washington) (WDF, 1987; NMFS, 1989). Decimation of razor clam populations due to pathogen infestations and other natural calamities in the early 1980's has ended commercial harvests, but recreational digging on Washington's outer coast currently accounts for over 70% of the contiguous U.S. coastal sport harvest.

Area 7 is particularly important for Pacific oysters because of the significance of Grays Harbor and especially Willapa Bay to oyster production (Appendix C, Figure 14). These two estuaries account for over half of all oysters harvested along the entire U.S. West Coast, and sometimes represent nearly 1/5 of the nationwide harvests (NMFS, 1989a). Areas 4 and 7, and the shallower portions of areas 3 and 6 (within 40 fathoms), are locations where more than 75% of the state's Dungeness crab catch is taken. Additionally, areas 4 and 7 are important for juveniles of the Dungeness Crab. The areal distribution of the ocean pink shrimp in the Washington outer coast occurs primarily in areas 2 and 5.

(d) <u>Fish Resources</u>

The diverse and abundant fish fauna along the outer coast are significant commercial and recreational resources. The same environmental factors that determine distribution, abundance, and species composition of other living resources of the area also affect fish communities. The diverse habitats of Washington's outer coast each claim their own characteristic assemblage of fish.

Fish of the nearshore sublittoral habitat show the greatest diversity and include many commercially important species. Salmon are anadromous fish that spend most of their life in salt water but return to fresh water to spawn at maturity. Five species of Pacific salmon occur along the outer coast of Washington: chinook, sockeye, pink, chum, and coho. Two other salmon-related anadromous species, sea-run cutthroat trout and steelhead, also inhabit offshore waters. Other species include albacore tuna, Pacific halibut, flounder (starry and arrowtooth), sole (petrale, Dover, English), numerous species of rockfish, Pacific cod, Pacific hake, lingcod, sablefish, thresher shark, Pacific herring, northern anchovy, jack mackerel, pollock, spiny dogfish, green and white sturgeon.

Fishes associated with sandy intertidal areas include starry flounder, staghorn sculpin, sand lance, sand sole, redtail surfperch, and sanddab. Surf smelt spawn at high tide on sandy beaches where surf action covers and aerates the eggs (Gardner, 1981).

Many of the finfish found in shallow rocky reefs are also common in kelp beds. The kelp canopy, stipes, and holdfasts increase the available habitat for pelagic and demersal species, and offer protection to juvenile fish. The numerous species of rockfish are the dominant fish. Other associated species include lingcod, kelp greenling, cabezon, kelp perch, wolf eel, and red Irish lord.

The rocky intertidal habitat is characterized by a rather small and specialized group of fish adapted for life in tidepools and wash areas. These fishes include tidepool sculpin, wolf eel, juvenile lingcod and greenling, gunnels, eelpouts, pricklebacks, cockcombs, and warbonnets.

The significance of the subareas to the distribution of several selected fish species found in the study area is summarized in Appendix C (Tables 5 and 6). Two observations are noteworthy. First, the salmon and groundfish species assemblages are the most significant species in the study area. The region is not only important for those salmon that spawn in streams adjacent to the study area, but potentially encompasses the migration corridor of both juvenile and adult salmonids from California, Oregon, and British Columbia as well. Second, the analyses suggest that offshore and mid-shelf areas under consideration for sanctuary status (areas 1,2,3,5, and 6) generally are more significant for non-anadramous fishes than the inshore areas.

Offshore areas 1 and 5 are the most important areas for commercial harvests of groundfish. More than 2/3 of annual 1987-88 outer coast harvests came from these areas for the following species: Pacific ocean perch, lingcod, English sole, Dover sole, Pacific cod, and sablefish. Area 5, produced the majority of harvests of widow rockfish. It is important to note, however, that four of the top ten fishes commercially harvested along the outer coast of Washington (chinook, coho, and chum salmon, and lingcod) are either estuarine-associated (i.e., they use estuaries during some time in their lives) or estuarine-dependent (i.e., they require estuaries to complete their life cycles). Additionally, the top four recreational species for Washington (chinook and coho salmon, steelhead, and lingcod) all utilize estuaries, at least as juveniles.

(e) Marine Birds

The rocky headlands, islands, and highly productive waters of the Washington outer coast provide essential habitat for a wide variety of both migratory and resident marine birds. Beyond their common link to the sea, marine birds are a very diverse group. They differ by size, shape, feeding habits, spatial distribution, habitat requirements, sensitivities and a host of other characteristics. The complex nature of many species makes it difficult to group birds into neat categories and impossible to apply sweeping characterizations about marine bird behavior. There is nearly always an exception to every rule, even among birds of the same species.

Bird surveys can thus be quite tedious and results may vary according to the degree of difficulty in gathering information and the resources available to researchers. For example, gathering production statistics on colonial nesters that lay their eggs on exposed, rocky surfaces (e.g. Common murre) is much easier and more precise than collecting the same data on species that scatter into coastal forests to nest in both old growth trees and concealed burrows (e.g. Marbled murrelet). Due to such differences, knowledge about some species is far more complete than for others.

Nevertheless, information on marine birds of the Washington coast has advanced dramatically over the past decade. The most comprehensive reports have been commissioned by state and Federal resource management agencies. This discussion draws heavily on those reports - particularly those by Strickland and Chasan, 1989; Speich & Wahl, 1989; Wahl, 1984; SAB, 1990; and MMS Study, 1992. These reports were produced through extensive literature searches and the most current survey techniques. They represent the best available information on Washington marine bird populations. Therefore, portions of these texts have been directly incorporated into this report. It should be noted that the 1992 MMS Study (cited above) was the first attempt to-date to describe offshore avifaunal distribution off Oregon and Washington using repeated, systematic sampling. Coastal nearshore populations have been tracked closely for two decades by Terence Wahl, Ulrich Wilson, and other researchers.

Data compiled from various sources lists approximately 128 marine bird species present off the Washington coast. Speich et al. (1987) reported a total of 87 species of birds observed or known to occur in the area between Point Grenville and Sealion Rock (Table 1). An additional 41 species known to occur in the study area and are listed in Table 2. At least eleven of these additional species occur regularly in the offshore waters along the coast, some in large numbers: black-footed and Laysan albatrosses, pink-footed, flesh-footed, Buller's and short-tailed shearwaters, red phalarope, south polar skua, Sabine's and glaucous gulls and Xantus' murrelet (Wahl, 1991).

Species composition and abundance of marine birds vary by season in Washington coastal waters. While many species of birds are year-round residents, others may be summer or winter visitors, or migrants passing through on spring and/or fall migrations.

Resident birds are present throughout the year. Breeding residents nest in the coastal areas of Washington. Non-breeding residents are represented by non-breeding individuals (juveniles that do not migrate) during the spring and summer periods. The glaucous-winged gull is a resident species that nests in coastal Washington, and many individual birds live their entire life in

Table 1. Bird Species Observed in Sealion Rock Study Area. Source: Speich et. al., 1987.

Common Name	Genus/Species
Loons	
Red-throated loon	*Gavia stellata*
Pacific loon	*Gavia pacifica*
Common loon	*Gavia immer*
Grebes	
Horned grebe	*Podiceps auritus*
Red-necked grebe	*Podiceps grisegena*
Western grebe	*Aechmophorus occidentalis*
Tube Noses	
Northern fulmar	*Fulmarus glacialis*
Sooty shearwater	*Puffinus griseus*
Storm-Petrels	
Fork-tailed storm-petrel	*Oceanodroma furcata*
Leach's storm-petrel	*Oceanodroma leucorhoa*
Pelicans	
Brown pelican	*Pelecanus occidentalis*
Cormorants	
Double-crested cormorant	*Phalacrocorax auritus*
Brandt's cormorant	*Phalacrocorax penicillatus*
Pelagic cormorant	*Phalacrocorax pelagicus*
Herons	
Great blue heron	*Ardea herodias*
Swans, Geese, Ducks	
Tundra swan	*Cygnus columbianus*
Greater white-fronted goose	*Anser albifrons*
Snow goose	*Chen caerulescens*
Brant	*Branta bernicla*
Canada goose	*Branta canadensis*
Green-winged teal	*Anas crecca*
Mallard	*Anas platyrhynchos*
Northern pintail	*Anas actua*
Northern shoveler	*Anas clypeata*
American wigeon	*Anas americana*
Canvasback	*Aythya valisineria*
Scaup species	*Aythya species*
Harlequin duck	*Histrionicus histrionicus*
Black scoter	*Melanitta migra*
Surf scoter	*Melanitta perspicillata*
White-winged scoter	*Melanitta fusca*
Common goldeneye	*Bucephala clangula*
Bufflehead	*Bucephala albeola*
Common merganser	*Mergus merganser*
Red-breasted merganser	*Mergus serrator*
Ruddy duck	*Oxyura jamaicensis*
Hawks and Eagles	
Osprey	*Pandion haliaetus*
Bald eagle	*Haliaeetus leucocephalus*
Falcons	
Merlin	*Falco columbarius*
Peregrine falcon	*Falco peregrinus*
Plovers	
Black-bellied plover	*Pluvialis squatarola*
Semipalmated plover	*Chardrius semipalmatus*
Oystercatchers	
American black oystercatcher	*Haematopus bachmani*
Shorebirds	
Wandering tattler	*Heteroscelus incanus*
Spotted sandpiper	*Actitis macularia*
Whimbrel	*Numenius phaeopus*
Long-billed curlew	*Numenius americannus*
Ruddy turnstone	*Arenaria interpres*
Black turnstone	*Arenaria melanocephala*
Surfbird	*Aphriza vigata*
Sanderlings	*Calidris alba*
Western sandpiper	*Calidris mauri*
Least sandpiper	*Calidris minutilla*
Rock sandpiper	*Calidris ptilocnemis*
Dunlin	*Calidrus alpina*
Red-necked phalarope	*Phalaropus lobatus*
Gulls and Terns	
Pomarine jaeger	*Stercorarius pomarinus*
Parasitic jaeger	*Stercorarius parasiticus*
Long-tailed jaeger	*Stercorarius longicaudus*
Bonaparte's gull	*Larus philadelphia*
Heerman's gull	*Larus heermanni*
Mew gull	*Larus canus*
Ring-billed gull	*Larus delawarensis*
California gull	*Larus californicus*
Herring gull	*Larus argentatus*
Thayer's gull	*Larus thayeri*
Western gull	*Larus occidentalis*
Glaucous-winged gull	*Larus gloucescens*
Black-legged kittiwake	*Rissa tridactyla*
Caspian tern	*Sterna caspia*
Arctic tern	*Sterna paradisaea*
Common tern	*Sterna hirundo*
Alcids	
Common murre	*Uria aalge*
Pigeon guillemot	*Cepphus columba*
Marbled murrelet	*Brachyramphus marmaratus*
Ancient murrelet	*Synthliboramphus antiguus*
Cassin's auklet	*Ptychoramphus aleuticus*
Rhinoceros auklet	*Cerorhinca monocerata*
Tufted puffin	*Fratercula cirrhata*
Swallows	
Northern rough-winged swallow	*Stelgidopteryx serripennis*
Barn swallow	*Hirundo rustica*
Crows and Jays	
Northwestern crow	*Corvus caurinus*
Common raven	*Corvus corax*
Starlings	
European starling	*Sturnus vulgaris*
Songbirds	
Savannah sparrow	*Passerculus sandwichensis*
Finches	
American goldfinch	*Carduelis tristis*

Table 2. Marine Bird Species Additional to those Listed in Table 1 Occurring in or near Sanctuary Boundary. Source: Speich et. al., 1987.

Common Name
Genus/Species

<u>Loons</u>
Yellow-billed loon
 Gavia adamsii
Arctic loon
 Gavia immer

<u>Tube Noses</u>
Short-tailed albatross
 Diomedea albatrus
Laysan albatross
 Diomedea immutabilis
Black-footed albatross
 Diomedea nigripes
Buller's shearwater
 Puffinus bulleri
Flesh-footed shearwater
 Puffinus carneipes
Pink-footed shearwater
 Puffinus creatopus
Manx shearwater
 Puffinus puffinus
Short-tailed shearwater
 Puffinus tenuirostris

<u>Storm-Petrels</u>
Least storm-petrel
 Halocyptena microsoma
Wilson's storm-petrel
 Oceanites oceanicus
Ashy storm-petrel
 Oceanodroma homochroa
Mottled petrel
 Teredroma inexpectata
Solander's petrel
 Teredroma solandri
Murphy's petrel
 Teredroma ultima

<u>Pelicans</u>
American White Pelican
 Pelecanus erythrorhynchos

<u>Cormorants</u>
Red-faced cormorant
 Phalocrocorax urile

<u>Swans, Geese, Ducks</u>
Barrow's Goldeneye
 Bucephala clangula
Oldsquaw
 Clangula hyemalis

<u>Shorebirds</u>
Northern phalarope
 Lobipes lobatus

<u>Gulls and Terns</u>
South polar skua
 Catharacta skua
Laughing gull
 Larus atricilla
Glaucous gull
 Larus hyperboreus
Slatey-backed gull
 Larus schistisagus
Ivory ull
 Pagophila eburnea
Red-legged kittiwake
 Rissa brevirostris
Ross's gull
 Rhodostethia rosea
Aleutian tern
 Sterna aleutica
Elegant tern
 Sterna elegans
Forster's tern
 Sterna forsteri
Sabine's gull
 Xema sabini

<u>Alcids</u>
Crested auklet
 Aethia cristatelia
Least auklet
 Aethia pusilla
Whiskered auklet
 Aethia pygmaea
Kittlitz's murrelet
 Brachyramphus brevirostris
Black guillemot
 Cepphus grylle
Parakeet auklet
 Cyclorrhynchus psittacula
Xantus' murrelet
 Endomychura hypoleuca
Horned puffin
 Fraturcula corniculata
Thick-billed murre
 Uria lomvia

the area. In fact, Puget Sound and the outer Washington coast are the sole breeding areas for the glaucous-winged gull in the contiguous U.S. (SAB, 1990). The surf scoter is a resident species that does not nest in the area, but non-breeding young birds remain here during the spring and summer months, while adults go north to nest.

Summer visitors are present during the spring and/or summer and usually absent during the winter. Summer residents may or may not breed in the area. Summer resident species that nest in the area include Leach's storm-petrel, osprey, snowy plover, spotted sandpiper, and Caspian tern. Summer resident species that do not nest in the area include sooty shearwater and Heermann's gull.

Winter visitors are present during the winter, and spring or fall, or both, and usually absent during the summer. Examples include the loons and grebes, swans, geese, brandt, most ducks, scoters, most shorebirds, herring gull, Thayer's gull, and black-legged kittiwake. Many species that are classified as winter visitors could also be classified non-breeding resident species, on the basis of small numbers of non-breeding individuals present during the summer period. Non-breeding common loons, Pacific loons, Western grebes, surf scoters, and black scoters are present in Washington coastal waters during the summer.

Migrants are generally only present during the spring or fall migration periods, or both. Examples include white-fronted geese, several shorebirds, phalaropes, pomarine and parasitic jaegers, California gulls, Sabine's gulls, and Arctic terns. Individual brown pelicans disperse up the Pacific coast from breeding colonies in Baja California, Mexico, and southern California, in late summer and fall, but by the end of the year nearly all birds have departed coastal Washington for southern waters. Heermann's gulls have an identical pattern, but it occurs earlier, in the summer and early fall period.

Seven marine bird species present in Washington waters are listed as threatened or endangered. The short-tailed albatross, peregrine falcon, brown pelican, and Aleutian Canada goose are all on the Federal endangered species list (although the short-tailed albatross is not yet regarded as endangered within the U.S.). The bald eagle is listed as a threatened species, and Grays Harbor is one of two major adult concentrations on the west coast. The State of Washington lists the snowy plover and American white pelican as endangered species. The marbled murrelet may soon be considered as an active candidate for listing as a threatened or endangered species.

The marine birds of the Washington coast may be divided into four groups, based loosely on their geographic distribution and feeding habits:

* Seabirds, such as alcids, shearwaters and gulls, which feed in open waters from the shoreline and estuaries to the open ocean. Some seabirds are strictly pelagic, while others prefer the nearshore environment;
* Shorebirds, such as sandpipers, which feed mainly along the intertidal and nearshore marine environment;
* Waterfowl, such as ducks and geese, found near shore on the open coast and in estuaries;
* Birds of prey, such as bald eagles and peregrine falcons, which breed and roost on land near water bodies, and feed in or near the water. (Strickland & Chasan, 1989)

As with the other living resources of the Sanctuary, marine birds are often associated with specific habitats. In general, seabird activity is most concentrated along the Olympic coast, while shorebirds and waterfowl are found primarily in the bays and shallow waters of the southern coast. All of the major seabird colony sites (15 with >1000 birds) along the outer coast are from Point Grenville to Cape Flattery. Alternately, Willapa Bay and Grays Harbor are critical as resting and foraging areas for several million migratory shorebirds and over one hundred thousand waterfowl. Birds of prey exist in very small numbers compared to the other marine bird categories and, though found throughout the study area, nest primarily on rugged terrain along the Olympic coast and at the mouth of the Columbia River. To determine bird species composition for specific habitats of the Washington coast, consult the species lists in Appendix C. Note that marine bird species interact at several trophic levels of the food web. This fact makes them a vital component of the coastal ecosystem.

1. Seabirds

The seabird colonies of Washington's outer coast are among the largest in population in the continental United States (Cummins, in Strickland and Chasan, 1989). The category "seabirds" refers to bird species that spend much of their lifecycle at sea. These birds inhabit sanctuary waters in greater number and frequency than any other marine birds. They also constitute the largest population of nesting marine birds within the proposed sanctuary boundaries.

Seabirds include those that are pelagic (i.e. generally forage far offshore over the continental shelf, continental slope, and in oceanic waters) and those that feed in nearshore zones. Pelagic seabirds go ashore primarily to breed, and otherwise rarely visit land. Pelagic species include the northern fulmar, five species of shearwaters, black footed albatross, arctic tern, pomarine jaeger, and fork-tailed and Leach's storm-petrels. The sooty shearwater is by far the most numerous. Huge flocks estimated to approach one million birds have been observed at the entrance to the Strait of Juan De Fuca during summer months (Strickland and Chasan, 1989). Nearshore seabirds feed within sight of land and include Pacific and red-throated loons, western grebes, brown pelicans, several species of gulls and cormorants, tufted puffins, common murres, and red-necked phalaropes.

A recent study for the US Department of Interior (MMS, 1992) describes offshore seabird activity in the Northwest as follows:

> Seabird populations were found to be most densely concentrated over the continental shelf and least so seaward of the continental slope (i.e., waters deeper than 2,000 m). During late spring through late summer, the shearwaters, storm-petrels, gulls, Common Murres and Cassin's Auklets numerically dominated the fauna. All these except the shearwaters nest in the study area. With autumn migration, the importance of shearwaters and petrels declined, but the number of phalaropes, California Gulls, and fulmars increased. Phalaropes, California Gulls, and fulmars, together with other gulls, murres, auklets, and kittiwakes, constituted the major elements of the winter fauna. Although total population estimates have not been attempted in this report, there is no doubt that peak populations in Oregon and Washington reach into the millions of birds.
>
> Every area over the shelf harbored dense concentrations of birds during the year. However, a few locations stood out prominently. The major colony complexes were located in southern and northern Oregon and along the Olympic Peninsula of Washington. Offshore of these sites, nesting birds foraged in dense aggregations to about 50 km radius. Petrels, shearwaters, and alcids heavily used the shelf-edge banks off central Oregon and northern Washington. The broad shelf area of northern Washington consistently harbored large populations of shearwaters, gulls, murres, and auklets.

The report findings demonstrate that foraging activity is significant throughout the study area to the shelf break and beyond. Swiftsure Bank and the Juan de Fuca Canyon stand out in the data as intense foraging sites. The 50 km foraging range of nesting birds extends, within the study area, from the international border to the Grays Harbor/Willapa Bay area. Strong topographically induced upwelling is known to occur along the shelf of southwestern Vancouver Island, particularly at the edge of the Juan de Fuca Canyon. Oceanic fronts, areas of strong horizontal property gradients, often occur at the seaward edges of coastal upwellings. These stratified water density layers trap poorly mobile zooplankton upon which some seabird species feed (MMS, 1992).

The coastal rocks and islands along the outer coast are critical nesting and roosting sites for many seabird species (See Appendix C, Figure 15 for ratings of significance to several species). All major seabird nesting sites along the Washington coast have been identified. Most are located on headlands or islands protected by the USFWS, the NPS, or native tribes.

The colony site is a very critical habitat for seabirds because reproduction and thus continuation of species depend on these sites. Here, the population will reach its annual low, just before young are hatched, and its annual high, just after hatching. At other times of the year, seabirds may be able to avoid problems, such as disruption of food supplies and perhaps even large oil spills, simply by flying elsewhere, but for successful reproduction, they are limited to the area in the vicinity of the colony.

Colonial seabird populations in the study area are estimated to range from 108,530 breeding pairs (Strickland and Chasan, 1989) to 240,000 individuals (Wahl, 1984). Approximately 75% of the total estimated colonial seabird population in Washington breed between Point Grenville and Neah Bay which is in, or adjacent to, subarea 4 (Figure 33). The shoreline south of Point Grenville, in or adjacent to subarea 7, has limited nesting habitat available for colonial seabirds, except for accreted sand islands in Grays Harbor and Willapa Bay and the rock cliff face at the mouth of the Columbia River (Speich and Wahl, 1989).

Figure 34 displays the location and density of breeding seabirds along the Washington coast. This data reveals a distinct difference in profile between the breeding seabird populations along the Olympic coast and those of the southern coast (Grays Harbor/Willapa Bay). The Olympic coast is dominated by the more pelagic species and much higher numbers of nesters, while the southern coast is primarily nesting habitat for gulls and terns. There is an obvious break in nesting activity between Ocean Shores and Point Grenville that coincides with a distinct change in habitat. These characteristics are also evident by the distribution of individual nesting colonies in Figure 35.
The dominant species of breeding seabirds in Washington are Cassin's auklets, rhinoceros auklets, common murres, Leach's storm-petrels, glaucus-winged gulls and tufted puffins (Figure 36). Destruction Island is home to one of the seven major colonies (18,000 pairs) of rhinoceros auklets in the world, and only one of two major colonies of greater than 20,000 birds along the entire west coast (SAB, 1990). The rhinoceros auklet, Fork

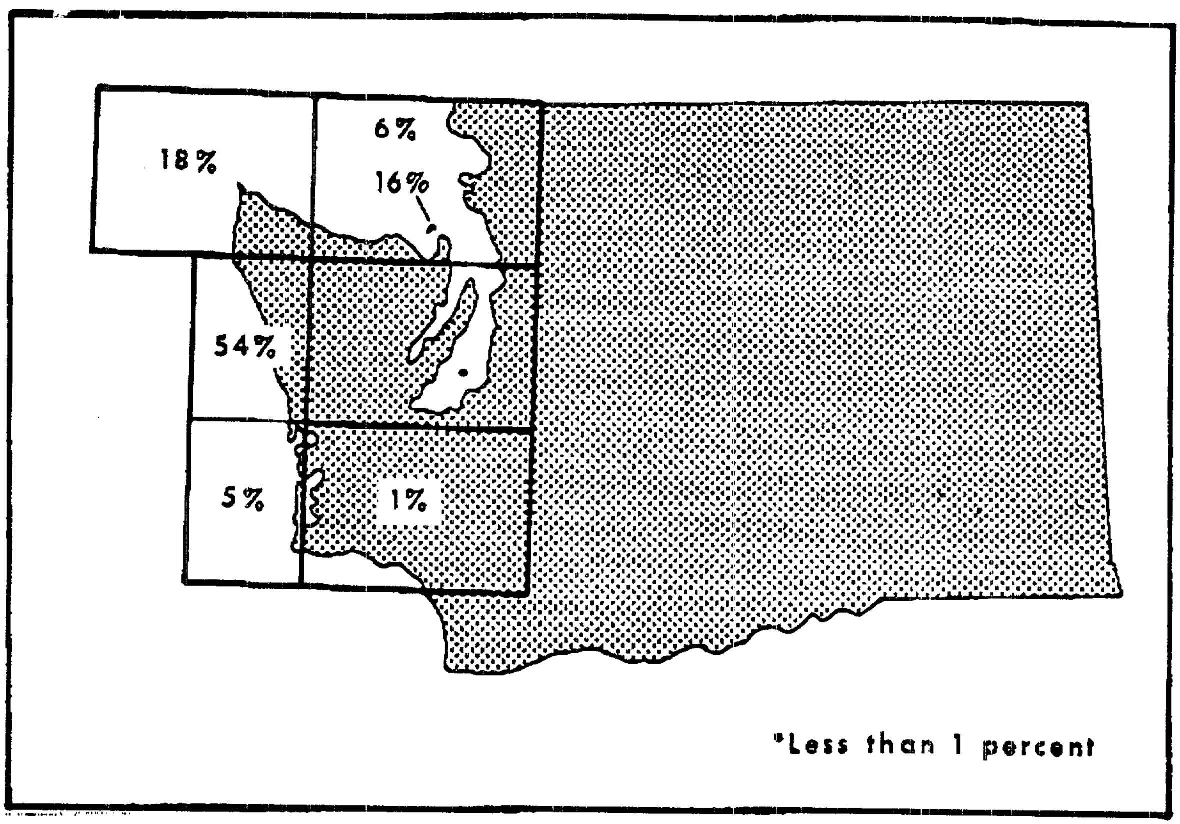


Figure 33. Percentage of Breeding Seabirds along the Marine Shorelines of Washington (Speich and Wahl, 1989).

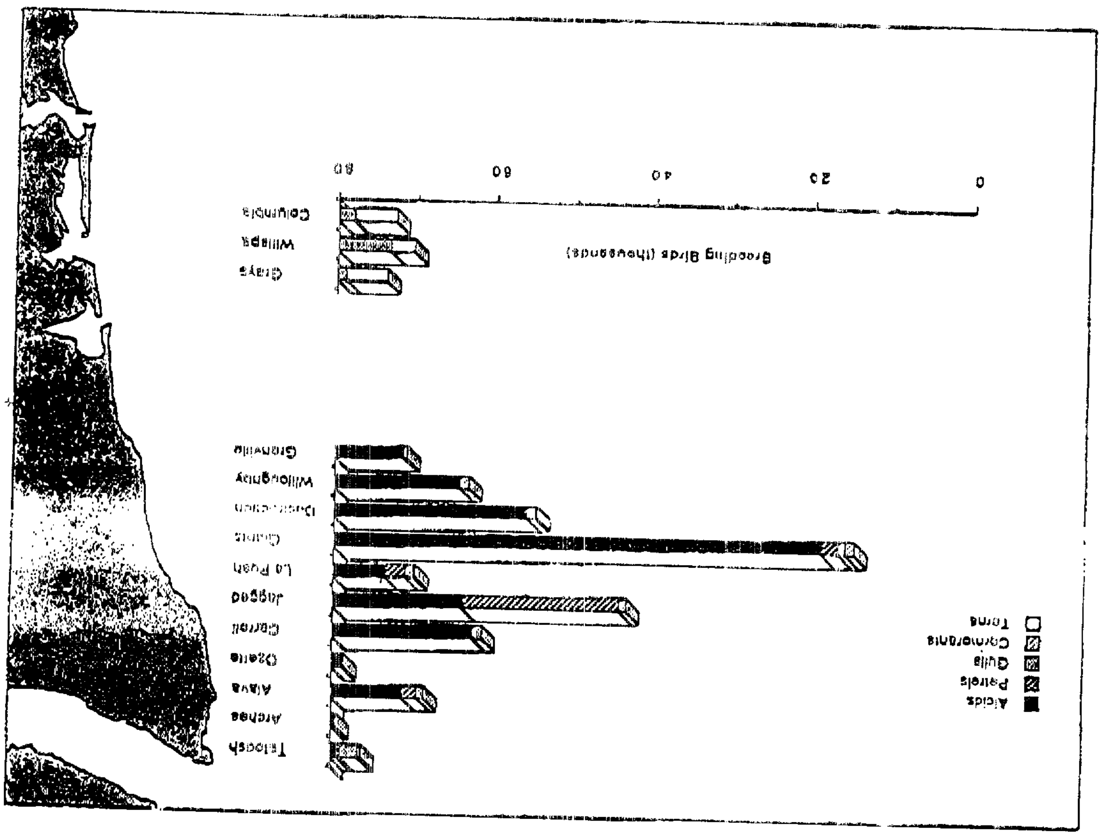


Figure 34. Estimated Breeding Populations (numbers of individuals) of Seabird Families (alcids, storm-petrels, cormorants, and terms) by Region along Coastal Washington (Strickland and Chasan, 1989 from data in Speich and Wahl, 1989).

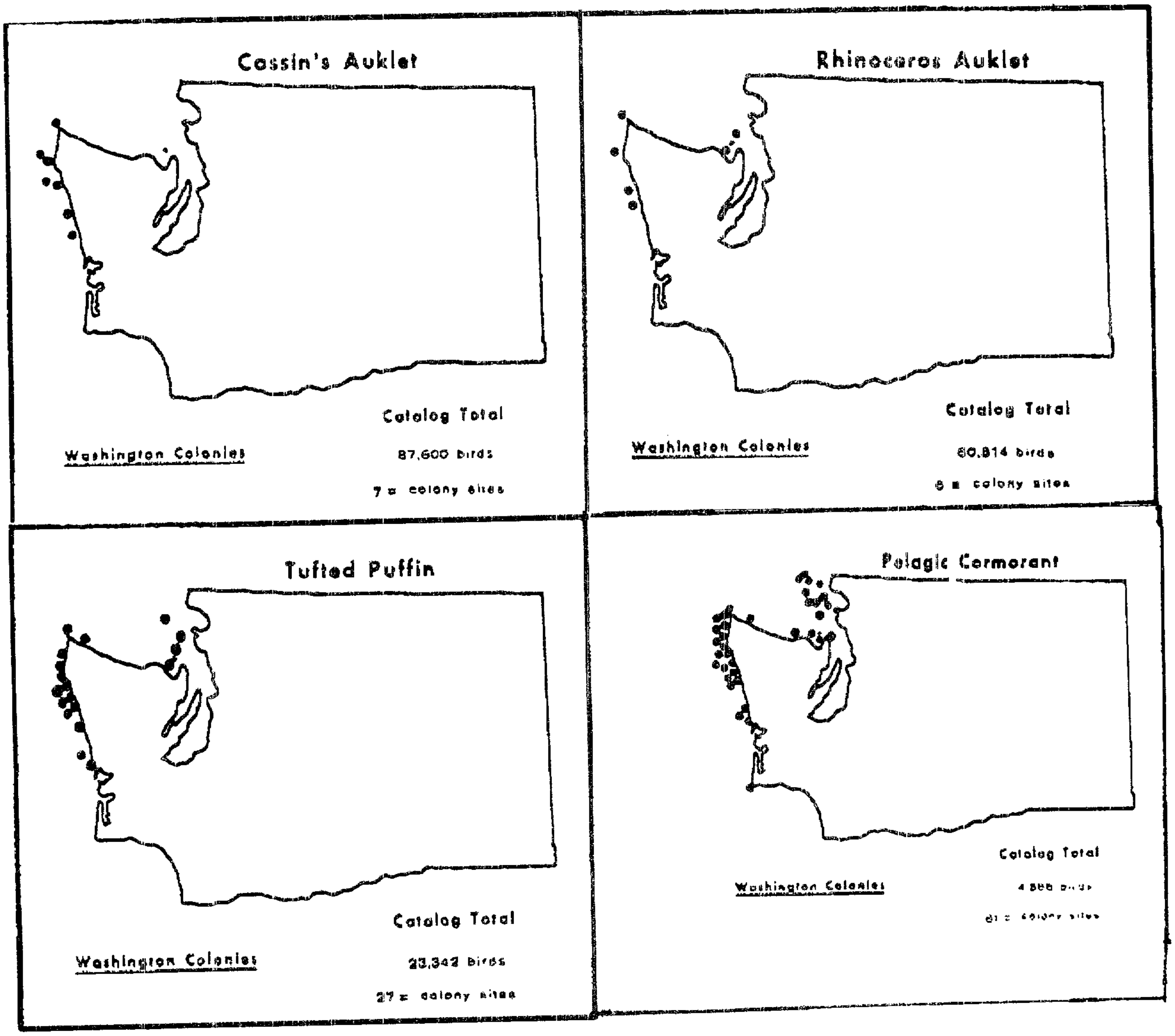


Figure 35. Distribution of Nesting Sites of the Washington Species of seabirds (Speich and Wahl, 1989).

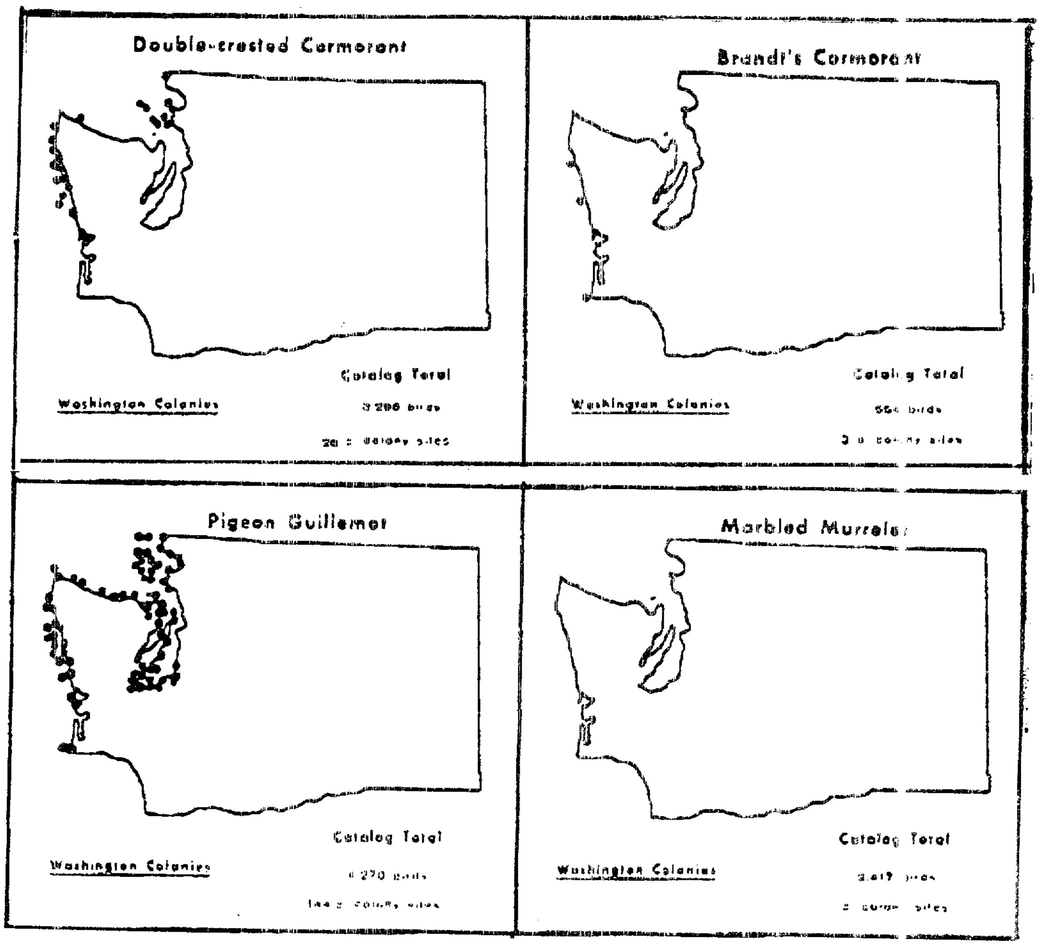


Figure 35. continued

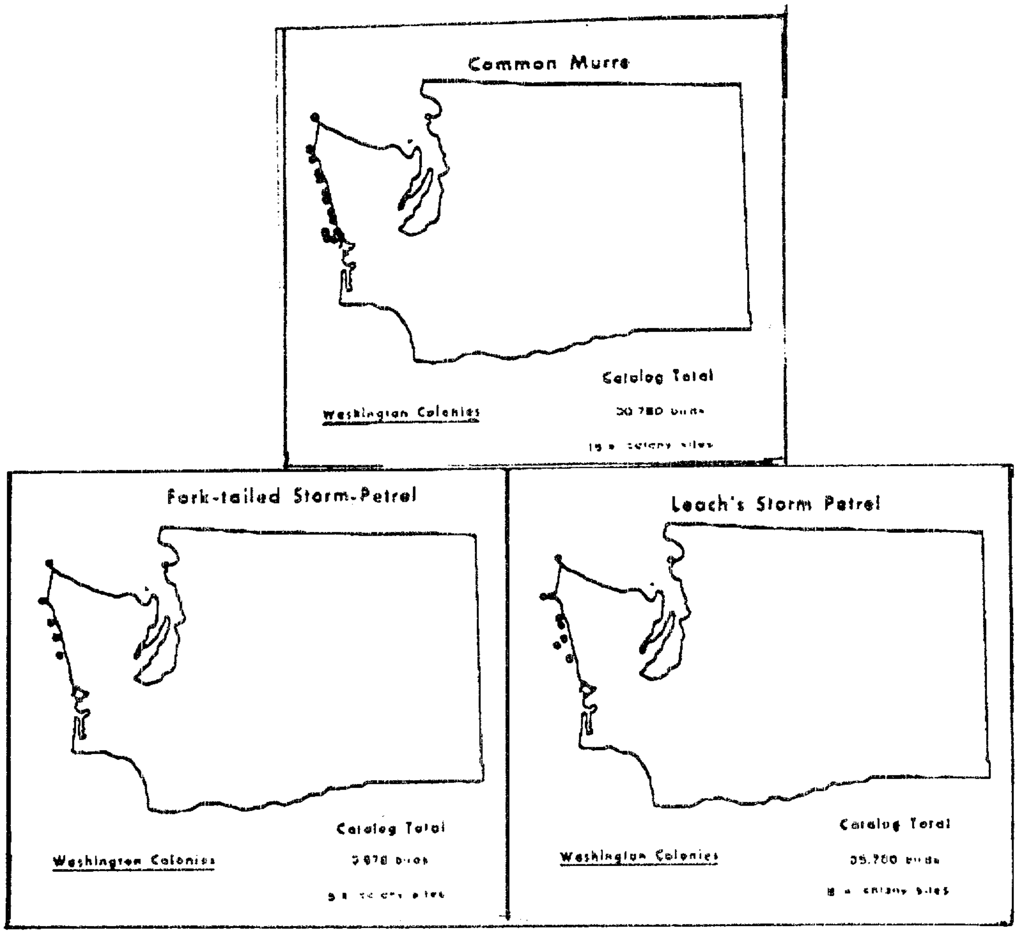


Figure 35. continued.

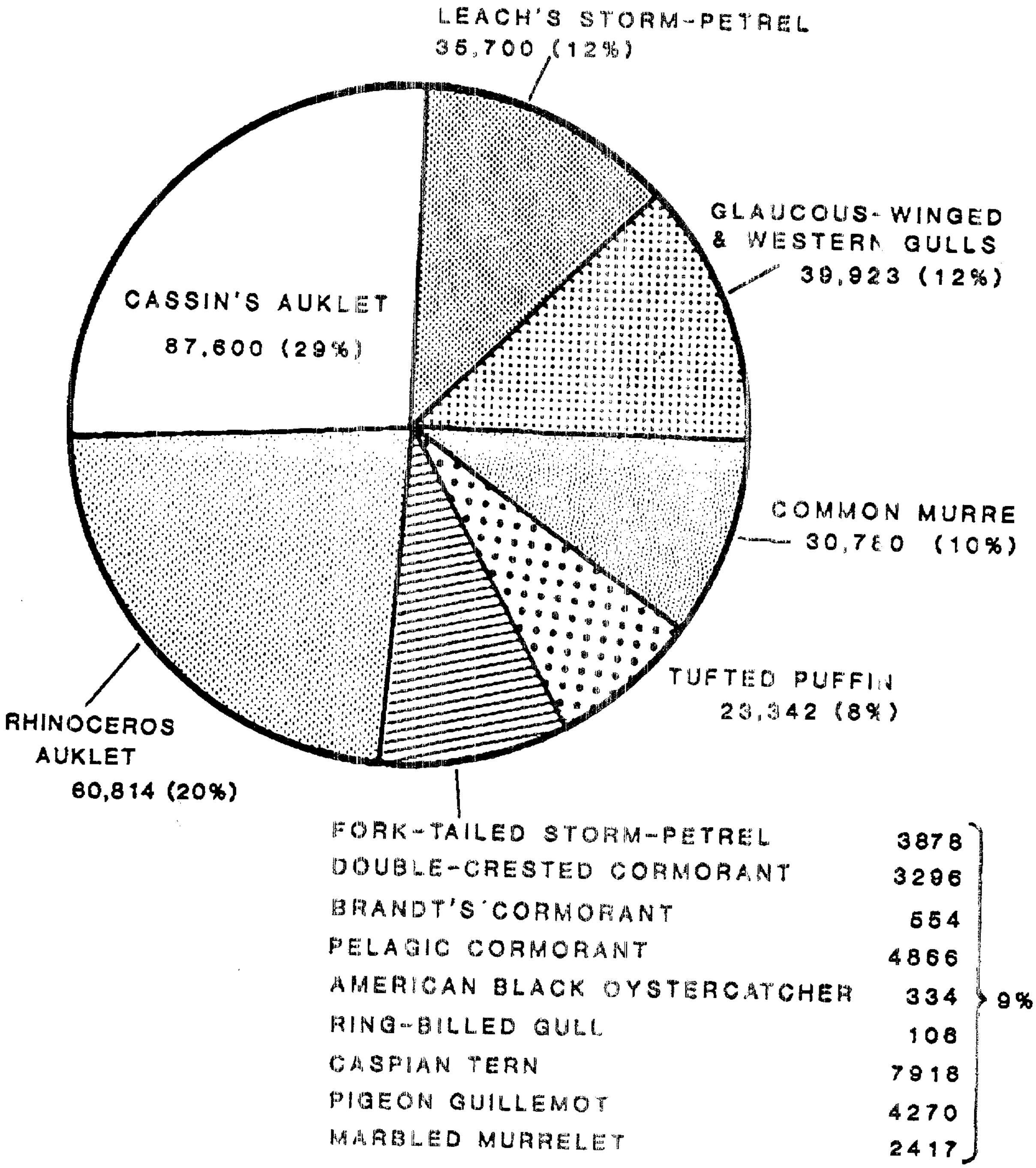


Figure 36. Populations of Breeding Seabirds and Percentages of Total Aggregate Population in Washington (Speich and Wahl, 1989).

-tailed storm petrel, Brandt's cormorant, and caspian tern are all restricted to very few nesting sites (Speich and Wahl, 1989). Other species that breed on these coastal rocks and islands include terns, cormorants, black oystercatchers, ring-billed and western gulls, pigeon guillemots, and ancient marbled murrelets.

Alcids are a distinctive family of seabirds present along the Washington coast that includes the tufted puffin, rhinoceros auklet, cassin's auklet, common murre ancient and marbled murrelets, and pigeon guillemot. They are colonial nesters, live long lives, and reproduce very slowly. Adults do not reach sexual maturity for several years, and then produce only one to two eggs per clutch. Also, breeding birds will not necessarily mate each year. Most alcids are found in shallower nearshore waters, especially in summer when birds are closely tied to nesting sites. Large colonies of tufted puffins, rhinoceros auklets, Cassin's auklets and common murres are present on the nearshore islands of the Olympic coast. Except for Cassin's auklets (nocturnal during breeding), birds are often seen roosting and gathering about the colonies. Foraging areas differ somewhat for each species. Cassin's auklets and tufted puffins are commonly found foraging over the continental slope. Rhinoceros auklets may forage in these areas but also regularly forage in closer nearshore waters, and in Grays Harbor. Common murres, like rhinoceros auklets, fly considerable distances to foraging areas up and down the coast, and are also seen from Grays Harbor south to the Columbia.

The traits and sensitivities of the common murre are in many ways typical of species within the alcid family. Common murres are among the most colonial species of seabirds. They nest on open rock or dirt ledges of coastal islands and narrow ledges of vertical cliffs. A pair of common murres will produce only one egg per year. The oblong egg is layed on bare rock and is held between the legs of the parent. Common murres nest at 18 locations along the Olympic outer coast and sometimes shift colony sites. These birds are strong fliers and are capable of foraging long distances from their colonies. They dive to considerable depths to capture fish, crustaceans, and cephalopods. In late summer and fall, adult females of the Washington coastal population fly into Puget Sound to molt and winter. Meanwhile, adult males accompany their newly fledged chicks to sea, staying with them and feeding them for several weeks. The chicks fledge when small and are unable to fend for themselves. While migrating, the adult murres undergo a complete molt rendering them flightless. The males and their fledgling chicks swim north and enter Puget Sound through the Strait of Juan de Fuca.

Common murres are highly vulnerable to oil contamination, particularly during the migration phase for males and chicks. Since these birds are flightless and completely dependent upon marine prey, they remain in the water where they can become immobilized and encased by oil. Preening can lead to ingestion of oil and toxic effects. Entire colonies could be devastated by a local oil spill occurring at the time the birds are departing nest sites for the water migration to Puget Sound. Nesting murres are particularly sensitive to disturbance by boats, low-flying aircraft, and humans on foot as well. When disturbed, adults flush from the colonies and may inadvertently destroy chicks and eggs held between their legs. The remaining chicks and eggs are subject to increased predation from gulls, ravens and crows. Studies by B. Tschanz in 1959 concluded that murres can lay a second or third egg if previous eggs are destroyed in a given season. However, chicks hatching later in the season are likely to have lower survival rates (Wilson, 1993).

There are many threats to the populations of breeding seabirds in Washington. They include disturbance of nesting areas by recreation, military operations, and domestic animals; loss of habitat and/or decline in the population of prey species; entanglement in fishing nets, particularly gill nets; and oil pollution. A negative impact on seabird populations may not be realized immediately for several reasons. One is that seabirds have long life spans, commonly between 20 and 30 years. Some more longer lived species may even have a breeding life of 50 years. Secondly, recruitment to breeding populations is slow and delayed. Many seabirds spend at least two years, commonly three, and up to 9 years as non-breeders. Thirdly, clutch size is small (1-5), compared to land birds (7-15). Long breeding lives, low recruitment rates, and delayed maturity mask the detection of effects on successive breeding populations for several years. This underscores the need to monitor seabird populations regularly to detect impacts of chronic pollution, habitat loss, oil spills, and other environmental disasters (Wahl, 1984).

The effects of disturbance are often subtle and easily overlooked by the casual observer, yet are often devastating to the birds. Impacts range from slight disruption of courtship behavior, incubation, and feeding of nestlings by adults, to outright mortality of nestlings from exposure to heat or cold, and induced predation by rival adult birds or by other species (Speich & Wahl, 1989). Each seabird species is sensitive to a unique set of factors and the particular timing of any disturbance. Some species have greater tolerance levels than others.

Encroachment on seabird colonies by humans or domestic animals (whether for recreational purposes or otherwise) can cause prolonged disruption of nesting sites, resulting in increased mortality rates. Dogs are particularly disruptive to nesting birds and can be disastrous to a colony. Marine recreational activities can cause repeated disruptions that may eventually lead to abandonment of nests or entire colony sites.

The intense activity (noise, motion, spotlights) surrounding search and rescue operations can frighten adults from colonies for several hours. The sudden loud noise of low-flying jet aircraft panics nesting birds from nest sites and particularly affects cormorants, common murres and tufted puffins.

The above disturbances can also impact birds at favored foraging and roosting sites. Additional activities that may directly or indirectly affect foraging seabirds are physical alterations of the benthos (e.g. dredging, filling, dumping) and fishing practices. Alteration of benthic habitat can reduce the carrying capacity of the area for prey species important to seabirds. Fishing can also deplete prey abundance and directly damage birds that are caught in nets.

Seabirds, especially pelagic, are particularly sensitive to impacts from marine oil spills. Clark (1989) effectively describes the impacts of oil on seabirds:

> Unlike most other organisms in the sea, sea birds are harmed through the physical properties of floating oil, and the toxicity of its constituents is of minor importance. If liquid oil (or any other surface-active substance) contaminates a bird's plumage, its water-repellant properties are lost. If the bird remains on the sea, water penetrates the plumage and displaces the air trapped between the feathers and the skin. This air layer provides buoyancy and thermal insulation. With its loss, the plumage becomes waterlogged and the birds may sink and drown. Even if this does not happen, the loss of thermal insulation results in a rapid exhaustion of food reserves in an attempt to maintain body temperature, followed by hypothermia and, commonly, death. Birds attempt to free their plumage of contaminating oil by preening and they swallow quantities of it. Depending on its toxicity, the oil may then cause intestinal disorders and renal or liver failure. Quite small quantities of oil ingested by birds during the breeding season depress egg-laying, and of the eggs that are laid the proportion that hatch successfully is reduced. If oil is transferred from the plumage of an incubating bird to the eggs, the embryos may be killed.
>
> Indirect effects of oil pollution on reproduction appears to be much less important than the direct mortality of adult birds, and most attention has been directed towards the latter problem. The species most commonly affected are auks: guillemots (murre), razorbills and puffins; and some diving sea-ducks: scoters, velvet scoters, long-tailed ducks (old squaw), and eiders. These birds spend most of their time on the surface of the water and so are particularly likely to encounter floating oil, and because they dive rather than

fly up when disturbed, they are as likely as not to resurface through the oil slick, so becoming completely covered with oil. Furthermore, these ducks are extremely gregarious except when ashore for breeding, and the auks are gregarious at all times of the year. Thus, if there are casualties they are likely to be numerous. Indeed quite small oil slicks drifting through concentrations of birds resting on the sea may inflict heavy casualties quite disproportionate to the quantity of oil. Thus, when 230,000 t of crude oil was lost from the Amaco Cadiz on the Brittany coast, the known sea bird casualties numbered 4572; but the largest known kill of sea birds from oil pollution was in the Skagerrak [an arm of the North Sea between Denmark and Norway] in January 1981 when 30,000 oiled birds appeared on the beaches, and this appears to have been caused by small amounts of oil discharged by two vessels. Indeed, the estimated loss of 12,000 birds on the north-east coast of England in January and February 1970 from oil slicks that were never even identified, equals the estimated loss following the wreck of the Torrey Canyon [the second largest tanker spill to date - 860,000 barrels in 1967].

In total, over 500,000 seabirds (juveniles included) are concentrated within Washington nesting colonies each year. Over 325,000 colonial seabirds are found in subarea 4 and about 45,000 are present in colonies in subarea 7. The remainder are found in inland waters (SAB, 1990). Those species for which the study area is particularly important are the black-legged kittiwake, the rhinoceros auklet, and the tufted puffin. Additionally, nesting colonies along the outer coast of Washington contain more than 50% of contiguous U.S. west coast total populations for the following species: Fork-tailed storm-petrel, Caspian tern, Cassin's auklet, and tufted puffin.

ii. Shorebirds

Shorebirds do not swim, but rather wade or probe at the waters edge, feeding on shallow-water organisms or prey in the intertidal mud or sand. Shorebirds such as western sandpipers, sanderlings, dunlin, and semi-palmated and black-bellied plovers roost and forage along coastal beaches and bays during their annual migrations.

While most shorebirds tend to feed on sandy beaches or mudflats, several species prefer to forage on rock substrate and are consistently found on rocks and islands of the Olympic coastal region. Representatives of this group include ruddy and black turnstones, wandering tattler, surfbird, and rock sandpiper (see Trophic Level (9), Appendix F). They pass through during migrations, but small numbers of three species winter in these rocky surf areas of the coast (Strickland and Chasan, 1989).

Unlike seabirds, most shorebirds are not associated with the marine environment during the breeding season, but nest on coastal and interior wetlands. A few species nest in small numbers in the Grays Harbor/Willapa Bay region. These include the snowy plover, kildeer, semi-palmated plover, and common snipe.

Shorebirds depend upon critical staging sites along the coast during migrations. Coastal bays and estuaries along the Washington outer coast (i.e. Grays Harbor and Willapa Bay) are important feeding and resting areas for large concentrations of birds during migration and the winter season. These areas are the last estuaries at which many birds stop during their migration to Alaska. Over 12 species of shorebirds stage in the spring with numbers greater than 1,000,000 in the Grays Harbor area, and 750,000 in Willapa Bay. Approximately 30,000 shorebirds overwinter in Willapa Bay. These are also important areas for the endangered peregrine falcons, which prey on many of the shorebirds (McMinn, 1993).

iii. Waterfowl

Waterfowl are flat-billed birds that spend the majority of their lifecycle on the water. Like shorebirds, waterfowl typically breed on freshwater habitats, but many species move to shoreline and nearshore habitats when breeding is complete. Many species of waterfowl stage and winter in Washington's protected marine waters. Approximately 10,000 ducks and geese overwinter in Willapa Bay, with numbers swelling during migrations to greater than 100,000. Approximately 20,000 waterfowl migrate through Grays Harbor (Atkinson, 1993). Very small numbers of geese and ducks remain to nest in these two areas during the spring and summer.

Other species, such as scoter, harlequin, bufflehead, merganser, goldeneye, oldsquaw, and scaup, winter in the nearshore waters of the open coast. Scoters are by far the most numerous species of sea ducks in nearshore waters. A small number of sub-adult birds are found in the area during the summer, soon joined by large numbers of adults from northern continental nesting areas. The sub-adult birds pass through a flightless period when they molt their feathers. At this time, flocks numbering tens of thousands are found scattered along the coast. At least 100,000 and possibly up to 300,000 birds molt in the area between Point Grenville and Destruction Island. After molting is completed, many birds may disperse down the Pacific coast, but scoters are found in Washington coastal waters throughout the winter (Strickland and Chasan, 1989).

iv. Birds of Prey

Peregrine falcons and bald eagles nest and feed extensively along Washington's coastal waters. The Washington Department of Wildlife (WDOW) Nongame Program counted 17 pairs of nesting peregrine falcons in the state in 1991. Nine of the 17 pairs nested on the outer coast. Peregrines prefer steep cliffs for nesting. Shorebirds are a favored food source for these birds of prey. Large flocks of migrating shorebirds at Grays Harbor attract peregrines from distant nesting sites along the coast. Peregrine falcons continue a slow, steady recovery in Washington and do not show evidence of serious biochemical contamination as do populations in California and Oregon (WDW, 1991). Their low numbers require that particular attention be given to preserving habitat and minimizing disturbance. The peregrine falcon is listed as an endangered species by Washington State as well as the Federal government.

A continuous band of bald eagle nests have been established along the entire shoreline of the study area, including the shoreline of the Strait of Juan de Fuca. The nesting territories are contiguous to one another, with nests approximately 1 mile apart (Taylor, 1992). The eagles patrol the coastline for fish, waterfowl and prey of opportunity. The bald eagle population in Washington appears to be in good health and is growing annually. The WDOW Nongame Program counted 426 active nests along western Washington waterways in 1991 (WDW, 1991). There are 51 breeding territories along the coastal boundary of the Sanctuary between Copalis Rock and Koitlah Point (WDW, 1993). The bald eagle in Washington State is listed as threatened by both the Federal government and the State of Washington.

A special report by the NOAA SAB (1990) analyzed marine bird populations based on ecological considerations such as breeding sites, staging areas, and foraging areas (Appendix C, Tables 7 and 8). Two observations are noteworthy. First, subareas 4 and 7 are most significant to the overall distribution of marine birds. This reflects the importance of colony sites along the rocky headlands in subarea 4, and the staging areas that serve as the last major stop-over on the Pacific flyway before the seabirds fly to Alaska.

(f) Marine Mammals

A total of 30 species of marine mammals are reported to occur in the coastal waters of Washington (Table 3). The distribution of a selected species of marine mammals in the seven subareas is shown in Appendix D, Table 9. Of these, seven are considered common: California sea lions, northern sea lions (although their numbers have decreased and they have become listed as threatened species), harbor seals, harbor porpoises, gray whales, Risso's dolphin, and Pacific white-sided dolphin. The river otter, usually associated with freshwater rivers and lakes, has adapted to the local marine environment. Species which are known to breed in the sanctuary study area include the

Table 3. Marine Mammal Species Reported From The Coastal Waters of Washington (Source: Speich et. al., 1987; Strickland and Chasan, 1989; and Schmitten, 1993).

Order	Species	Occurrence	Legal Status
Carnivora	Sea otter, *Enhydra lutris*	R	WAC, MMPA, ESA, WSE
Pinnipedia	Ca. sea lion, *Zalophus californianus*	C	WAC, MMPA
	N. sea lion, *Eumetopias jubatus*	C	WAC MMPA
	N. fur seal, *Callorhinus ursinus*	R	WAC, MMPA
	Pacific harbor seal, *Phoca vitulina*	C	WAC, MMPA
	N. elephant seal, *Mirounga angustirostris*	R	WAC, MMPA
Cetacea	Ca. gray whale, *Eschrichtius robustus*	C	WAC, MMPA, ESA
	Right whale, *Eubalaena glacialis*	A	WAC, MMPA, ESA
	Minke whale, *Balaenoptera acutorostrata*	R	WAC, MMPA
	Fin whale, *Balaenoptera physalus*	A	WAC, MMPA, ESA
	Sei whale, *Balaenoptera borealis*	A	WAC, MMPA, ESA
	Blue whale, *Balaenoptera musculus*	A	WAC, MMPA, ESA
	Humpback whale, *Megaptera novaeangliae*	R	WAC, MMPA, ESA
	Sperm whale, *Physeter macrocephalus*	R	WAC, MMPA, ESA
	Pygmy sperm whale, *Kogia breviceps*	A	WAC, MMPA
	N. Pacific beaked whale, *Mesoplodon stejnegeri*	A	WAC, MMPA
	Hubb's beaked whale, *Mesoplodon carlhubbsi*	A	WAC, MMPA
	Cuvier's beaked whale, *Ziphius cavirostris*	A	WAC, MMPA
	Baird's beaked whale, *Berardius bairdii*	A	WAC, MMPA
	Pilot whale, *Globicephala macrorhynchus*	A	WAC, MMPA
	Risso's dolphin, *Grampus griseus*	A	WAC, MMPA
	Killer whale, *Orcinus orca*	R	WAC, MMPA
	False killer whale, *Pseudorca crassidens*	A	WAC, MMPA
	Common dolphin, *Delphinus delphis*	A	WAC, MMPA
	N. right whale dolphin, *Lissodelphis borealis*	A	WAC, MMPA
	Striped dolphin, *Stenella coeruleoalba*	A	WAC, MMPA
	Pacific white-sided dolphin, *Lagenorhyncus obliquidens*	A	WAC, MMPA
	Dall's porpoise, *Phocoenoides dalli*	R	WAC, MMPA
	Harbor porpoise, *Phocoena phocoena*	C	WAC, MMPA, WST

C = Common R = Rare A = Accidental

WAC – Washington Administrative Codes
MMPA – U.S. Marine Mammal Protection Act
ESA – U.S. Endangered Species Act
WSE – Washington State Endangered Species
WST – Washington State Threatened Species

sea otter, harbor seal, and harbor porpoise. Four species, the northern sea lion, California sea lion, northern fur seal, and gray whale are regular seasonal migrants along the coast.

Marine mammals listed on the Federal threatened and endangered species list include gray, right, fin, sei, blue, humpback, and sperm whales, and the northern (Steller) sea lion (listed as a threatened species under the ESA by final rule on November 26, 1990). The sea otter is listed as a Washington State endangered species; the harbor porpoise is listed as a Washington State threatened species.

Some species of cetaceans (whales and porpoises) are found along the Washington coast during the entire year. The most frequently observed are the harbor porpoise, Pacific white-sided dolphin, Risso's dolphin and California gray whale. The harbor porpoise is a year-round resident that often inhabits bays and inshore waters, however its shyness makes it difficult to acquire accurate population data. Aerial and ship surveys conducted between 1984 and 1986 estimated a population of about 45,000 animals along the coasts of California, Oregon, and Washington (Osmek, 1993).

The gray whale is primarily a coastal, nearshore species usually found in water depths of less than 50 meters. Its range extends from breeding grounds off Baja California to major feeding areas in the Bering and Chuckchi Seas. They are most abundant along the Washington outer coast during northward migration from February through April, and southward migration from October through December. The population of Eastern North Pacific gray whale is estimated to be about 21,000 animals (Jones et al., 1984; Reilly et al., 1983). Annually, ten to fifteen individuals remain as summer residents near Kalaloch, Cape Alava, and Cape Flattery.

Other cetaceans regularly observed in coastal or offshore waters include killer whales, Dall's porpoise and Minke whales. Humpback, blue, and sperm whales are seen offshore during the summer months, but these sightings are rare. The right whale is an extremely endangered species with an estimated population of only 200 in the entire North Pacific Ocean.

Pinnipeds (seals and sea lions) found along the outer coast include the California sea lion, northern sea lion, northern fur sea, Pacific harbor seal, and the northern elephant seal. The distribution of pinniped haulout sites is shown in Figure 37. Harbor seals are the most abundant pinniped in coastal Washington. They are year-round residents of both offshore and inshore waters and the only pinnipeds that breed in Washington.

Harbor seals use nearshore rocks, reefs, and sand bars for rookery and haulout sites. They frequent logs and floating

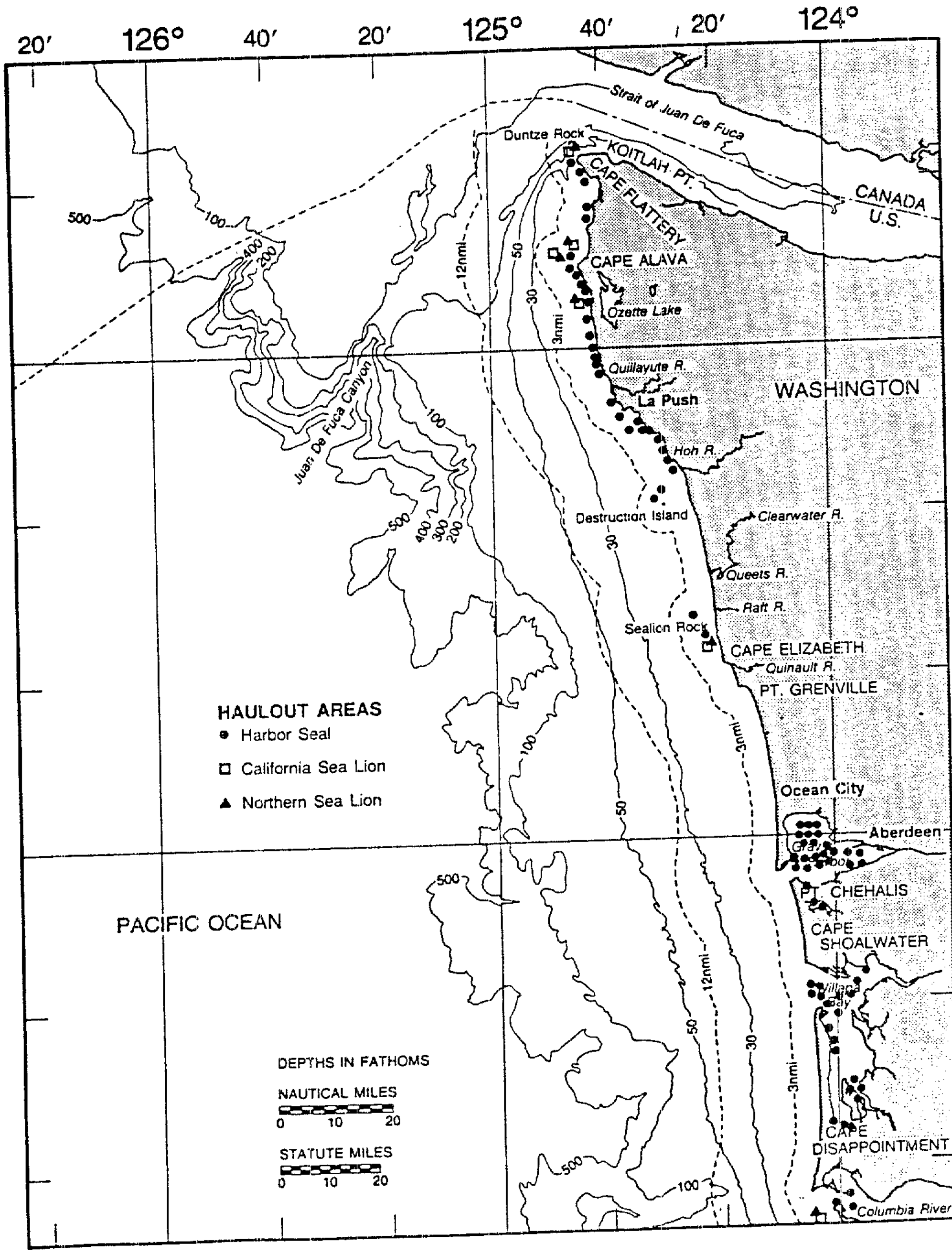


Figure 37. Distribution of Harbor Seal and Sealion Haulout Sites Along the Washington Coast (S. Jeffries, WDW in Strickland and Chasan, 1989).

structures, shallow bays, and tidal flats near abundant food sources. The current harbor seal population in Washington is estimated to be approximately 32,688 animals (Huber et al, 1993), with approximately 2,200 seals occurring from Point Grenville to Cape Flattery (Speich and Whal, 1989).

Both California sea lions and northern sea lions are present on the Washington outer coast. Sea lions use open water for feeding, and nearshore islands, reefs, and rocks for hauling out. California sea lions breed on islands off the coast of California and Mexico. After breeding, many adult and sub-adult males migrate northward into British Columbia. They are found in Washington waters from August through May. As many as 4,000-5,000 individuals have been estimated to migrate through the vicinity of Sealion Rock (Bigg, 1985 in Speich et al., 1987). California sea lions prefer isolated rocky areas of coarse sand beaches free from human interference as haulout sites.

Northern (Stellar) sea lion population declines have been documented in the core of their range in Alaska resulting in the species being listed as threatened under the Endangered Species Act. However, numbers of Stellar sea lions have remained stable in British Columbia, Washington and Oregon. The range of the northern sea lion extends around the Pacific rim from Hokkaido, Japan, to the Channel Islands off the coast of southern California. The centers of abundance and distribution are the Gulf of Alaska and Aleutian Islands, respectively (Loughlin et al., 1987). Loughlin, Perlov, and Vladimirov (1992) estimated the current Stellar sea lion population range-wide at 39-48 percent of the population estimated by Kenyon and Rice in 1961. The NMFS has placed the northern sea lion on the Federal list of threatened species due to massive population declines (63% loss between 1985-1989) in areas where they are most abundant such as the Aleutian Islands and the Gulf of Alaska (NMFS, 1992).

While there are no known breeding areas in Washington, northern sea lions are found along the coast throughout the year. Primary haulout sites are located along the northern coast, especially near Flattery Rocks, Cape Alava, and Split Rock. Northern sea lion populations in Washington were estimated during the 1970's to be about 450 in winter and 600 in summer (Strickland and Chasan, 1989).

Northern fur seals breed primarily on the Pribilof Islands in the Bering Sea. They migrate southward into the eastern North Pacific Ocean during the late fall and early winter, reaching peak numbers of 86,000 off Washington in April (Antonelis and Perez, 1984). Northward migration begins by early spring with the fur seals mostly absent from the area from July through December. Northern fur seals prefer the open waters of the continental shelf and rarely come within 8 km of land.

The northern elephant seal is the largest of the pinnipeds in the North Pacific. They breed between January and March on island from central California south to Baja California. After the breeding season, they move into coastal and offshore waters with males traveling as far north as southeast Alaska. Elephant seals can be seen year-round off Washington though sightings are most common in the spring. They usually prefer waters well offshore but have been sighted on Tatoosh Island (Calambokidis et al., 1987) and are reported to occur in inland waters of Washington (Everitt et al., 1979, 1980).

Sea otters along the Washington coast once ranged from the mouth of the Columbia River to Point Grenville, with fewer numbers found north to Cape Flattery, Neah Bay, and east into the Strait of Juan De Fuca. Commercial hunting for its valuable pelt had eliminated the species from Washington by the early 1900's. The last known "resident" sea otters in Washington were taken in Willapa Bay in 1910 (Scheffer, 1940). A total of 59 otters transplanted from Alaska were released at Point Grenville and La Push in 1969 and 1970, forming the basis for the present population estimated to be 300 individuals in 1992 (Bowlby, 1992). Sea otters currently range along 70 km of the coast from Destruction Island north to Point of the Arches (Figure 38). They prefer rocky habitats with extensive kelp beds common to the northern portion of the sanctuary study area, and usually feed within one mile of shore in waters less than 20m deep. The population undergoes seasonal shifts in location. The Cape Alava area is used all year with higher numbers there in winter and early spring. By summer some of the population has shifted south to the area of Cape Johnson (just north of La Push). These otters eventually return north, and by September the main population is back at Cape Alava. This area is probably preferred for winter habitat because of the extensive *Macrocystis* kelp beds, and the protection offered by Ozette and Bodelteh Islands. The sea otter is on the Washington State endangered species list.

River otters are land mammals usually associated with freshwater rivers and lakes, but have adapted to the marine environment. They are often mistaken for sea otters and are found in marine/estuarine areas along the outer coast, especially in the vicinity of Cape Alava. Their diet includes marine prey such as fishes, crabs, mussels, oysters, barnacles, and sea stars. Other land mammals such as black bear, deer, and raccoons prowl the intertidal area for food.

An analysis of the distribution of marine mammals among the seven subareas indicates that areas 1, 2 and 5 stand out as most significant to the overall assemblage of marine mammals. These are the areas that are furthest offshore. Also, the sanctuary study area provides particularly significant habitat for seven marine mammals: the harbor seal, harbor porpoise, killer whale,

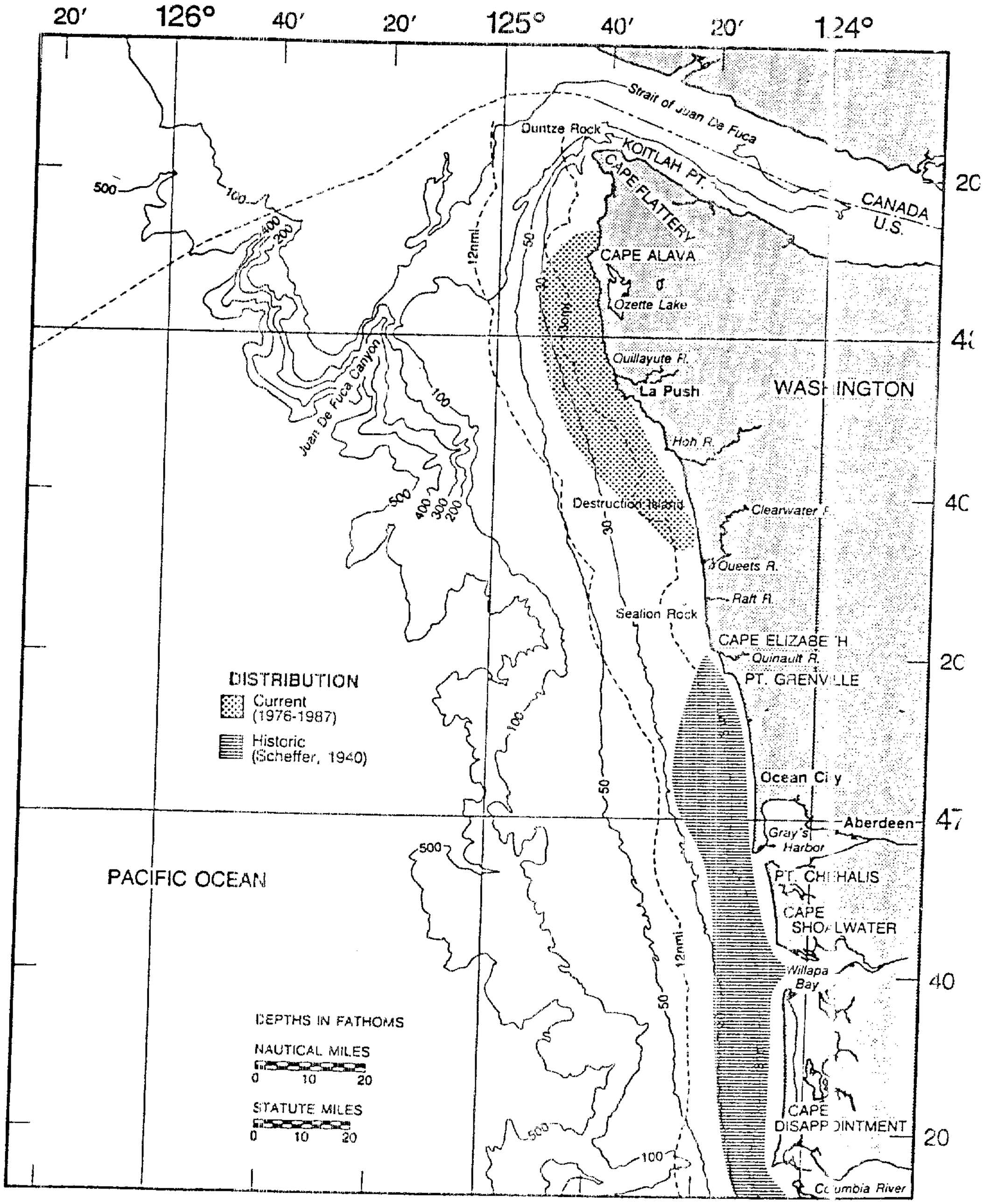


Figure 38. Historic and Current Distribution of Sea Otters in Washington State (Strickland and Chasan, 1989).

Pacific white-side dolphin, gray whale, fin whale, and Risso's dolphin. For these seven mammal species, the areas nearest to the coast are significant to the harbor seal, harbor porpoise, killer whale, and gray whale, while the other three species depend on the outer shelf areas. Most of the region under consideration for sanctuary status occurs within migration pathways for several species. It is noteworthy that a major adult summer area for the endangered fin whale occurs along the continental slope seaward of the study area (SAB, 1988).

G. Sea Turtles

Studies of sea turtle distribution and abundance in the North Pacific Ocean are progressing, but there are many gaps in the knowledge base. Pacific sea turtles nest on beaches in the tropics and subtropics but have been sighted in the eastern North Pacific as far north as the Gulf of Alaska. Many species are highly mobile and may migrate thousands of miles. Most sea turtle information to-date has been collected at nesting sites. Observation and study becomes much more difficult once the turtles leave the shore. Subsequently, very little is known about the life stages between hatchling and adult. Some evidence suggests that post-hatchling and juvenile life stages occupy a poorly known pelagic habitat (Eckert, 1991).

Sea turtles live very long lives. It is believed that some species (e.g. loggerhead and hawksbill) require as many as 30 years or more to reach sexual maturity. Each individual female will typically return to the same beach for each nesting cycle. In addition, nesting usually occurs at multiple-year intervals (often 2-4 years). Turtles are most vulnerable to predators (e.g. humans, birds, crabs, mammals, fish, sharks, and reptiles) while in the egg and hatchling stages. Adult leatherbacks are preyed upon by killer whales in Mexican waters and presumably larger sharks. Hard shell sea turtles are believed to have decreasing mortality rates as they mature to adulthood due to size and armoring. (Eckert, 1991)

Sea turtles frequent the Washington coast but have never been found in the inland waters of the state. However, there was an unconfirmed reported sighting of a live sea turtle from Skagit Bay in August, 1992. The following description of sea turtle status in Washington waters is the best and most concise summary found among the available scientific literature:

> Three state and federally listed species of sea turtles - loggerhead, leatherback and green - visit Washington waters, but rarely come ashore unless sick or injured. The leatherback is classified as an endangered species [Federal and state lists] and the loggerhead and green sea turtles are threatened species [Federal and state lists].

The most common sea turtle off Washington's coast is the leatherback, a black flexible-shelled turtle that can be six feet in shell length. Their primary food is jellyfish. They are the most wide-ranging of all living reptiles and are more tolerant of cold waters than hard-shelled sea turtles. Leatherbacks nest on beaches in southern latitudes. The largest known nesting area is on the Pacific coast of Mexico. Collection of its eggs for food, primarily in the western Pacific ocean, is a major threat to this species.

The green sea turtle is the most common hard shell sea turtle found off Washington's coast. Like many other tropical species, unusual warm ocean currents off our coast [particularly El Nino events] can bring the green sea turtle to our shores. Two live green sea turtles [were] found beached on the Washington coast during winter 1989-90... [Green sea turtles have been sighted as far north as Admiralty Island, Alaska.] This species nests on many islands in the tropical Pacific Ocean, including the Hawaiian and Marshall Islands, and the Phillipines. While their eggs have long provided for subsistence harvest, recently developed markets for skin and other products from the turtles has led to near collapse of some populations.

The loggerhead sea turtle is rare in temperate waters. Washington is as far north as this species has ever been found. A juvenile loggerhead was found on the beach at Ocean Shores in December 1990... Adults grow to four feet in length. They feed on marine animals such as crabs, snails, clams, and shrimp. The loggerhead nests on beaches in the Pacific Ocean around Australia, China, and Japan. Recently, thousands [>100,000] of juveniles were discovered feeding on red crabs off Baja Mexico. The causes of recently observed declines at Pacific Ocean nesting beaches are not known.

The first Olive Ridley sea turtle ever found in Washington washed ashore near Copalis in November 1989. This carnivorous, hard-shelled sea turtle is abundant in the tropical Pacific Ocean and nests in Mexico, Costa Rica, Malaysia, and Thailand. Synchronized nesting may occur and can involve as many as 150,000 females. Some populations are on the verge of collapse, however, because of massive egg collecting (WDW, 1991b).

Aerial surveys of California, Oregon, and Washington waters have shown that most leatherbacks occur in slope waters, while fewer occur over the continental shelf. Adult green turtles are benthic herbivores, subsisting mainly on algae and sea grasses. Their diet would seem to restrict them to the photic zones surrounding islands and continents. Loggerheads inhabit continental shelves, bays, estuaries and lagoons. They are generally found feeding on benthic invertebrates in hard bottom habitats. Olive Ridleys are widely distributed in the Pacific and appear in both coastal and pelagic habitats. Foraging appears confined mainly to tropical neritic waters, where individuals may dive as deep as 300 meters to feed on benthic crustaceans. (Eckert, 1991).

Duxbury (1992) asserts that humans pose the greatest threat to the survival of all sea turtles. Turtle eggs, meat, skins, and shells are prized throughout the Pacific, and exploitation has been severe in some areas. Habitat loss at nesting areas has also contributed to the decline of some sea turtle populations. However, turtles have never been an important component of local economies or cultures on the western seaboard of the United States (Eckert, 1991).

Human activities that could possibly impact sea turtles in Washington waters are fishing operations and oil spills. Since sea turtles frequent the Washington coast in dispersed, low numbers, incidental catch by coastal fisheries poses a negligible threat to Pacific species. A report by the NMFS (1990) states that, "The incidental involvement of sea turtles with commercial fisheries on the west coast is rare... No turtles have been reported taken in groundfish fisheries [of Washington, Oregon, and California]" (NMFS Section 7 Biological Opinion, 1990). Leatherback turtles have been taken in salmon seines in Alaska and experimental shark drift gillnets (1986-88) off California, Oregon and Washington; however, federal permits for the shark drift gillnet operations were not renewed after 1988. Sea turtles have been a frequent bycatch in high-seas driftnets, but United Nations action ended this fishery on January 1, 1993.

The effects of oil spills on sea turtles is unclear due to lack of research. Because the migration range of adult turtles is wide, it is unusual to have large numbers of turtles directly impacted by an oil spill. Spill related turtle impacts are mostly anecdotal and poorly documented as to cause of death. Laboratory studies, however, have indicated that oil contamination of eggs, hatchlings and juveniles may cause morphological, physiological and behavioral alterations or death in young sea turtles. Pelagic tar also seems to be harmful to sea turtles, since it can seal the mouths and nostrils of the animals. A review of world-wide sea turtle decline by the National Research Council (1990) presents no conclusive data regarding oil effects on sea turtles. The report states that additional information is needed on the reaction of sea turtles to petroleum ingestion, fouling, and toxicity (NRC, 1990; (NMFS, 1991).

3. Cultural and Historical Resources

The earliest record of human life on the coast of Washington is that of the coastal Indians (WDOE, 1986). Five native American cultures occupied the coastal areas within the proposed sanctuary: the Makah, Quileute, Hoh, Queets, and Quinault (Figure 39). An archaeological survey conducted by the University of Washington in 1955 found a total of 19 sites in the coastal area of Olympic National Park (National Park Service, 1976). A recent inventory re-located 10 shell midden sites and 2 rock art sites (Wessen, 1989). The most important site is the Ozette Archaeological Site located on Cape Alava (listed in the National Register of Historic Places). Here, the Ozette Indian Nation occupied the Ozette village into the early 1900's. Shell midden deposits have yielded bones and artifacts as old as 2,000 years along with protohistoric houses that were buried and preserved by a mudslide (Huelsbeck, 1983). Other primary sites include the Kahii Village Site at Toleak Point south of La Push, White Rock Village located about two miles south of Cape Alava, and the Sand Point site about three miles south of Cape Alava. There may be more undiscovered archaeological and traditional cultural properties in the area. Petroglyphs of unknown age are found at Wedding Rock, about 1.3 miles south of Cape Alava (listed in National Register of Historic Places).

There are two small memorials to the crews and passengers that perished in shipwrecks along the coast. The Norwegian Memorial, found 8 miles south of Sand Point, commemorates the 18 people that died in the wreck of the Prince Arthur in 1903. The Chilean Memorial, 4 miles to the south, commemorates the 20 people lost in the wreck of the P.J. Pirrie in 1920. Both memorials are in the form of small stones with the names of the victims, and are located just back from the beach in dense brush. Other recorded shipwrecks include 9 ships wrecked between Quillayute Rocks and Cape Alava, 5 at Destruction Island, and 4 in the vicinity of Hoh Head (Malin, 1984).

C. Human Activities

1. Commercial Fishing and Aquaculture

Washington's local water fleet is typified by small-scale operations with relatively small earnings per vessel. In 1987, ex-vessel revenues per boat averaged between $54,000 and $69,000. Total employment by this fleet is estimated to be approximately 7,000 with an additional 500-700 fishermen associated with other fleet components and tribal fisheries. The number of vessels in the local water fisheries has been declining. Since 1975, troll permits issued in the salmon fishery have declined by over 2,000 (NRC, 1988). These permits cannot be reinstated under the limited entry system established in the 1970's. In 1987, there were 3,525 boats participating in Washington's local fishery (NRC, 1988). Over 350 boats have withdrawn from the fishery between 1985-1987 due to the withdrawal of approximately 372 salmon troll permits.

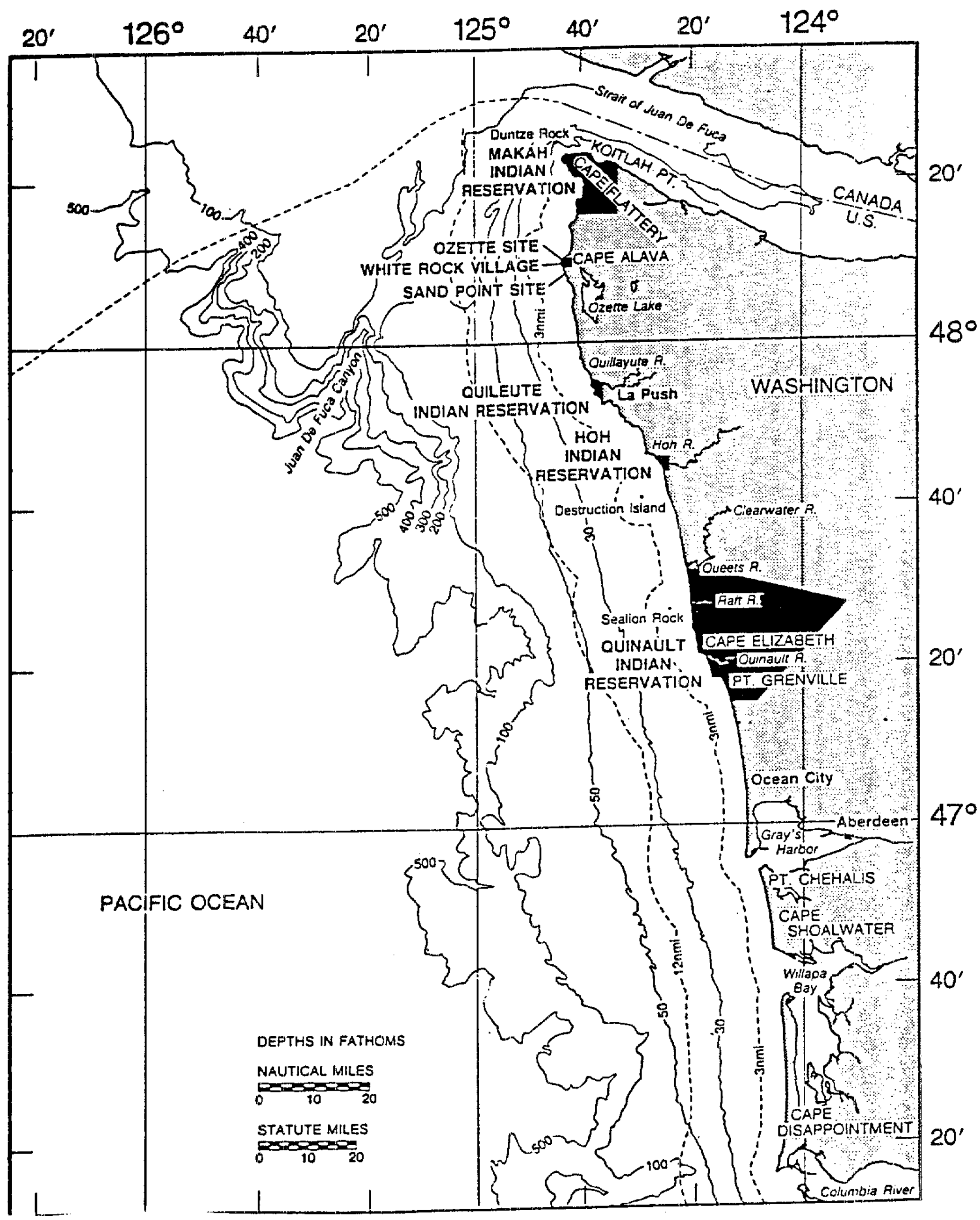


Figure 39. Indian Reservations and Associated Archeological sites along the Olympic coast (Illustrations, Unlimited, 1991).

The fishery resources harvested by Washington's local water fleet include five species of salmon (chinook, coho, sockeye, chum, pink), bottomfish (including halibut, rockfish, cod, flatfish, sablefish, hake, green and white sturgeon), and shellfish (Dungeness crab, pink shrimp, clams and oysters). Aquaculture and mariculture operations, conducted primarily in Puget Sound and in estuarine areas off the coast contribute significantly to the local waters harvest (NRC, 1988).

Fisheries for salmon which contribute the bulk of revenues for the local fleet, are influenced by the cyclical abundance of approximately 60 distinct stocks. Many specific salmon fisheries are controlled on the basis of "weak stock management" in which harvest limits are set to safeguard against over-harvest of the least viable individual stocks. In the ocean troll fishery for coho and chinook salmon, occurring in the oceanic waters of the study area, this management regime has put severe constraints on harvest levels. Washington's gillnet and seine salmon fisheries, which occur in the Strait of Juan de Fuca and in the river mouths entering the study area, are still highly dependent on sockeye salmon from Canada's Fraser River. These Fraser River sockeye runs are based on a four-year cycle (NRC, 1988).

Groundfish include bottomfish which are caught mainly on or near the seafloor, and other marine species that are caught at mid-water. The harvest of groundfish species is comprised of over 35 varieties of rockfish, flatfish and roundfish. The primary species caught include many species of rockfish (Pacific ocean perch, widow rockfish, yellowtail rockfish, black rockfish), flatfish (English sole, Dover sole, arrowtooth flounder, Pacific halibut), and roundfish (Pacific cod, Pacific hake, lingcod, and sablefish). The commercial coastal catch of groundfish has risen from approximately 18 million pounds in 1970 to 42.1 million pounds in 1991 (PacFIN, 1992). Groundfish are caught by bottom (otter) trawling, midwater trawling, longlining or setlining, bottom trolling, fixed pots, and hand-line jigging. Fishing may take place in depths ranging from 10 fathoms out to the canyons at the edge of the continental shelf, and beyond. Roundfish dominate the landed catch in this fishery. In recent decline are the abundance and mean size of sablefish (black cod) (Parks and Shaw, 1987). The most important commercial rockfish in the eastern Pacific is the Pacific ocean perch. Because stocks of this species have become severely depleted, the PFMC has adopted a management strategy to rebuild them to previous levels (Ito <u>et al</u>., 1987). Commercial interest has recently been shown in the thresher shark which migrates into Washington coastal waters in the spring. Both domestic and joint-venture catches of Pacific hake (marketed as whiting) have increased since the early 1980's and its stocks are currently fully utilized (Hollowed <u>et al</u>., 1988; June, 1993). Surf smelt are recreationally dipped as far north as the mouth of the Quillayute River.

Dungeness crab and pink shrimp stocks have historically been quite cyclical in nature. Razor clam stocks have declined dramatically in recent years due to the outbreak of the NIX virus, gill parasites and overharvesting. Only a small Indian fishery and recreational fishery exist for razor clams.

The amount and value of the local catch is of great importance to the state's economy. In 1992, the ex-vessel value of the commercial landings approximated $152 million, up from the 1981-1985 average of $92.8 million (Table 4) (NRC, 1986; NMFS, 1992a). The salmon fishery was once the largest and most valuable fishery in the coastal waters. The salmon catch is now exceeded in tonnage by the groundfish catch; however, the yearly harvest of salmon is nearly three times more valuable at the fisherman level than the groundfish or shellfish catch (Natural Resources Consultants, 1986; June, 1993). The values and volumes for commercial harvests of selected species in Washington State, and in the sanctuary study area are shown in Appendix C (Tables 1 and 2).

The salmon and groundfish species in the study area are managed under Federal Fishery Management Plans (FMP's) drafted by the PFMC. In the FMP's, the PFMC establishes catch limits for groundfish and specifies the duration of the fishing season and catch and size limits for salmon. Commercial and recreational fishing gear restrictions are specified for both the groundfish and salmon fisheries. The Magnuson Fishery Conservation and Management Act (MFCMA) provides for enforcement of FMP's prepared by the PFMC and approved by the Secretary of Commerce after review by the NMFS.

Fisheries for Pacific halibut are regulated by the NMFS under a treaty with Canada. The Dungeness crab and pink shrimp fisheries are managed by the Washington Department of Fisheries. The Pacific States Marine Fisheries Commission is currently developing interstate (Washington, Oregon, and California) plans for the crab and shrimp fisheries under the Inter-jurisdictional Fisheries Act (IJFA). NMFS is funding portions of the state monitoring and management of these fisheries.

The tribes are co-managers of the fisheries resources and are involved in plan development, monitoring, licensing and enforcement. The tribes are guaranteed a portion of the salmon and steelhead catch pursuant to the Boldt Decision of 1974 which allocates a portion of the anadromous fish among tribal and non-tribal fishers by region of origin. For the purposes of fish stock allocation and record keeping, local or coastal commercial fisheries are classified as the non-treaty commercial fishery and the treaty fishery.

Table 4. Volume and Value of Washington State's Local Water Catch by Fishery Type (1981-1985 average; 1990)

FISHERY	POUNDS (Millions of lbs)		VALUE (Millions of $)	
	1981-85 (avg)	1992	1981-85 (avg)	1992
Groundfish	78.2	33.6	13.9	10.8
Salmon	40.6	45.1	40.0	39.8
Shellfish	16.6	45.5	10.6	57.7

Source: Data supplied by Washington Department of Fisheries, 1993 and PacFin, 1992, Report #002.

(a) Commercial Non-Treaty Fishery

Salmon, bottomfish, crab, shrimp, oyster, and clams form the basis of the coastal non-treaty commercial fishery (Figure 40). Salmon caught off the Washington outer coast must be caught by the trolling method. Other methods, such as purse seines, drift nets, or drift gillnets, are prohibited in ocean waters. Commercial trollers mainly catch coho, pink and chinook salmon. Since 1976, coastal trollers' salmon catch has fallen. For example, average landings of chinook salmon declined from 262,000 fish in 1971-1975 to 183,000 fish in 1976-1980; only 54,600 were caught in 1987 (PFMC, 1988). Most of the trolling for chinook and coho salmon is centered around the Grays Harbor area. Pink salmon, which are harvested only in odd-numbered years, are taken primarily off the north coast from Cape Flattery to Quillayute.

The major commercially harvested shellfish in the sanctuary study area and adjacent estuaries include Dungeness crabs, pink shrimp, Pacific oysters, and several species of clams. Although their abundance varies over and 8 to 10 year period, Dungeness crabs are the most important commercial shellfish. Pink shrimp are also subject to large variations in abundance. Production areas for shrimp harvesting are found from Cape Elizabeth north to Cape Flattery. The razor clam population, depleted in recent years by the NIX virus, gill parasites, and perhaps over harvesting, only supports a small restaurant trade and recreational fishery. The most recent commercial harvest occurred at offshore spits in Willapa Bay and the Quinault Indian Reservation (Strickland and Chasan, 1989). There is also a coastal commercial sea urchin harvest.

(b) Treaty Fisheries

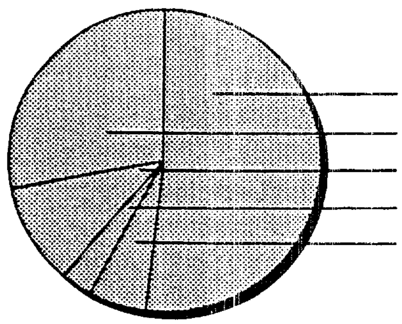
The entire study area north of Willapa Bay can be considered a usual and accustomed fishing area for treaty tribes. Salmon and steelhead trout are the most important fishery resources available to the coastal tribes. Salmon and steelhead trout are harvested by either gillnets or troll gear. The treaty ocean troll fishery operates throughout the summer. The fishing activity is centered around the areas of Grays Harbor, Quillayute and Cape Flattery. Coho, chinook, and pink salmon are the main species taken by this fishery. The Makah Tribe conducts a marine gillnet fishery along the shore near Cape Flattery and in the Strait of Juan de Fuca for chinook and sockeye salmon. In-river treaty gillnet fisheries harvest coho and chinook salmon in the Queets, Hoh, and Quillayute Rivers; and chum, coho, sockeye, and chinook salmon in the Quinault and Ozette Rivers. In addition, treaty fisheries take steelhead trout in all the major rivers of the Olympic Peninsula.

The coastal tribes, Makah, Quileute, Hoh, and Quinault, participate in a variety of groundfish fisheries. Rockfish,

The Harvest

Volume of Washington's Local Water Catch by Fishery Type

(1981-1985 Annual Average)

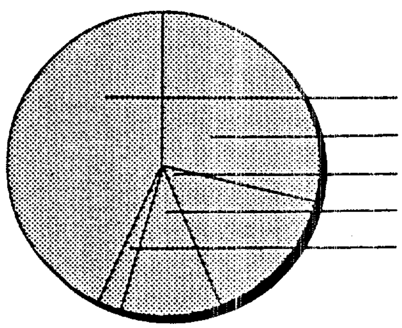


SPECIES	LANDINGS (MILLIONS OF LBS.)
GROUNDFISH	78.2
SALMON	40.6
SHELLFISH	16.6
AQUACULTURE	10.6
OTHER	4.7
TOTAL	150.7

Value to Harvesters

Ex-Vessel Value of Washington's Local Water Catch by Fishery Type

(1981-1985 Annual Average)

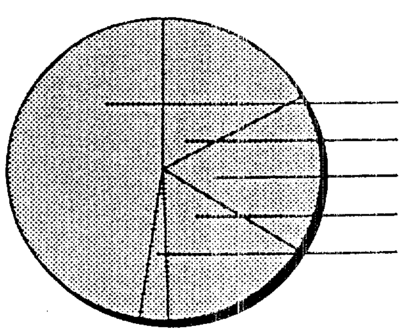


SPECIES	VALUE OF LANDINGS (MILLIONS OF $'s)
SALMON	40.0
AQUACULTURE	26.7
GROUNDFISH	13.9
SHELLFISH	10.6
OTHER	1.6
TOTAL	$92.8

Value of Products

Wholesale Value of Products Processed from Washington's Local Water Catch by Fishery Type

(1981-1985 Annual Average)



SPECIES	VALUE OF PRODUCTS (MILLIONS OF $'s)
SALMON	80.0
SHELLFISH	29.4
GROUNDFISH	27.9
AQUACULTURE	26.7
OTHER	4.0
TOTAL	$168.0

Figure 40. Commercial and Recreational Fishing Areas (Strickland and Chasan, 1989; WDF, 1992).

sablefish and Pacific halibut are the targeted species and are taken by longline and handline gear. These fisheries generally occur in the fall and spring and are centered off the north coast of the Olympic Peninsula. The coastal tribes have recognized treaty rights for halibut, and since 1986 the tribes have received a direct halibut allocation from the International Pacific Halibut Commission. In addition, the Makah and Quileute tribes receive a set aside of sablefish from the PFMC.

The coastal tribes conduct a variety of fisheries in the nearshore area. Sea urchin, mussels, ocean clams, gooseneck barnacles, Dungeness crab, salmon, steelhead, rockfishes, cod, and smelt are harvested for subsistence and ceremonial purposes by the various tribes. The Quinault Tribe harvests razor clam for commercial purposes from beaches within their reservation. The Quileute Tribe conducts a small commercial fishery for smelt harvested from within the estuary reaches of the Quillayute River.

(c) <u>Aquaculture and Coastal Hatcheries</u>

Aquaculture and hatchery operations in areas adjacent to the sanctuary study area produce salmon, oysters, mussels, and clams for commercial purposes or for augmenting natural stocks. The importance of fish and shellfish farming to Washington's seafood industry is shown by the fact that fewer than 200 oyster, salmon, and clam farms produce 16 percent of the wholesale value of the state's local seafood harvest (Natural Resources Consultants, 1986). Most of the aquaculture operations are in Puget Sound or Grays Harbor and Willapa Harbor. Coastal hatchery facilities closest to the sanctuary study area include four tribal salmon hatcheries located on the Makah, Quileute, Hoh, and Quinault Reservations. These hatcheries released approximately 8.5 million fish in 1986, including 2 million steelhead trout (Butts, 1988). The WDF operates the Soleduck, Bear Springs, Kalawa River Ponds, and Snyder Creek (in cooperation with a steelhead guide operation) hatcheries in the Quillayute drainage system. WDF also operates the Canyon Springs acclimation pond on the Hoh River in cooperation with the Hoh Tribe, and the Shale Creek hatchery on the Queets River. A proposed WDF facility on the Mathaney River is expected to be competed within a year. The USFWS and Quinault Tribe operate a facility on Cook Creek.

2. Oil and Gas Activities

The State of Washington and the Federal government have both conducted oil and gas lease sales in Washington's offshore waters. The state conducted a series of lease sales in the 1960's in state waters in the vicinity of Grays Harbor. Union Oil Company drilled three exploratory wells several miles west of Ocean Shores. Only one well was successfully drilled, but no commercial quantities of oil or gas were found. The Federal government conducted a lease sale in 1964 (Lease Sale P-2) off Washington and Oregon. Forty seven of the 196 tracts offered for lease were located off Washington. Only 27 of these tracts were actually leased. The highest bid off Washington was $1,785,888 ($310.05/acre) for a tract in the Copalis Beach area between Gray's Harbor and Willapa Bay. Four wells (three original and one redrill) were drilled off the Washington coast from 1966 to 1967: 1) nine miles west of Destruction Island; 2) nine miles west of Westport; and, 3) nine miles west of the northern entrance to Willapa Bay. While oil and gas were found in two of the wells (near Westport and Willapa Bay), quantities were not sufficient for commercial production.

Since the early 1900's, onshore exploratory wells have been drilled along the Washington coast. The discovery of a natural oil seep in the vicinity of Hoh Head at Oil City, just north of the mouth of the Hoh River, led to several attempts at drilling for oil. An attempt in 1913 was abandoned because commercial quantities were not found. In 1936, drilling in the same area led to the discovery of Washington's first oil well that went into production. Production could not be sustained and the site was abandoned. Currently, there is no onshore production of oil or gas in the State of Washington.

MMS, within the U.S. Department of the Interior, is the Federal agency with authority over all minerals development on the OCS outside of the three-mile limit of state jurisdiction. MMS is responsible for preparing and implementing 5-year plans which identify the federal waters to be opened for offshore oil and gas leasing.

MMS's current 5-year plan is entitled Outer Continental Shelf Natural Gas and Oil Resource Management Comprehensive Program and covers the years from 1992-1997. According to the plan, Washington and Oregon are not scheduled for any lease sales and will not be until after the year 2000. However, before any leasing activities can take place, a series of environmental studies must be preformed to determine whether or not oil and gas development can take place in an environmentally sound manner. This position is based on Federal executive policy developed in 1990 which canceled a number of lease sales around the country, including Lease-Sale 132 (Washington/Oregon Planning Area) (Figure 41). Figures 42 show "highlighted areas" which correspond to areas that the Governors of Washington and Oregon requested be deleted from the former Lease Sale #132; and areas within the Oregon/Washington planning area, referred to as "subarea deferrals", that MMS has deleted from sale #132. Leasing and exploration for oil and gas is not permitted in Washington state waters; Washington HB 2242 establishes a moratorium on oil and gas exploration and development in state waters until 1995.

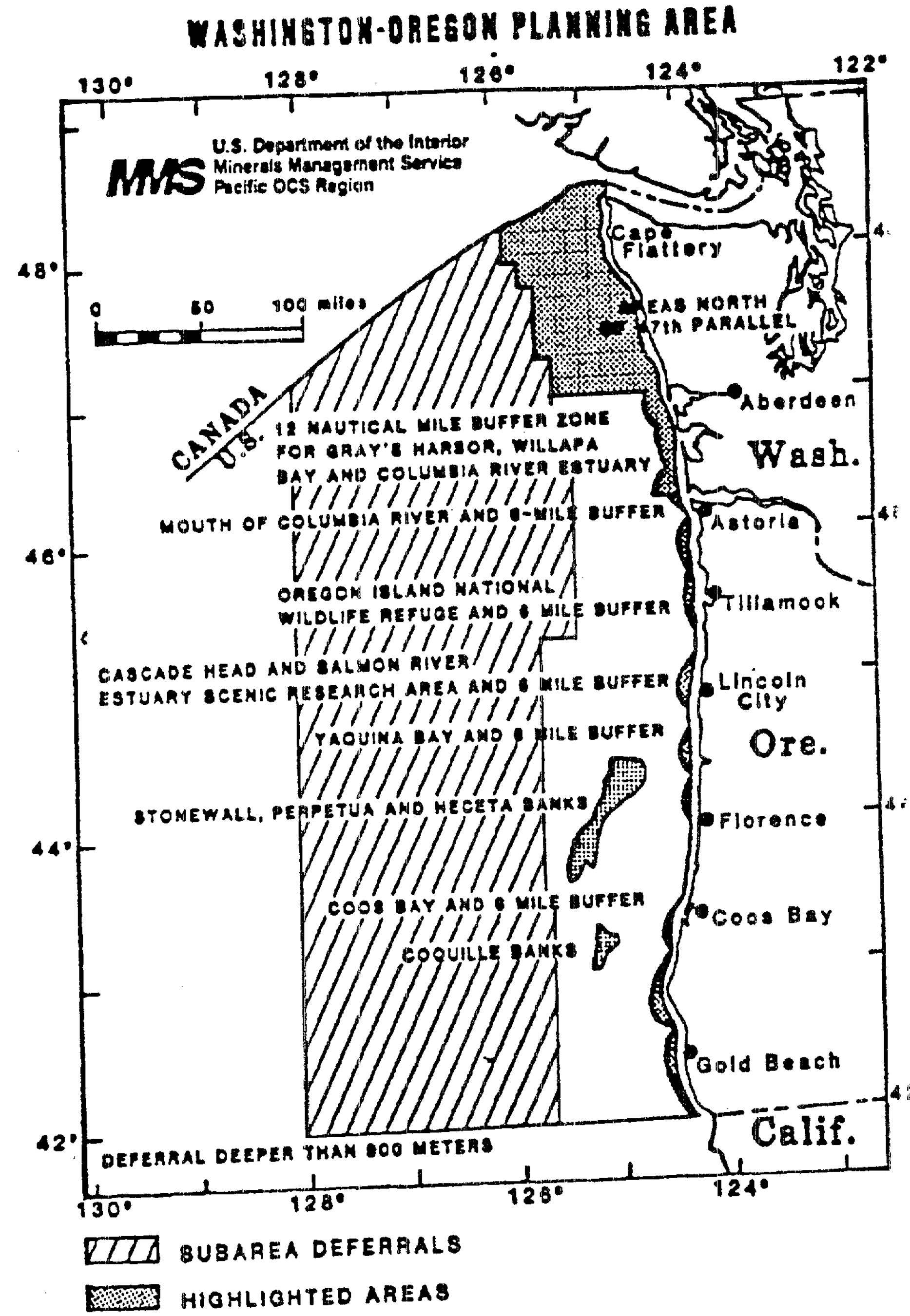


Figure 41. Washington/Oregon Planning Area.

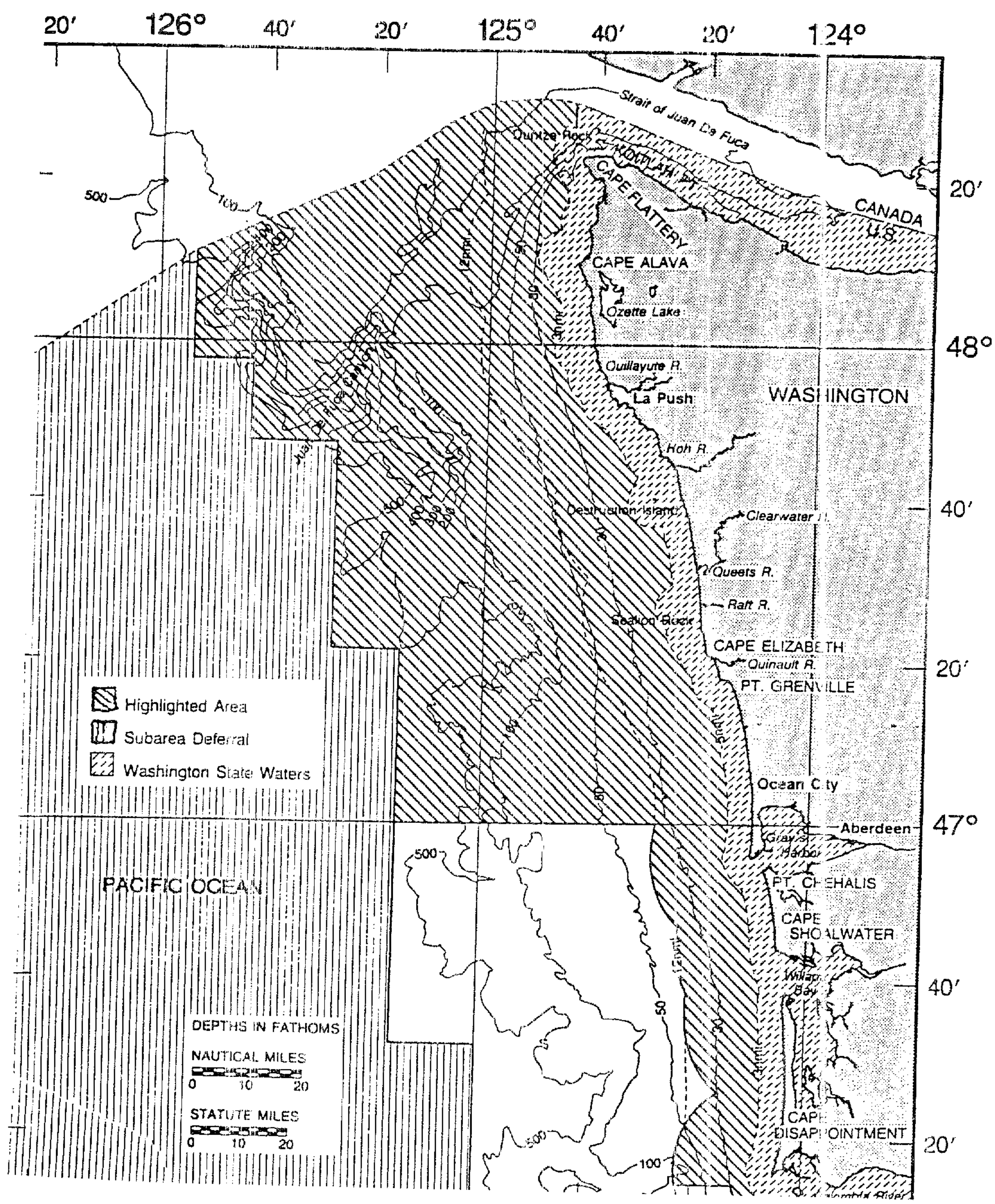


Figure 42. MMS Planning Area for Lease Sale #132 off Washington (Strickland and Chasan, 1989).

MMS has evaluated the oil and gas potential of the study area for the proposed sanctuary. By first making an assumption that past geologic conditions were conducive to the formation and entrapment of oil and gas, it is then possible to evaluate existing seismic data to estimate the location and volume of subsurface sedimentary structures that would contain the oil and gas reserves. Using the limited data available, MMS has estimated that production resulting from the former Lease Sale #132 would total 58 million barrels of oil and 1.0 trillion cubic feet of gas over a 35 year period. The entire sanctuary study area (i.e., the entire continental shelf off Washington) would include 20% of the total estimated reserves of the Lease Sale 132 area (MMS, 1990a). Of that 20%, 15% would be located in the area south of Copalis National Wildlife Refuge (which is not within the sanctuary boundary), with the remaining 5% distributed across the northern portion of the continental shelf which NOAA proposes to include within the Sanctuary (1.5% in zone 1, 2.5% in zone 2, 1.0% in zone 3). Zone 4 is entirely within Washington State waters, and is therefore not included in these estimates (Martin, 1990a).

Under the previous 5-year plan (1987-1992), the Washington and Oregon coasts had been scheduled for a lease sale in 1992. In order to resolve issues surrounding the proposed lease sale, the states of Washington and Oregon, the Northwest Indian Fisheries Commission, the Columbia River Intertribal Fish Commission and the Department of Interior established the Pacific Northwest Outer Continental Shelf OCS Task Force.

The Task Force's technical subcommittee recommended, through a resolution to the Secretary of Interior, a series of environmental studies to be completed prior to any leasing activities. The studies consist of the following:

1. Nearshore Ecosystems

2. Physical Oceanography
   a) Estuary/coastal ocean exchange and Columbia River plume dynamics
   b) Interannual Variability
   c) Support of nearshore ecosystem
   d) Cape Flattery
   e) Heceta Bank

3. Marine Mammal/Seabirds
   a) Supplementation of existing survey program
   b) Seabird colony research program
   c) Seabird life history research
   d) Northern fur seals
   e) Northern Sea Lion

4) Socioeconomic
   a) Expand scope of existing recreation and tourism survey
   b) Coastal community impacts
   c) Extension of basic analysis of Indian tribal dependencies on coastal resources and activities potentially affected by OCS development
   d) Causes and consequences of cumulative ecosystem impacts relative to lease sale 132

5. Air Quality

Included in the Pacific Northwest OCS Task Force's resolution was a policy statement that precluded any leasing activities until after the above studies are completed. The Federal policy discussed above was a result of the resolution.

In 1992, the Marine Research, Protection, and Sanctuaries Act was amended to prohibit any oil and gas development activities inside the Olympic Coast Sanctuary.

B. State Waters

In 1989, the Washington State Legislature passed the Ocean Resources Management Act (ORMA). The Act placed a moratorium on the leasing of state waters for the purpose of oil and gas development. The moratorium will be reviewed during the 1995 Washington State Legislative session to determine whether it should be continued or lifted.

3. Commercial Shipping

Due to the linkages between vessel traffic patterns along the outer coast, the Strait of Juan de Fuca, and Puget Sound, this section addresses shipping issues which span all of these areas. Vessel traffic along the Washington Coast, in the Strait of Juan de Fuca and Puget Sound includes tankers transporting crude oil and refined petroleum products, bulk carriers transporting non-petroleum products, barges, ferries, fishing boats, and pleasure craft. The general profile of vessel activities in the study area are that ferries and tank barge movements, including bunkering activities, account for the greatest number of vessel transits, and tanker traffic accounts for the greatest volume of petroleum products shipped (Chadbourne and Leschine, 1989). According to the Port Needs Study conducted by the USCG (1991), by 2010 there is expected to be a 555% and 81% increase in ferry/tank barge movements and tanker traffic transits through the Strait of Juan de Fuca and Northern Puget Sound, respectively (Table 5). Washington ports and harbors serving these vessels include the Port of Willapa Harbor, Port of Grays Harbor, La Push, Neah Bay, Port Angeles, the Ports of Tacoma and Seattle, Port of Everett, Port of Anacortes, and Port of Bellingham. These ports and harbors, all which are located in

Table 5. Current and Projected Vessel Transits in the Study Area.

	Strait of Juan de Fuca			N. Puget Sound		
	1987	2010	% change	1987	2010	% change
Passenger	3,888	4,451	14%	18,380	21,374	16%
Dry Cargo	102,808	621,309	504%	288,309	552,087	91%
Tanker	1,056	1,568	48%	1,009	1,498	48%
Dry Cargo Barge Tow	796	20,859	2520%	12,574	19,636	56%
Tanker Barge Tow	557	9,745	1649%	6,544	8,998	37%
Tug/Tow Boat	4,855	89,261	1738%	51,455	81,503	58%
Total	113,960	747,193	555%	378,271	685,096	81%

Source: United States Department of Transportation, U.S. Coast Guard, Office of Navigation Safety and Waterway Services. August, 1991. Port Needs Study (Vessel Traffic Services Benefits), Volume II: Appendices, Part 1. DOT-CG-N-01-91-1-3, Pt.1; DOT-VNTSC-CG-91-2-11, Pt. 1.

the study areas for the proposed Olympic Coast and Northwest Straits marine sanctuaries (except for the Port of Tacoma) handle predominately petroleum and wood products, and many of the ports and harbors have berths for fishing and pleasure crafts as well. While the overall density of traffic along the coast, in the Strait of Juan de Fuca, and throughout Puget Sound is low compared to other U.S. waterways, there are areas of high vessel concentration and restricted passageways which present risks of collisions and groundings. These conditions also exist outside the opening of the Strait of Juan de Fuca, beyond the jurisdiction of the Vessel Traffic Service. The sinking of the Tenyo Maru is the most recent example of such risk. Recent Federal, state, and international management regimes and legislation have been developed to address these risks while facilitating vessel traffic.

This section will discuss the: 1) routes and areas of vessel concentration; 2) nature of current and planned port-related activities; 3) economic significance of vessel traffic and port activities to Washington State; 4) vessel management regimes; and 5) vessel contingency plans and capabilities.

a. **Routes and Areas of Vessel Concentration**

i. Tanker Traffic

Tankers entering the Strait of Juan de Fuca or transiting along the Washington coast follow four major routes: 1) Valdez, Alaska to Washington State; 2) Valdez, Alaska to San Francisco, California and Panama; 3) the coastal tank vessel trade; and 4) foreign tanker routes (Figure 43).

Tankers transiting through the Strait of Juan de Fuca are predominately domestic vessels carrying North Slope crude oil to the refineries in Northern Puget Sound. These vessels approach the Strait of Juan de Fuca from the north remaining outside of Canada's Tanker Exclusion Zone (TEZ). The TEZ parallels the Canadian coastline at 60 nautical miles narrowing to 35 miles in the proximity of the international border (Figure 44). This zone, applicable only to U.S. vessels transiting from Valdez, Alaska to Puget Sound, has been mutually agreed upon by the American Institute of Merchant Shipping (AIMS), and the U.S. and Canadian Coast Guards. The southernmost point of the TEZ brings tankers into the Strait of Juan de Fuca on the United States side of the international boundary. Compliance with this agreement has resulted in little or no reported violations (Pokeda, 1992).

As North Slope oil supplies dwindle, the profile of tankers visiting Washington is predicted to shift to one dominated by foreign tankers. Since the Strait of Juan de Fuca includes internal waters of both the U.S. and Canada, and vessels transiting through the Strait are bound for both Canadian and

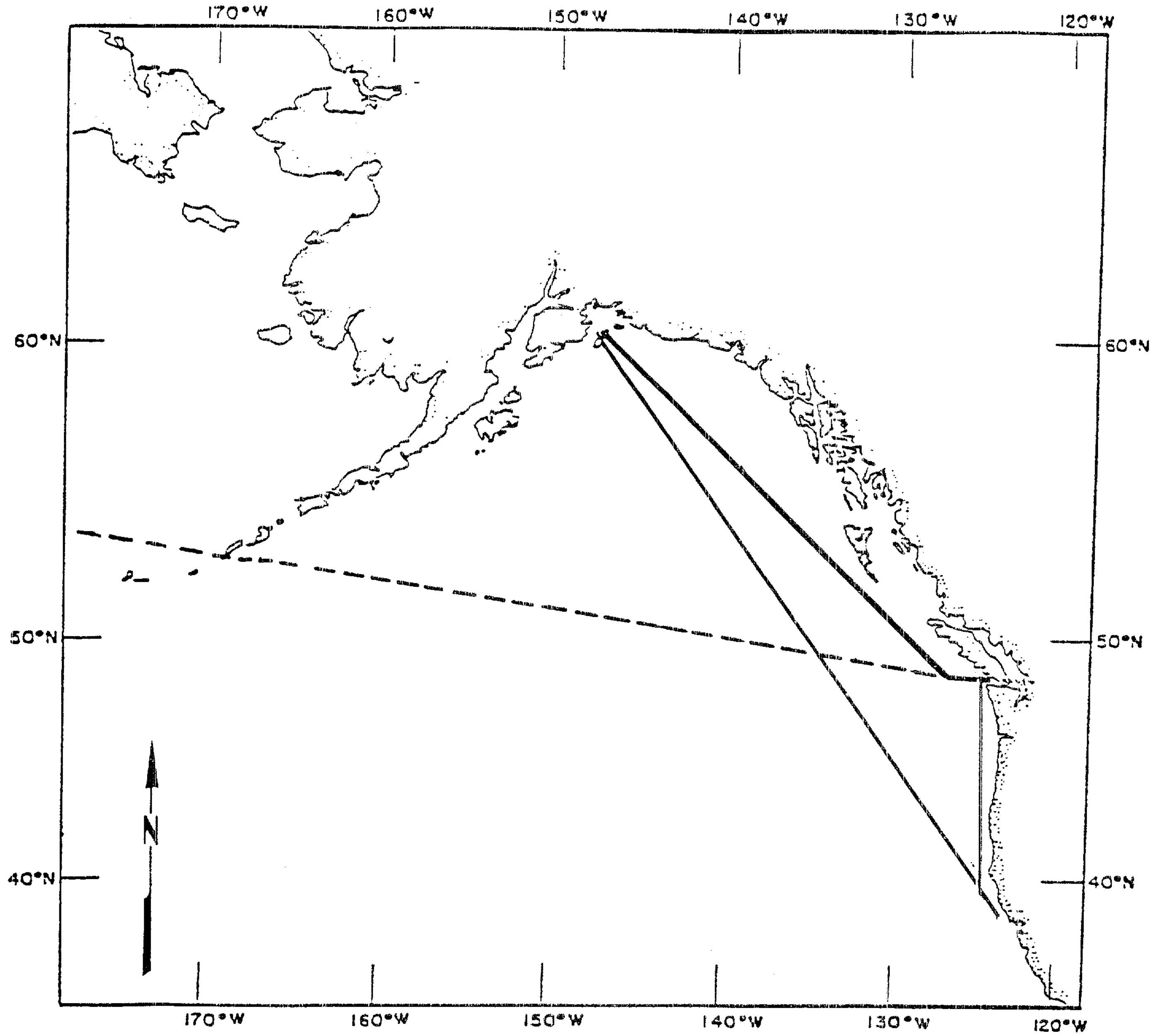


Figure 43. Tank Vessel Traffic Outer Coast (Wolferstan, W.H. Oil Tanker Traffic: Assessing the Risks for the Southern Coast of British Columbia. Victoria, B.C.: ADP Bulletin 9. July, 1981).

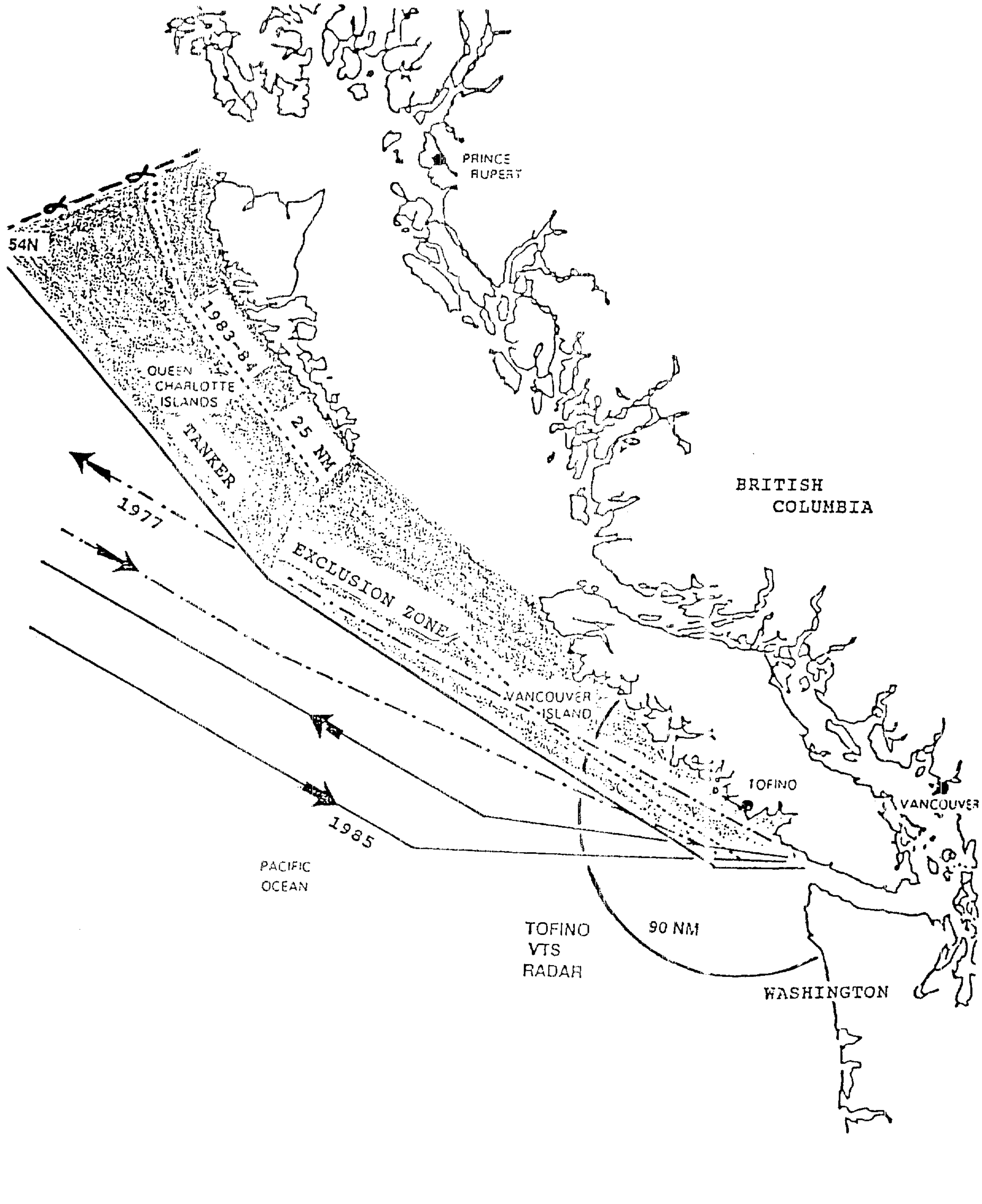


Figure 44. Tanker Exclusion Zone (Canadian Coast Guard, 1989).

U.S. ports, both countries have coordinated their environmental regulations.

Tankers transiting from Valdez, Alaska to California or Panama remain well offshore. The route is approximately 340 miles offshore of the United States/Canadian border narrowing to approximately 125 miles from the shoreline at the Washington/Oregon border (Pokeda, 1992). Pursuant to a policy of the Western States Petroleum Association (WSPA), tankers engaged in offshore coastal traffic carrying North Slope crude or other persistent oils, voluntarily remain at least 50 nautical miles off the U.S. coastline when not entering ports.

Foreign tanker routes passing through the study area include vessels inbound from the Far East and Central and South America. The former remain well offshore until their approach to the Strait, however the latter usually operate between 10 and 40 miles off the Washington coast.

Tank vessels entering and transiting Puget Sound are limited by regulation to not larger than 125,000 dead weight tons (DWT) east of Port Angeles (Title 33, CFR 161.143). The average inbound tanker holds approximately 322,000 barrels of crude oil, and the average outgoing tanker carries approximately 123,000 barrels of refined products (Chadbourne and Leschine, 1989). Tanker traffic accounts for most of the volume of petroleum shipped through the Strait of Juan de Fuca and into Puget Sound (77% volume; 17% transits), while barge traffic accounts for the greater number of transits (23% volume; 79% transits). In 1991, there was an average of 4.7 tanker transits/day (petroleum, chemical, LPG/LNG) through the Strait of Juan de Fuca (Tofino Traffic Service, 1991). There is no large seasonal variation of traffic throughout the year (Chadbourne. and Leschine. 1989).

ii. <u>Barges and Tug Boats</u>

There are innumerable tug and barge movements along the coast between Grays Harbor, Willapa Bay and Puget Sound ports. Barges are used mainly to transport lumber and wood chips from Grays Harbor and Willapa Bay, and chemicals, petroleum products and bulk cargos from the Puget Sound area. Barges operate close to the shoreline when transiting through the study area, remaining between 3 and 15 miles offshore. However, some companies require their tows stay a minimum of 20-25 miles offshore when towing loaded petroleum barges (Scalzo, 1992).

Barges are also used to transport decommissioned, defueled Naval submarine reactor plants from the Puget Sound Naval Shipyard to the Hanford Site on the Columbia River for disposal. The normal commercial shipping lanes from Puget Sound Naval Shipyard are used, via Rich Passage, past Restoration Point, northerly through Puget Sound, westerly through the Straits of

Juan de Fuca, past Cape Flattery and in a southerly direction down the Washington Coast to the mouth of the Columbia River (U.S. Department of the Navy, 1984). Barges used to transport the decommissioned reactor plants travel close to shore so that in the unlikely event that a barge carrying the reactor plants were to sink it can be easily recovered.

Extensive precautions are taken to ensure that these barge shipments are made safely. The reactor compartment packages meet stringent U.S. Nuclear Regulatory Commission and Department of Transportation regulations for transportation of radioactive material, including being able to withstand such unlikely and unrealistic accidents as a 30 foot drop onto an unyielding surface. The transport barges are used solely for these shipments and are designed to remain stable in an upright position even with any two adjacent watertight compartments flooded. The barges would remain afloat even with over half of their compartments flooded, and the reactor compartment package is welded to the barge deck so that it would remain attached even if the barge capsized. A fully capable backup tugboat and an escort vessel accompany each barge shipment. Reactor compartment shipments are not made during the winter months or during any times when unfavorable weather is forecast.

Conflicts between barge traffic and crab fishermen have resulted in a "gentleman's agreement" reached in 1971 which identifies towing lanes for tugs and barges along a major portion of the West Coast, including most of the Washington coast (NOS, 1990). The location of the lanes are determined on a yearly basis. According to the agreement, crab fishermen refrain from putting their pots in lanes designated for tugs and barges. If pots are placed in designated lanes, crabbers forfeit their right to complain if pots are destroyed by a tug or barge. In turn, towboaters agree to stay within designated lanes, as weather and ship safety allow. The agreement has saved millions of dollars for both the fishing and towing industries. An annual meeting, and publication and distribution of charts depicting the agreed upon lanes, is organized by the Northwest Towboat Association (Northwest Towboat Association, 1991). This function has been assumed by the Oregon State University, Extension Sea Grant Program.

Barges account for the greatest number of vessel transits along the Washington coast and through the Strait of Juan de Fuca and Northern Puget Sound. Barges and tug boats accounted for 33% of the petroleum shipped and 79% of transits throughout Puget Sound and along the Washington Coast to Grays Harbor and Willapa Bay in 1988. This represents approximately 8.1 (81%) of the average 10 petroleum-related transits in the Strait of Juan de Fuca and Puget Sound (Chadbourne and Leschine, 1989). The number of transits of barge-direct activity, (i.e., barges that make direct passage in and out of the Strait without significant movement within the Sound itself) varies substantially from month-to-month in both volume and number of transits (Chadbourne and Leschine, 1989). The average volume on any barge is approximately 22,000 barrels per transit.

iii. Foreign Product Carriers

Many of the vessels transiting the Washington coast are engaged in foreign trade. There are also many foreign flagged vessels that run coastal routes along the coasts of Washington and Oregon. The usual route for this traffic extends from Cape Flattery, Washington to Southern California and is concentrated between 3-20 miles offshore (Pokeda, 1992). These vessels are not subject to the voluntary policy of the WSPA that applies to oil tankers. However, all vessels, foreign or domestic, must comply with OMS' prevention and contingency plan regulations. Foreign vessels, while not forced to comply with some voluntary vessel regulations, are required to submit prevention and contingency plans to OMS.

IV. Ferries

Ferry traffic is used extensively throughout the year to transport passengers and vehicles to numerous destinations throughout Puget Sound and represents the greatest source of total vessel movement in the Sound (including petroleum and non-petroleum vessels transits). According to statistics kept by VTS Seattle, approximately 73% of the nearly 600 vessel transits per day within Puget Sound and the Strait of Juan de Fuca, are ferries along scheduled routes (USCG, 1991).

Two ferries cross several times per day between Port Angeles and Victoria, B.C. Direct ferry service also exists between Seattle and Victoria. Scheduled ferry service from Anacortes westward to the San Juan Islands and to British Columbia transits Rosario Strait on a frequent basis. Another ferry route connects Kingston, on Bainbridge Island, and Edmonds and another connects Port Townsend and Whidbey Island (USCG, 1991). Other ferry routes traverse the Sound south of the boundaries suggested for the proposed Northwest Straits National Marine Sanctuary. All ferries in the Northwest Straits study area (with the exception of the Port Angeles-Victoria route which is privately owned) are operated by the Washington State Department of Transportation.

V. Fishing Vessels

Washington's fishing vessels harvest a wide variety of fish and shellfish including bottomfish, shellfish, and five species of salmon. The fishing vessels are operated by commercial non-treaty, treaty, and recreational fishermen. Salmon landed by non-treaty commercial fishermen are harvested using the trolling method. Purse seines, drift nets and gill nets are prohibited in ocean waters. Most trolling for chinook and coho is centered off Grays Harbor. Trolling for pink salmon (harvested in odd-numbered years) occurs off the northern Peninsula between Cape Flattery and Quillayute. A major fishing area for salmon also exists at the entrance of the Strait of Juan de Fuca on Swiftsure Bank. Particularly hazardous vessel traffic conditions exist over Swiftsure bank during periods of low visibility, when commercial vessel traffic must exercise extreme caution to avoid collision with fishing boats which tend to defy radar detection. Commercial and recreational seasons for the salmon fisheries are set between May 1 and October 31 (PFMC, 1984).

Bottomfish are harvested by bottom and midwater trawling, longlining, bottom trolling, and hand-line jigging. Fishing may take place in depths ranging from 10 fathoms out to the canyons at the edge of the continental shelf, and beyond. The Pacific coast domestic trawl fisheries are conducted by vessels ranging from 30-110 feet in length, weighing under 200 gross tons. Trawlers based in northern Washington generally make trips of 6-10 days due to the greater distance to their fishing grounds. Vessels in the groundfish fishery operate year-round (PFMC, 1989). While bottomfishing occurs throughout the Washington coast, Swiftsure Bank, off the mouth of the Strait of Juan de Fuca is a popular bottomfish harvesting area. Some bottomfish fisheries such as the hake, which are migratory in nature, incorporate many, much larger trawling vessels, as well as large processing ships operating on the fishing grounds.

Gillnets and troll gear are used by the tribes to harvest salmon and steelhead trout. The Makah Tribe conducts a marine gillnet fishery along the shore near Cape Flattery and in the Strait of Juan de Fuca for chinook and sockeye salmon. The four coastal tribes also participate in the bottomfish fishery using longline and handline gear. These fisheries occur in the spring and fall and are centered off the north coast of the Olympic Peninsula.

In summary, vessels fishing for salmon operate from May 1 to October 31 throughout the study area, with heavier concentrations in the Strait of Juan de Fuca, especially when the Treaty gillnet fishery is in effect, off of Grays Harbor, and on Swiftsure Bank. The bottomfish fishery occurs throughout the study area during the entire year, with concentrations over Swiftsure bank as well.

vi. Pleasure Boats

Pleasure boating represents a large and expanding use of Puget Sound waters. The highest concentrations are centered around the San Juan Islands. In 1989, there were an estimated 160,000 boats registered in Washington, with over half of them remaining in Puget Sound (Washington Department of Health, 1989). There are 63 marinas located in the Strait of Juan de Fuca and

Puget Sound north of, and including, Port Townsend. By far, the largest concentration of marinas (44) are located in the San Juan Islands (WDNR, 1990).

b. Washington State Ports and Harbors

i. Willapa Harbor

Willapa Bay is bounded on the south by a low sandy peninsula known as Leadbetter Point, and on the north by the sandy peninsula of Cape Shoalwater. Willapa River and Harbor are used primarily by fishing boats engaged in the salmon, shrimp, crab and bottomfish fisheries, and also by barges transporting wood chips from Willapa Harbor to Longview on the Columbia River. There is an average of one barge per week entering and exiting Willapa Harbor (Littlejohn, 1992). There are no petroleum products transported by vessel into or out of Willapa Harbor.

The COE ceased dredging the Channel in 1976, at which time the depth was 26 feet over the bar at the mouth of Willapa Bay, and 24 feet from deep water in Willapa Bay to both forks of Willapa River at Raymond. No deep draft vessels have entered Willapa Bay since 1976 (US Department of Commerce, 1988).

Willapa Bar extends about three miles beyond a line joining Willapa Bay Light and Leadbetter Point. The bar channel is continually shifting, and depths over the bar vary seasonally. As a result, depths have consistently been less than the 26-foot project depth (US Department of Commerce, 1988). Today, the minimum depth of the channel over Willapa Bar is 21 feet (U.S. Department of Commerce, 1988).

An interim dredge disposal site is located approximately three and a half miles off the mouth of Willapa Harbor. The site has been used for disposal of dredge spoil from the bar at the opening of Willapa Bay. Although the site has not been used since 1976, the COE plans to utilize the site for three years, and then, due to the rate of shoaling, not for approximately another ten years. The site is currently being evaluated by EPA and the COE and is expected to be designated by 1994 (Findley, 1992).

ii. Grays Harbor

The entrance to Grays Harbor is approximately two miles wide, but shoals extending south from Point Brown narrow the navigable channel to a width of 0.7 miles (US Department of Commerce, 1988). From its entrance, the bay extends eastward for 15 miles to the mouth of the Chehalis River. The bay has many shoals and flats that are exposed at low water and cut by numerous channels. Pilotage is compulsory for all registered vessels (U.S. Department of Commerce, 1988).

Grays Harbor is an important outlet for the Washington State timber industry and represents an important lumber port in the foreign and domestic trade. A large number of vessels servicing Grays Harbor and Willapa Bay are engaged in coastwise service between ports in Washington, Oregon and California.

The Port of Grays Harbor operates three marine terminals. They include berthing space for three ocean-going vessels and one shallow draft vessel or barge (Port of Grays Harbor, 1988). In addition to the port-operated facilities, there are more than seven private deep draft piers and wharves in the Hoquiam, Aberdeen, and Cosmopolis area. Westport Marina is a modern fishing boat harbor in Grays Harbor with space for 800 boats. The Marina supports commercial fishing, seafood processing, recreational fishing and tourism, and ship building and repair industries. Two major railroads and two major highways service Grays Harbor. Bowerman Airport is owned and operated by the Port of Grays Harbor (US Department of Commerce, 1988).

The Port of Grays Harbor, the fifth largest deep water port in the State of Washington, is the only deep water port on the outer coast of Washington capable of handling vessels of up to a 36 foot draft. There have been over 2,500 bar crossings in Grays Harbor between 1980 and 1990 representing an average of 250 vessel crossings each year (Stevens, 1991). In 1988, harborwide trade of logs, lumber, wood chips, lignin and petroleum products handled by the Port and private terminals (Weyerhauser, ITT Rayonier, and Citifor) amounted to 5 million tons (Port of Grays Harbor, 1988). Refined petroleum products are barged into Grays Harbor from refineries in Northern Puget Sound.

In recent years there has been an aggressive effort to make the Port of Grays Harbor better prepared to handle an increasingly diversified mix of non-log cargo such as steel and aluminum products, paper products, wood products, machinery, granite and seafood products (Barkstrom, 1992). The COE, EPA and the Port of Grays Harbor have invested $75 million in expanding and enhancing maritime activities in Grays Harbor through waterway dredging and port terminal development programs. This effort now enables the port to handle the largest ships that can pass through the Panama Canal. In 1991, approximately 31% of the cargo handled by the Port of Grays Harbor was non-log cargo. By 1992, the amount of non-log cargo handled by the port is expected to reach 50%.

Bunkering activities documented in 1988 included 14 transits from Tacoma to Grays Harbor by way of the Strait of Juan de Fuca transporting 465,658 barrels of bunker fuel. Within Grays Harbor, a total of 120 bunkering operations took place, transferring a total of 479,000 barrels of bunker fuel. The marketing terminal at Grays Harbor holds an inventory that accounts for the difference between inflow and outflow

(Chadbourne and Leschine, 1989).

Dredge spoil disposal is deposited at three EPA designated dumpsites outside the mouth of Grays Harbor. The dumping of dredged material helps control erosion occurring at the mouth of the harbor (Tipton, 1991). Regulated dumping of dredge materials into ocean waters falls under Sections 102 and 103 of the MPRSA. The designation of dredge disposal sites is delegated to the EPA. The COE is the permitting authority for dredged material. Two ocean dredge spoil disposal sites outside of Grays Harbor recently received final designation by EPA Region 10 (Federal Register Vol. 55, No. 129, July 5, 1990). These include the 3.9 mile site and an 8 mile site. The former site is used for disposal from the Corps' maintenance dredging program in Grays Harbor. It also received material from the Corps/Port of Grays Harbor Navigation Improvement Project (NIP) accomplished in 1990. The latter site only received material from the NIP in 1990, and has since been de-designated by EPA (Ploudre, 1991).

iii. La Push

La Push is a Quileute Indian village approximately one half mile north of the entrance of the Quillayute River. It is an important recreational and Indian fishing center. The river channel, maintained by the Corps of Engineers, leads from the sea to a small-craft basin at La Push. Approximately 200 berths are provided in the harbor of La Push (U.S. Department of Commerce, 1988). Dredge disposal material from the harbor at La Push is deposited on land.

iv. Neah Bay

Neah Bay, located on the Makah Indian Reservation, is located about five miles east of Cape Flattery just inside the Strait of Juan de Fuca. The existing Federal project constructed by the COE at Neah Bay consists of: 1) an 8,000 ft. long rubblemound breakwater between Waadah Island and the westerly shore of Neah Bay; 2) reinforcement of the existing rock revetment extending approximately 2,200 feet west from Baadah Point; and 3) an 800 ft. extension of the revetment westward. The breakwater was developed to provide a harbor of refuge. The rock revetment protects US Coast Guard facilities and Makah Tribal headquarters.

Neah Bay is used extensively by small vessels as a harbor of refuge in foul weather, and as a sport fishing site. There are also two cooperative fishing piers which have facilities for icing and supplying fishing boats, and a sea urchin processing plant. Neah Bay is a customs port of entry and customs officers also perform immigration duties (US Department of Commerce, 1989).

The Makah Tribe plans to develop the harbor at Neah Bay to provide a protected marina to support a changing commercial Indian and non-Indian fishery from a one-season, one species activity to a multi-species, year-round endeavor. The preliminary project plans aim to develop a marina that accommodates 275 boats. The harbor would be dredged to a minimum depth of 15 feet below mean lower low water. Dredge spoil will be used to nourish reservation beaches with the remainder deposited on land (Simmons, 1993). An emergency response towing vessel stationed at Neah Bay has been recommended to OMS by the Regional Marine Safety Committees.

v. Port Angeles

The Port Angeles harbor, located 56 miles east of Cape Flattery, is bounded by a long narrow spit of sand known as Ediz Hook. Logs, lumber, plywood, newsprint, pulp, shakes and shingles, and petroleum products are the principal commodities handled (US Department of Commerce, 1988). The port currently owns and operates two deep-water terminals with a total capacity of five vessels. Port Angeles harbor has the capacity to handle 2 million tons of export logs per year under existing conditions without significant additional costs to shippers for multiple shift working or vessel delays (Port of Port Angeles, 1992). In 1988, 51 bunkering operations took place. Approximately, 10,803 barrels of bunkering fuel was transferred per operation. Total bunker fuel transported in Port Angeles amounted to 550,951 barrels (Chadbourne and Leschine, 1989).

A ferry terminal supports ferry traffic that transits between Port Angeles and Victoria, B.C. A small craft basin supports a fleet of 563 fishing boats and pleasure craft, with pleasure craft accounting for 60% of the boats. A marina in Sequim Bay provides 272 permanent moorage slips and an additional 22 transient slips. The moorage will be expanded, as demand dictates, to a maximum capacity of 355 slips (Port of Port Angeles, 1992). The Port also owns and operates two airports, one at Port Angeles and one at Sekiu.

A pilot is required for all vessels greater than 1600 gross tons transiting east of Port Angeles. Some vessels require a state licensed pilot, while others require a federally licensed pilot (See RCW 88.16.070 and 46 USC 8501). The state may grant an exemption to pilotage requirements to smaller passenger vessels and yachts under 500 gross tons or 200 feet or less in length. Tugs in excess of 1200 horsepower are stationed in Port Angeles and tugs to 7200 horsepower are available in North Puget Sound and from Seattle with advance notice. Port Angeles is also a customs port of entry (U.S. Department of Commerce, 1988). The Port Angeles Coast Guard Air Station is located on Ediz Hook, in addition to a Coast Guard VTS radar tower and radio beacon and fog signal (US Coast Pilot, 1988).

vi. Ports of Anacortes and Ferndale

Large volumes of crude oil are transported to refineries in Anacortes and Ferndale. Refined products and petroleum coke are then transported by pipeline, truck, vessel and barge. In 1989, Anacortes and Ferndale received 41.9% and 51%, respectively, of the tanker transits transporting petroleum products into and out of Puget Sound (Chadbourne and Leschine, 1989). In 1988, nine bunkering operations were documented, averaging 30,662 barrels per operation. In Anacortes, five bunkering operations took place, averaging 30,251 barrels per operation (Chadbourne and Leschine, 1989).

c. Economic Contribution of Vessel Activities

Vessel traffic is intricately linked to the economy of Washington State, with an estimated one out of every six jobs in the state attributable to international trade (Kapp, 1987). On a local and regional level, the significance of vessel traffic to local economies is more profound. It was demonstrated that in 1988, port related activities in Grays Harbor generated 7,886 jobs (representing approximately 35% of the jobs in Grays Harbor County), and contributed over $21 million in county tax revenues. The jobs created by port activities include trucking, logging, yard handling, and vessel stevedoring. The average annual wage for these jobs is $21,085, 33% higher than the county average (Port of Grays Harbor, 1988).

In 1991, approximately 165 million board feet were handled at the Port of Port Angeles, generating 505 direct jobs, and indirect employment for over 1,388 people (Port of Port Angeles, 1992).

The economic contribution of the Ports of Anacortes and Ferndale to the Pacific Northwest is highly significant. Without the refineries, there would be no infrastructure to supply the Northwest fuel demand (Weiss, 1992).

d. Vessel Management Regimes

i. Voluntary Management Initiatives

Four voluntary management regimes address vessel traffic in U.S. waters of the Pacific Coast: 1) a WSPA agreement to keep coast-wise tanker traffic more than 50 nautical miles offshore when not entering port (Tomasovic, 1992); 2) a crabber-tugboat agreement to designate lanes for tugs and barges during crabbing season (Northwest Towboat Association, 1991); 3) the use of the Mukkaw Bay anchorage site off of the Makah Indian Reservation; and 4) the Cooperative Vessel Traffic Management System (CVTMS). The first two agreements have been discussed in the sections

The Mukkaw Bay anchorage, a mutually agreed upon site by both Canadian and U.S. Coast Guards, is used to minimize haphazard movements of vessels that are either waiting for a pilot in Port Angeles, or directions from home ports (Pokeda, 1992). The anchorage is not a designated anchorage and therefore not enforced nor maintained by the Coast Guard. However, it's use is monitored by Tofino Vessel Traffic Service. It is located just outside of the 3 mile limit of state jurisdiction, and thus convenient for ships to await orders, or available pilots without having to go through U.S. customs. The use of the Mukkaw Bay anchorage is monitored by Tofino Vessel Traffic Service (VTS) monitoring station. According to data provided by the Tofino VTS, approximately 35 vessels used the anchorage between May of 1989 and May of 1990. The average duration of stay at this site was 3.8 days per vessel.

The use of Mukkaw Bay as an anchorage site has created some management problems. One such problem involved the recent presence of the Asian gypsy moths on Washington and Vancouver Island beaches which has subsequently threatened coastal forests. It is presumed that the moth has been introduced by ships infested with larvae. Also, trash and low level oiling has been identified as a problem in the past, presumably due to vessel activities at the anchorage site. These nuisances have been reduced in recent years with the passage of MARPOL and more attention by the U.S./Canadian CVTMS.

ii. Cooperative Vessel Traffic Management Service

There are four aspects to the CVTMS: 1) required reporting by all vessels inbound to the Strait of Juan de Fuca greater than 500 gross tons; 2) a Traffic Separation Scheme (TSS) in the Strait of Juan de Fuca; 3) a vessel movement reporting system (VMRS): and 4) radar surveillance. To reduce the conflicts between fishing vessels operating at the mouth of the Strait of Juan de Fuca and commercial vessel traffic, Tofino Traffic Control Center in Canada and OMS have established a mandatory reporting regime where vessels greater than 500 gross tons bound for the Strait of Juan de Fuca report to Tofino Traffic Service when: 1) they are within 24 hours of either country's territorial sea (vessels greater than 300 gross tons are required to report to OMS); and 2) when approaching 50 nautical miles of Vancouver, or when crossing latitude 48°N inbound from the south, and longitude 127°00 W from the west (Figure 45). This reporting initiative allows enough time for Tofino VTS to assess language problems and deal with the vessels accordingly. If, during a pending emergency, a vessel captain can not speak english, Tofino is afforded enough time to explore other avenues to facilitate communications with the ship.

In addition, the Coast Guard and OMS have initiated an educational campaign to encourage vessel companies to ensure that

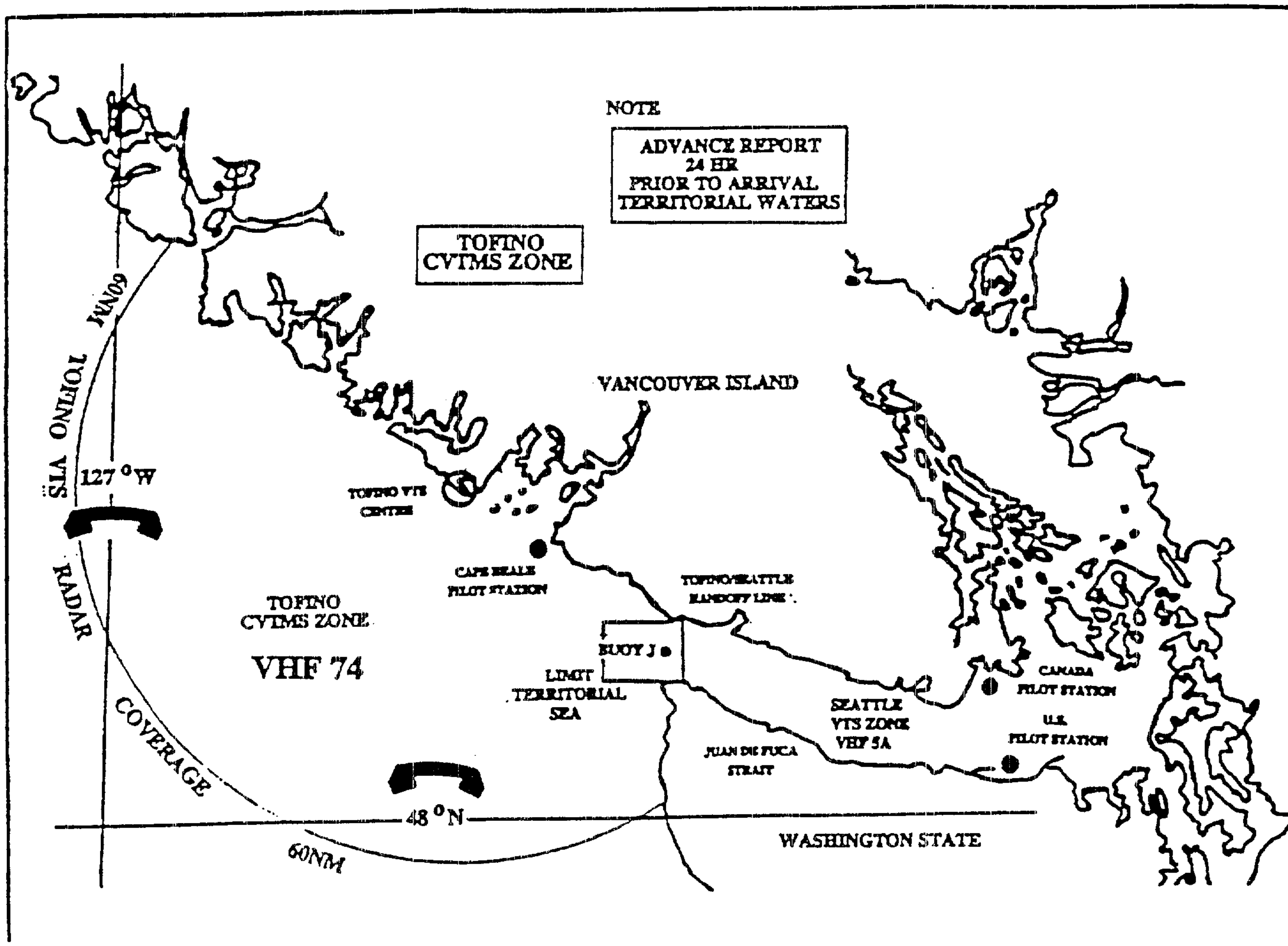


Figure 45. Vessel Traffic Management Service off the Strait of Juan de Fuca (CVTMS Offshore Traffic Management Task Force, 1991)

captains and/or at least one Deck Officer can speak adequate english. A monitoring effort is documenting the success of this campaign (Motekaitis, 1992).

The IMO sanctioned a Traffic Separation Scheme (TSS) consisting of all navigable waters of the Strait of Juan de Fuca and its offshore approaches (Figure 46). The US and Canada jointly operate the system within the waters of the Juan de Fuca region. The TSS is comprised of a network of one-way traffic lanes, and precautionary areas at the end points or where vessels normally join, leave, or cross the TSS. The traffic lanes are each 1,000 yards wide, and are separated by 500 yard wide separation zones. Most traffic lanes have a minimum depth of 60 feet.

Voluntary traffic separation schemes exist in southern Georgia Strait, the San Juan Archipelagos, Rosario Strait, Boundary Pass and Haro Strait. Two restricted areas are present within Puget Sound: Rosario Strait and Guemes Channel. No vessel over 20,000 DWT may enter these areas without VTC approval (33 CFR Part 161.37- Harbors, Marine Safety, Navigation (water), Telecommunications, Vessels, Waterways). Rosario Strait represents for large ships, the most difficult transit within the Puget Sound area. Rosario Strait is the site of the 13th Coast Guard District's "worst case" pollution scenario which envisions a tanker grounding, with subsequent cargo tank rupture, involving a major spill of crude oil. Rosario Strait is used by many small craft and ferries. When this type of traffic is combined with navigational factors such as strong tidal currents, the resulting hazard warrants imposition of the "one-way" Rosario Strait VTS rule. Hence, tankers moving through Rosario Strait are accompanied by an escorting tug, voluntary speed restrictions apply, and the Strait is regulated as a one-way channel for large ships (U.S. Coast Guard, 1991).

According to conclusions reached by the Port Needs Study conducted by the U.S. Coast Guard in 1991, the priority for the existing VTS system in Puget Sound is to modernize the present vessel traffic control center. The surveillance and communications workload created by the repetitive ferry crossings and the channel interference caused by commercial fishing boats must be reduced through enforced regulation and VTS automation. There are a number of improvements/upgrades occurring at VTS Puget Sound including a Tacoma extension, a new Vessel Traffic Center, closed circuit TV cameras in Seattle and Tacoma, direction finders/weather monitors at radar sites, communications improvements, a new voice hotline with the Canadian VTS's and a new computer data link with the Canadian VTS's (Norman, 1992).

The Joint Coordinating Group (JCG) is the Canadian/U.S. body which oversees the CVTS in the Pacific Northwest. Recent issues addressed by the JCG include: 1) communication problems with non-

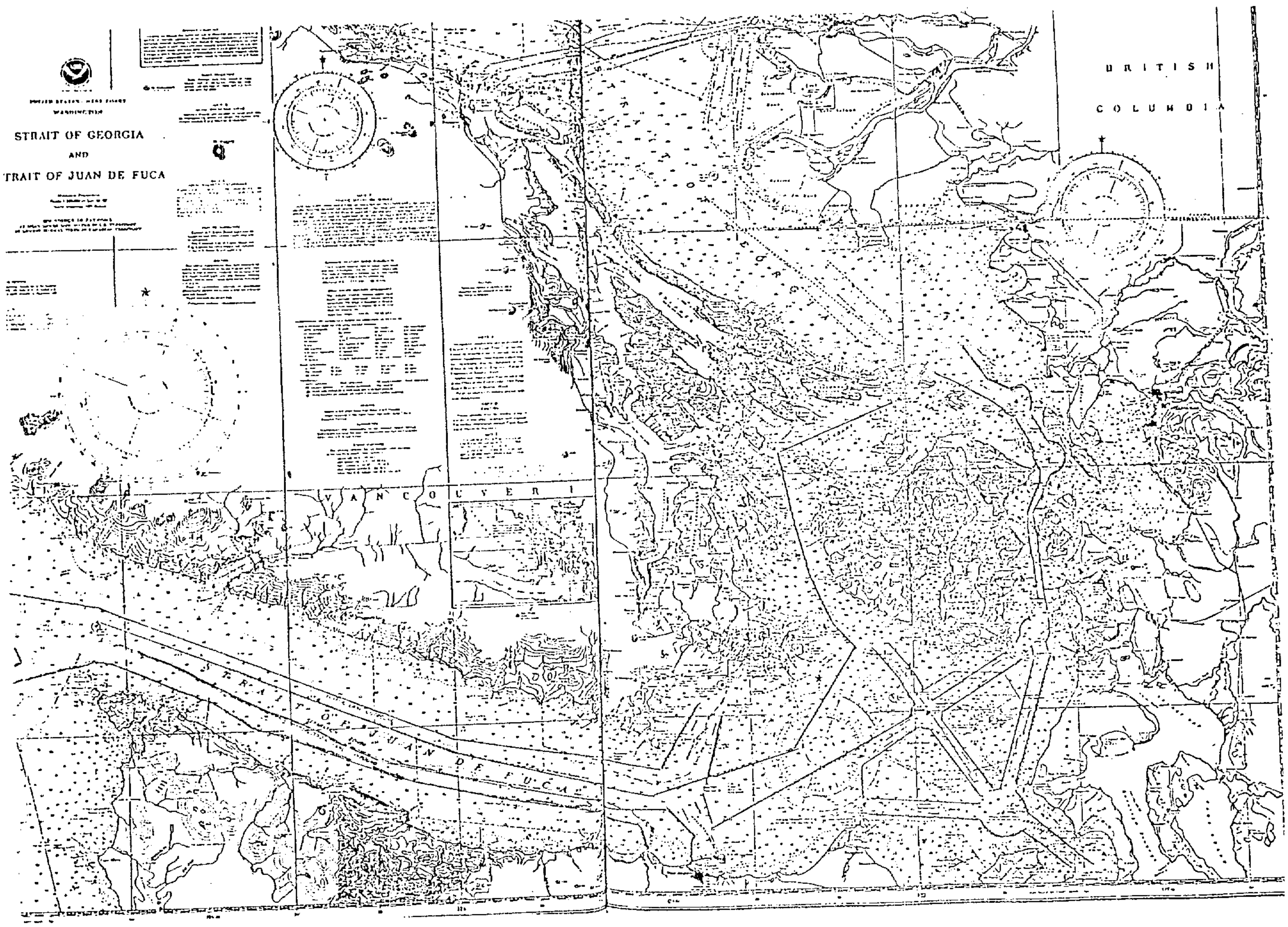


Figure 46. Traffic Separation Scheme in the Strait of Juan de Fuca and Puget Sound (U.S. Coast Guard, 1987).

procedures; 3) vessel routing schemes in the offshore approaches to minimize conflicts with fishing vessels; and 4) shortcomings in mariner awareness of available services. The JCG commissioned a task force to address these problems and initiatives have been developed which are now being implemented.

e. Contingency Plans

i. Oil Pollution Act of 1990 (OPA 90)

The Oil Pollution Act of 1990 creates a comprehensive prevention, response, liability, and compensation regime for addressing vessel and facility-caused oil pollution. It substantially increases Federal oversight of oil transportation by setting new requirements for vessel construction, crew licensing and manning; mandates contingency planning; enhances Federal response capability; broadens enforcement authority; increases penalties; and creates a new research and development program. A one billion dollar trust fund is available to cover cleanup costs and damages not compensated by the spiller, whose financial responsibility requirements are significantly increased.

Six Titles apply directly to the proposed Olympic Coast Marine Sanctuary. **Title I** creates a liability and compensation regime for tank vessel and facility-source oil pollution. Any party responsible for the discharge, or the substantial threat of discharge, of oil into navigable waters or adjoining shorelines is liable for the removal costs and damages for injury, destruction, loss or loss of use of natural resources, including assessment costs, real or personal property damages, subsistence use, lost government revenues, and lost profits and earning capacity. NOAA has the responsibility of promulgating damage assessment regulations. Sums recovered by a trustee for natural resource damage will be retained in a revolving trust account to reimburse or pay costs incurred by the trustee with respect to those resources.

Title II makes numerous amendments mandating that other Federal statutes conform to the provisions of the Oil Pollution Act.

Title III encourages the establishment of an international inventory of spill removal equipment and personnel.

Title IV is divided into three subtitles: A) Prevention; B) Removal and C) Penalties and Miscellaneous. Subtitle A gives added responsibility to the Coast Guard regarding merchant marine personnel, including the review of alcohol and drug abuse and review of criminal records prior to issuance and renewal of documentation. It also increases the responsibility of the Coast Guard to regulate the conduct of tankers by requiring some vessels to participate in vessel traffic service systems, and authorize the expansion, construction, improvement and operation of vessel traffic systems in U.S. ports.

More specifically, Subtitle A establishes double hull requirements for tank vessels. Most tank vessels over 5,000 gross tons will be required to have double hulls by 2010, while vessels under 5,000 gross tons will be required to have double hulls or double containment systems by 2015. All newly constructed tankers must contain a double hull (or double containment system if under 5,000 gross tons), while existing vessels are phased out over a period of years.

Subtitle B amends subsection 311 (c) of the Clean Water Act (CWA), requiring the Federal government to ensure immediate removal from navigable waters or adjoining shorelines of any oil or hazardous substance that threatens to affect natural resources. It also requires a revision and republication of the National Contingency Plan within one year which will include, among other things, a fish and wildlife response plan developed in consultation with NOAA and USFWS. Nothing in Subtitle B preempts the rights of States to require stricter standards for removal actions.

Subtitle C alters and increases civil and administrative penalties for discharges and violations of regulations under the Clean Water Act. As well as criminal penalties, other penalties are included for negligent operations and failure to comply with Federal law on carriage of liquid bulk dangerous cargoes, load lines, manning,m and crew complements and requirements. Financial responsibility and civil penalties may be assessed up to $25,000 per day. All penalties are to be paid into the Oil Spill Liability Trust Fund.

Title VII authorizes oil pollution research and technology development, including the establishment of an Interagency Coordinating Committee, that is chaired by Department of Transportation and comprised of representatives from the Departments of Energy, Interior, Commerce (NOAA), EPA, Federal Emergency Management Agency, National Aeronautics and Space Administration, and the U.S. Fire Administration.

Title IX amends the Oil Spill Liability Trust Fund and increases from $500 million to $1 billion the amount that can be spent on any single oil spill incident, of which no more than $500 million may be spent on natural resource damages.

ii. State Framework for Contingency Planning

After the spill from the Nestucca barge in 1988 off of Grays Harbor, Washington, the Governor of Washington and the Premier of British Columbia created the B.C./Washington Task Force on Oil

Spills. The mission of the task force was fourfold: 1) to seek ways to prevent oil spills; 2) to review oil spill response procedures; 3) to study methods of determining compensation claims; and 4) to develop a coordinated plan for preventing and responding to spills. Following the Exxon Valdez spill in 1989, Alaska, Oregon and California joined the task force and it was renamed the B.C./States Task Force. In its final report, the Task Force made 46 joint recommendations involving issues of vessel traffic, vessel design, personnel, enforcement, regulatory oversight, education, interstate cooperation, and future studies. The State of Washington proposed an additional nine recommendations for state action including efforts to reduce navigation conflicts (Final Report of the States/B.C. Oil Spill Task Force, 1990).

The Washington State Legislature adopted several provisions recommended by the States/B.C. Task Force. In 1991, the State Legislature passed Washington ESHB 1027 which establishes the infrastructure for marine spill response. Included in this infrastructure are the WDOE, the newly created Office of Marine Safety (OMS), the Maritime Commission, Regional Marine Safety Committees, the Board of Pilotage Commissioners, University of Washington Sea Grant, the Marine Oversight Board (MOB), and existing state agencies including Washington Parks and Recreation Commission, WDNR, WDW, WDF, and Department of Revenue.

The USCG (the Federal on-scene coordinator in coastal and tidal waters) has ultimate authority to coordinate and direct all Federal, state and private cleanup operations when discharges pose a substantial threat to the public health or welfare.

WDOE has primary responsibility for oil and hazardous substance spill response and clean-up on land and water. It focuses, however, on land-based oil storage operations.

The primary focus and jurisdiction of OMS is vessel oil spill prevention. OMS also has responsibility to ensure adequate spill response planning. The OMS has undertaken five initiatives to fulfill its responsibilities: 1) the establishment of four regional marine safety committees including one for the North Puget Sound/Strait of Juan de Fuca and one for the Outer Coast to address vessel operations and regional traffic patterns; 2) the adoption of tank vessel oil spill prevention plan rules to insure that individual vessels operations provide the best achievable protection from oil spills; 3) the adoption of cargo and passenger vessel screening rules to ensure that individual vessels do not pose a substantial risk of harm to public health, safety, and the environment; 4) a vessel monitoring program; and 5) education and technical outreach programs.

The regional committees were charged with preparing plans addressing the safe navigation and operation of tankers, barges, and other vessel traffic within its specific region. The plans must consider tug escort requirements, speed limits, anchorage designations, communication systems, congestion in shipping lanes, navigation aids, channel design plans, routings from port construction and dredging projects, routing vessels during emergencies, management requirements for vessel control bridges, environmentally sensitive areas, enforcement mechanisms, and adequacy of the Coast Guard VTS. The plans were submitted to OMS in May, 1993. OMS is currently reviewing the plans and will submit its recommendation by December, 1993. OMS will then implement the recommendations over which the agency has jurisdiction and will pass the recommendations for issues over which it does not have jurisdiction to the appropriate federal or state agency. The work of the committee has been ongoing and it will continue to make recommendations and update existing ones.

The OMS will be establishing an emergency response system for the Strait of Juan de Fuca after receiving recommendations from the regional marine safety committee. The emergency response system will address emergency towing and firefighting capabilities, and emergency response availability. The subcommittee recommendations have been submitted to the regional committees for review as of February 10, 1993. OMS' Vessel Screening Program will be used to select cargo and passenger vessels that pose a risk to the safety of Washington waters. These vessels will be boarded and inspected as a part of the Vessel Monitoring Program. Submitted Tanker Prevention Plans will be used by the Vessel Monitoring Program to select and board the tank vessels that pose a risk to the safety of Washington waters.

The Oil Spill Prevention Plan rules, effective in September, 1993, will require tankers and tank barges transiting Washington waters to file an oil spill prevention plan with the OMS. The plan must ensure that tank vessels demonstrate the "best achievable protection" from oil spills. The prevention plans must demonstrate minimum compliance with respect to staffing, vessel inspection programs, spill prevention training, prevention technology on board, English language proficiency by at least one bridge officer through procedures adopted by the vessel owner or operator. The Oil Spill Prevention Plan program will be implemented in three phases involving: 1) establishment of standards for interim prevention plans; 2) adoption of plans requiring detailed comprehensive information about a vessel and its operations to aid in defining "best achievable protection"; and 3) establishment of standards for achieving the best achievable protection. The best achievable protection standards are scheduled to be implemented by July, 1995. The 1993 Prevention Plans will be effective for five years. New plans will be required in 1998 and best achievable protection standards will be revised as required.

Commercial Vessel Screening rules, addressing cargo and passenger vessels over 300 gross tons will result in a data base of all vessels transiting Washington waters including information on the vessels cargo characteristics, the vessels operating characteristics, and operating environment, past incidents and human factors. All vessels are required to give 24 hour advanced notification of their arrival and include a safety report.

The vessel screening data base and submitted prevention plans will be used by the Vessel Inspection Program to select vessels that pose the greatest risk to the safety of Washington waters. These vessels will be boarded and inspected for compliance with state and federal regulations. OMS is studying the use of tax credits and other financial incentives to encourage industry compliance with safe marine transportation practices.

The Maritime Commission, established by the Legislature in 1990, is charged with: 1) developing first response oil spill contingency plans for covered vessels; 2) providing emergency oil spill response services for up to 24 hours of an oil spill incident; and 3) providing a 24-hour communication network for spill response notifications. Both of these functions have been contracted-the former to Foss Environmental and the latter to the Marine Exchange of Puget Sound. The Commission develops vessel contingency plans and is planning to maintain a database of vessel accidents.

Numerous state agencies provide spill response assistance and planning information related to resources that may be impacted by a spill. Education and outreach efforts are provided by the University of Washington Sea Grant and Washington Parks and Recreation Commission. The MOB provides independent oversight of the actions of the federal government, industry, the Department of Ecology, OMS, and other state agencies with respect to oil spill prevention and response for covered vessels and facilities. The MOB is comprised of five gubernatorial appointees, who, acting in an advisory role report to the Governor, and make recommendations to agencies and the State legislature.

iii. Response Readiness for Oil Spills

Many of the provisions established by Washington ESHB 1027 are similar to those promulgated by OPA90, including the requirement for vessels to have their own contingency plans approved by OMS before they are allowed to enter state waters. To meet the stringent contingency plan requirements of OPA90 and State legislation, many vessel owner/operators contract with an oil spill response contractor in the State which has the necessary equipment and trained personnel to respond to a "worst-case scenario" identified for their particular vessel.

While the USCG has ultimate authority over a marine incident, there are numerous response mechanisms and capabilities in the private, non-profit and government sectors to address a spill incident involving oil. If, at any time, the clean-up response effort is deemed to be inadequate, the USCG can step in and contract with a local resource, or call out the strike team in San Francisco which has large ocean lightering and pumping equipment and aircraft. The USCG can also call upon the resources of the Navy which has mobile skimmers, and pumping and lightering equipment. If the responsible party is taking proper action, the USCG and the state will monitor the events.

When a spill occurs, the Maritime Commission is called upon to respond during the first 24 hours unless the vessel has its own contingency plan and primary response contractor, after which the designated responder assumes control over the incident (House Bill Report ESHB 1027). Among the responders in the study area are one large cooperative (Clean Sound Cooperative), private contractors (Foss Environmental, Global Diving and Salvage Inc., and the Maritime Corporation - a division of Crowley Environmental Services), and the soon-to-be-established Marine Spill Response Corporation. A worst probable case scenario/plan is in place to enable all area agencies dedicated to oil spill response to combat a spill in Puget Sound of approximately 1,322,000 barrels.

Clean Sound Cooperative, organized in 1971, is a non-profit, regional oil spill response organization funded by its industry members including oil, oil pipelines and transportation companies. They focus on the containment of spills in open water up to 20 miles from shore. Clean Sound owns, maintains and operates a fleet of specialized oil spill response equipment and cleanup vessels stationed throughout Puget Sound at Bellingham/Ferndale, Anacortes, Edmonds, Seattle, Tacoma and Port Angeles. The cooperative also maintains more than 30 crew members and backup contractor crews. Its crews and equipment are prepared for immediate response, regardless of the location, time of day or weather conditions. Clean Sound plans to involve commercial fishermen in their response efforts by equipping vessels with oil containment barriers designed to fit their existing fishing net reels (McCartan, 1992).

Foss Environmental Services has contracted with Washington State's Maritime Commission to provide a first response system to a spill. This division also provides standby response services to several facilities and emergency oil spill response services to other potential spillers. Foss Environmental is a division of the tug and barge company of Foss Maritime. Foss maritime has approximately 65 tugs and 65 barges, although these tugs and barges are not dedicated vessels. Among these, there are approximately 15 tank barges in use in Puget Sound at any one time that can be called upon to assist a spill in inland waters

(Felton, 1992).

Foss Environmental has equipment pre-staged at eight locations around Washington State covering all of Puget Sound, the Strait of Juan de Fuca and offshore waters. This equipment is dedicated to marine spill response incidents. Pre-staging locations are Bellingham, Anacortes, Everett, Seattle, Tacoma, Willapa Bay, Aberdeen, and Port Angeles. The equipment is pre-staged to respond to a spill in all State waters navigable by vessels 300 tons and greater (with the exception of the Columbia River) within two hours. Their equipment includes nine fast response vessels capable of speeds in excess of 30 knots and equipped with 1000 ft. of boom; 34,000 ft. of boom aboard fast response vessels for rapid deployment with recovery capacity of over 20,000 bbls. per 24-hr. period at a 20% efficiency rating (1000 feet aboard each fast response vessel and the balance containerized for rapid deployment over land or by air); over 100 OSHA/HAZwoper trained response personnel and 30 standby personnel on-call 24 hrs./day 365 days/yr (Barton, 1992).

Global Diving and Salvage, Inc. is a private contractor specializing in salvage operations, and the cleanup of beaches, coastal and inland waterways, and rivers. They respond on a daily or weekly basis to incidents in harbors, ship canals and along the coast. Their inventory includes small coastwise tug-boats including a 70 ft. tug, a fleet of work boats, several thousand ft. of containment boom, a variety of skimmers, and a 40 ft. barge. They have no ocean-going vessels and no ocean-going equipment except high-capacity lightering systems which pump up to 300 gallons per minute (Craig, 1992).

The Crowley Environmental Service is a division of Crowley Maritime Corporation, the largest tug and barge company in the world. The Maritime Corporation, when approved, will concentrate on marine response efforts as opposed to beach clean up efforts. They have access to numerous barges and tugs, salvage operations, and are amassing booms and skimmers to operate in the marine environment. Due to the mandates of OPA90 and State Legislation, they will concentrate on Puget Sound and Washington State Waters. Expecting to be fully operational by the end of 1992, Maritime Corporation will preposition equipment in high risk areas yet to be determined (G. Douglas, 1992)

The Marine Spill Response Corporation (MSRC) will be in operation in 1993 to address catastrophic spills of over 25,000 barrels in open seas and 40,000 barrels in protected waters. Under MSRC's charter, the decision as to whether the spill exceeds local response capabilities will be determined by the USCG. MSRC is a not-for-profit organization funded by the Marine Preservation Association (MPA). MPA collects dues from oil, pipeline, and tug and barge companies. Both MPA and MSRC were formed on the recommendation of a task force organized after the

Exxon Valdez spill to examine existing resources for responding to catastrophic oil spills. MSRC is the response to the OPA90 provisions mandating that by 1993 vessels must be able to respond to catastrophic spills. MSRC has five regional centers throughout the United States and, if needed, they can call on personnel and equipment from other regions to assist. This ability will make it the largest oil response agency in the world. MSRC is not intended to replace existing oil spill cooperatives and independent response contractors. Rather, it will respond when the existing infrastructure does not have sufficient resources to respond to a large spill (Patterson, 1992).

There will be three pre-staging areas where MSRC's equipment, and, at times, vessels and personnel will be located. Pre-staging areas are planned for Everett, Bellingham and Port Angeles, WA as well as Astoria, Oregon. MSRC will provide a best-effort response to major spills of persistent oil (oils that do not evaporate or degrade quickly) in U.S. coastal and tidal waters (out to the limits of the U.S. EEZ) that are beyond the capacity of local response organizations. In addition to its own equipment and personnel, a variety of subcontractors will provide support.

Among the equipment inventory planned for the Seattle area is a 208 foot offshore response vessel, numerous smaller work boats, booms, skimmers and pumping equipment. A second response vessel will be moored at the Astoria site. Onshore facilities will include an 80,000 sq. ft. warehouse including administrative offices, a training center, test tank and a 24 hr. manned response center (Patterson, 1992).

As a result of OPA90 and Washington State legislation, all state waters are covered by numerous vessel contingency plans. In Washington State, there are currently no tugs and only two barges exclusively dedicated to oil spill response although the Marine Spill Response Corporation plans to dedicate two barges for oil spill response. These two barges are owned and operated by Clean Sound Cooperative. Supporting the barges dedicated to spill response, are a large number of tugs and barges in constant operation within Puget Sound which are available in the event of an emergency (Felton, 1992).

iv. Emergency Towing Response for Vessels and Tugs/Tows Adrift

While management of vessels into and through the Strait of Juan de Fuca and Puget Sound is well coordinated, and contingency planning has, and is, being addressed through a number of Federal, State, regional, private and non-profit initiatives, the very real possibility of a vessel or tug and tow losing power near the sensitive offshore habitats of the outer coast and

Strait has not been adequately addressed. There have been well publicized instances when barges and vessels have lost power causing, or threatening to cause, damage to coastal resources. Some examples in recent history include the grounding of the Nestucca barge in 1988 off of Grays Harbor involving a spill of over 200,000 gallons of oil, in addition to the Exxon Philadelphia and Exxon San Francisco which lost power off Cape Flattery in 1989.

Although there are contingency plans in place, no response strategies exist to respond to such occurrences off the Washington Coast and in the Strait of Juan de Fuca. No vessels are specifically designated to respond to an emergency in which a vessel or tug and tow loses power in these areas. While there are several major towing and salvage companies in the area, the time of response to an emergency occurring off the outer coast requiring towing would depend on both vessel availability and distance from the scene of the incident. Emergency response could be significantly delayed due to prior assignment of response vessels to other towing, docking, or salvage operations, or the remote location of an incident from available vessels.

The United States Navy has several tugs in the Puget Sound area, however all are yard craft rather than ocean going vessels. Further, none are dedicated, nor readily available for emergency response. In addition, the U.S. Coast Guard has no tugs in the area (COMSUBGRU 9, 1992). The initial USCG response to a drifting vessel or tug and tow are primarily Search and Rescue missions aimed at protecting human life. The Canadian Coast Guard operating from Victoria has five vessels: two are assigned primarily to search and rescue missions, and three are buoy tenders. In an emergency, one of these vessels might be able to render assistance to a small disabled commercial vessel or drifting tug and tow (Cheng, 1992).

The OMS, with the benefit of recommendations from, and in coordination with the regional marine safety committees and the Marine Oversight Board, and in consultation with the province of British Colombia, is mandated by the legislature to establish an Emergency Response System for the Strait of Juan de Fuca. The system will address emergency towing capability for vessels in these waters.

4. Military Activities

Military activities in the area of the Sanctuary consist of subsurface, offshore surface, and aerial operations. Navy submarines homeported in Puget Sound conduct three types of operations within the sanctuary study area: 1) transit between Puget Sound and the undersea operating areas; 2) hull integrity tests and other deep water tests of 1 to 2 weeks duration, which are performed in a rectangular area between 7 to 30 miles off

Cape Johnson; 3) in-water testing of non-explosive torpedoes, 6-8 times per year, lasting from 1 to 4 days, in a rectangular area 5 to 14 miles off Kalaloch; and 4) the barging of defueled nucleau reactor compartments from Puget Sound to the Columbia River.

Ongoing operations near the entrance to the Strait of Juan de Fuca include surveys for hidden obstacles by Navy minesweepers to ensure that in the event of hostilities or other incidents affecting national security, Navy ships would be able to pass safely to sea. The details of these operations are classified, however, they are generally limited to passive surveying and do not involve active sweeping or clearing. The Navy also operates an acoustical net off Washington, with its operations base located at NAS Whidbey Island.

The Seattle Sectional Aeronautical Chart shows two Warning Areas (W-237A and W-237B) which are designated training and operating areas for the Pacific Fleet air and surface forces, two Military Operation Areas (MOA Olympic A and B), and Restricted Area R-6707 (Figure 47).

The two Warning Areas extend from three miles off the coast out to a distance well beyond the sanctuary study area, from approximately 48°09'N latitude due south to approximately 46°55'N latitude. Air operations in W-237A (the southern half of the study area) include air combat maneuvering, air intercept, air refueling, air-to-air gunnery and rocketing, air-to-surface gunnery and missile exercises, anti-submarine warfare training, and other training evolutions, at altitudes from the surface to 50,000 feet above mean sea level. In W-237B area, air operations are basically the same. In W-237A, ordnance is expended under controlled conditions that attempt to minimize threats to the living environment and to ensure the safety of other ships and aircraft that may be operating in the area. Anti-submarine warfare operations require the expenditure of sound receiving and transmitting buoys, called sonobuoys, as well as marine smoke markers from aircraft. Sonobuoys eventually flood and sink to the bottom after use.

Surface operations in W-237 consist primarily of routine transit, single and multiple platform maneuvering, as well as live firings of guns, missiles, torpedoes, and chaff. Any vessel or aircraft requiring exclusive use of W-237 schedules the area with NAS Whidbey Island. For calendar year 1991, W-237 was scheduled for 2,572 hours out of a possible 8,760 hours. During this time frame there were a total of 575 events. According to Boeing and the Federal Aviation Administration, these events were distributed as follows: 156 Navy aircraft, 224 Air Force aircraft, 131 Coast Guard aircraft, 10 Navy ships, 27 coast guard ships, and 27 civilian aircraft.

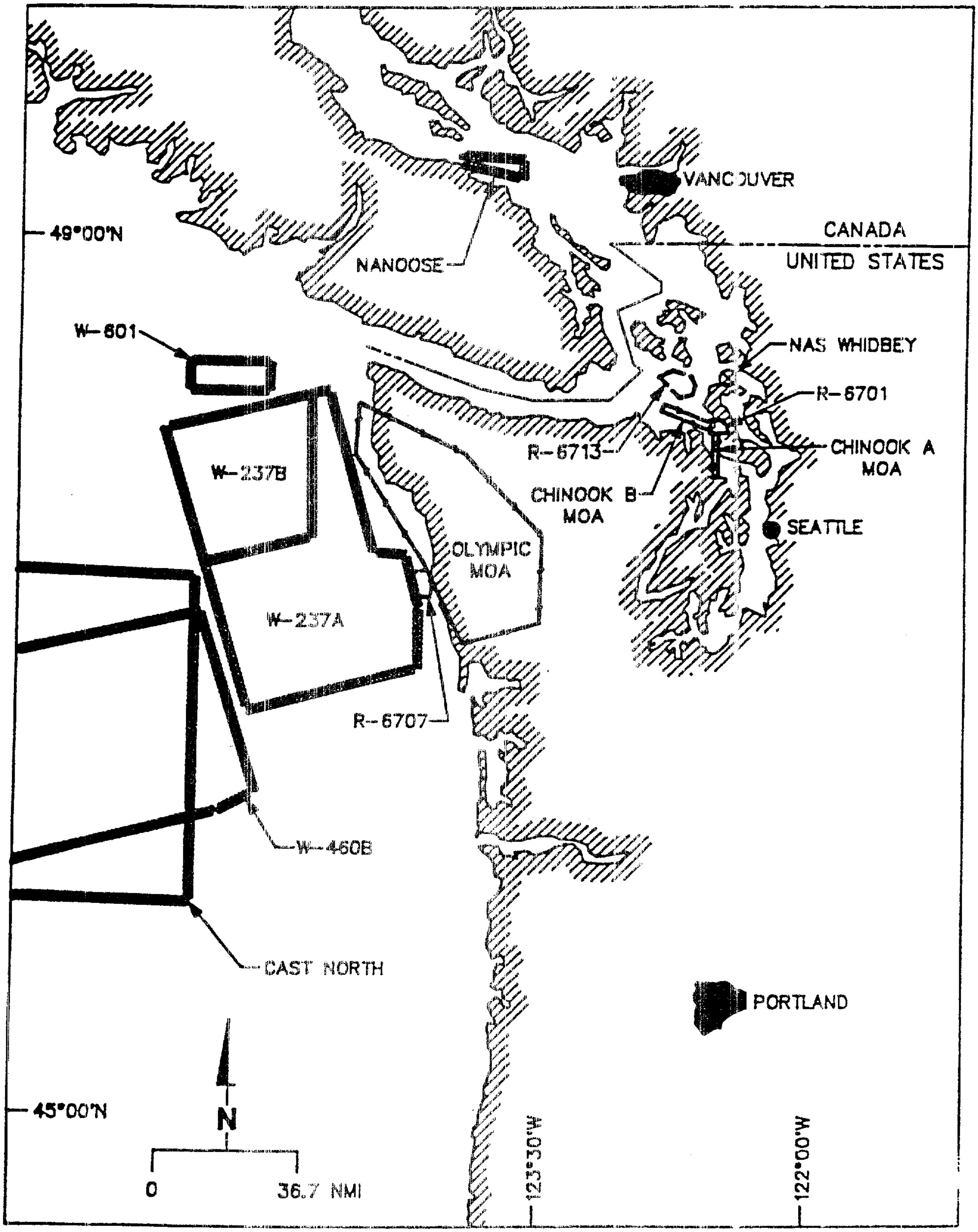


Figure 47. Zones of Military Activity off Washington Coast, (Whidbey Island Complex, West).

The Navy operates and maintains an undersea test range located in Navy Operations Area W-237-B (Figure 48). This range is known as the Quinault Range, and is instrumented to track air craft, surface vessels, submarines, and various undersea vehicles (non-explosive torpedoes, mines, counter-measures, etc...) for both the Navy and private industry. The range is available for operation year round, and test operations are typically conducted 8-15 times per year, each operation lasting from 1-7 days. In all cases, only non-explosive testing is conducted.

The typical test scenario in the Quinault range involves: 1) oceanographic measurements prior to a test exercise; 2) test vehicle launching; 3) underwater and above water tracking of participating craft and test vehicles during the test; and 4) recovery of all test vehicles from the water surface by vessel or aircraft or from the seabed by vessel and remote controlled recovery vehicle at the conclusion of the test exercise. The above-water tracking instrumentation uses standard Global Positioning System and radio telemetry equipment and covers the range and surrounding area as required to conduct operations. The undersea instrumentation, all located on the ocean floor, consists of tracking sensors connected by coaxial cable to junction boxes. The junction boxes are connected by fiber optic and coaxial cables to the range's shore termination sites at Kalaloch and Pacific Beach.

The range is located approximately 7.5 miles off the Washington coast at Kalaloch within Military Operating Area W-237 and its area is approximately 30 square nautical miles, centered at latitude 47°30'N and longitude 124°37'W. The location and/or size of the undersea tracking area is adjusted from time to time to support specific Navy testing requirements, but it remains within W-237.

There are a variety of activities that take place within the sanctuary area in support of Quinault Range use and maintenance. Testing operations are supported by a variety of surface and air craft. Vessels transit to the range, position and temporarily moor throughout the test areas, and launch and recover test vehicles as required to meet test objectives. Navy aircraft are periodically used to launch test vehicles and helicopters provide range surveillance and may be used for test vehicle recovery. Helicopter operations include staging at shore sites, typically Forks or Pacific Beach, and transit to and from test areas, at altitudes from the surface to approximately 1,000 feet above mean sea level. Testing of autonomous and acoustic homing vehicles involve sonar searches and sonar target size measurements. Maintenance requires replacement of underwater instrumentation and cabling in the identified range area and along paths to shore termination sites. Maintenance activity involves using temporarily anchored surface vessels to support retrieval and placement of underwater sensors, junction boxes and cable laying

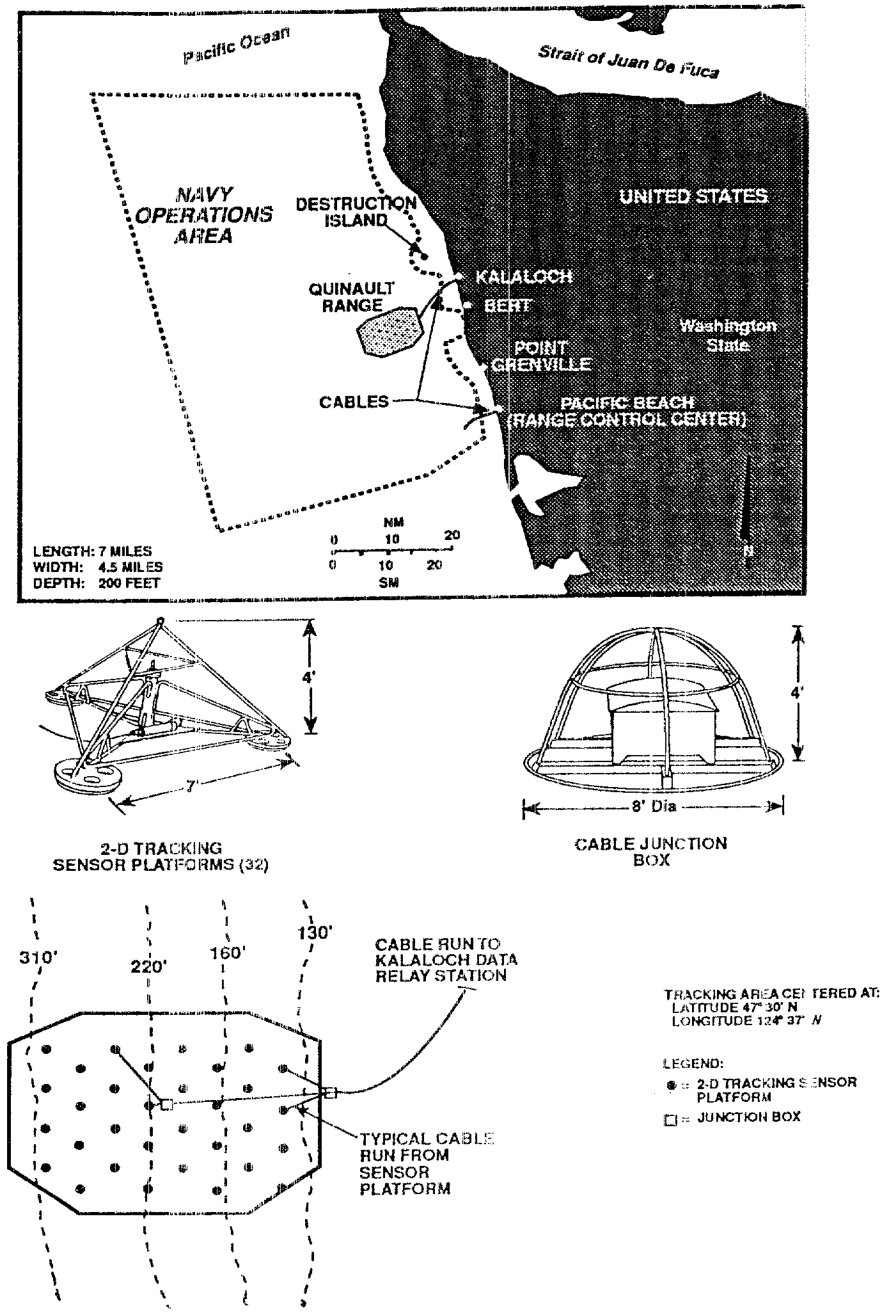


Figure 48. Quinault Range Tracking Area and Bottom-Mounted Instrumentation.

on the seabed.

Navy ranging activities primarily produce the type and level of discharges associated with normal surface vessel traffic. On rare occasions some of these activities are conducted outside W-237 due to unique conditions or requirements such as lost/sunken vessels or equipment, requests for assistance by other groups, and classified operations. For example, the Ex-BUGARA (sunken submarine located off Cape Flattery) is used for Naval undersea test tracking operations.

The Navy regards W-237 to be a key part of the Pacific Fleet offshore training complex in the northeast Pacific, which is essential to unit training, and overall Fleet readiness. For air operations, W-237 is particularly desirable from a cost standpoint because it is close to the coast and therefore requires fewer flying hours and steaming hours to reach. The importance of these areas is expected to increase by the mid-1990's with the addition of a carrier battle group at a new homeport in Everett, Washington. Puget Sound will become home to several additional Navy warships and support vessels, and the relatively few surface operations currently conducted off the Washington coast should increase, although the exact number of the increase is unknown. Operating costs will drive the need to conduct routine battle group training in W-237 and the surrounding operating areas.

The Olympic MOA A and B, which are primarily over land, also extend three miles offshore throughout much of the sanctuary study area. Air operations within the Olympic MOA's include combat tactics, flight training, intercepts, instrument training, tanking, and formation at altitudes from 6,000 to 35,000 feet above mean sea level; but this is not to be below 1,200 feet above the ground. No ordnance is allowed. The MOA is scheduled for approximately 1,300 hours of a possible 8,760 hours per year.

A restricted air space (R-6707) extends from the coast out four miles just south of Queets and north of Taholah (Figure 49). The following described actions conducted in this training area were, until recently, considered vital to national defense. With the downsizing of the Navy, however, this training site is no longer considered as vital to Fleet readiness.

Sealion Rock, a 80' by 30' uninhabited volcanic rock, awash at high tide, was historically the sole target within R-6707. It is located at 47° 27' N latitude and 124° 24' W longitude, approximately 2.7 nautical miles off the coastline. This site was used exclusively as an alternate practice bombing range for Navy A-6 aircraft from NAS Whidbey Island, and from aircraft carriers in the North Pacific during Fleet exercises. Only inert ordnance was dropped, and only in accordance with established flight procedures detailed in an approved Operations Plan.

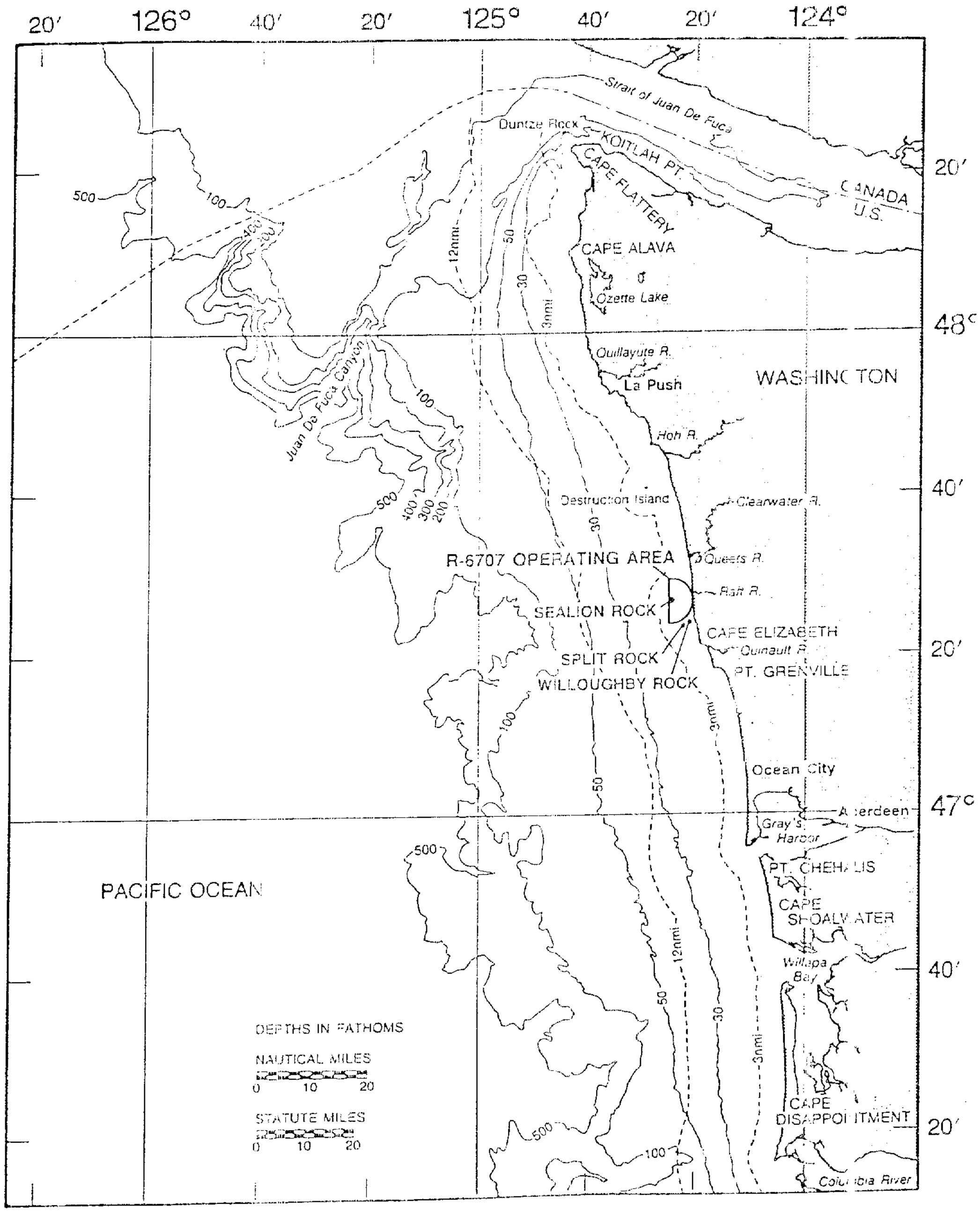


Figure 49. Restricted Airspace R-6707.

Procedures in the flight operations plan dictated a north to south pass from Destruction Island to Sealion Rock. Aircraft were not to descend below 3,000 feet until they were two miles south of Destruction Island. All exit turns were to the west, away from the coast. Prior to practice bombing runs, a clearing pass was undertaken over Sealion Rock to clear the rock of marine mammals. If any marine mammals remained on the rock, an additional clearing pass was required. All clearing passes were below 500 feet.

The primary and alternate routes by which Navy planes arrived at R-6707 is depicted in Figure 50. Prior to entry into the Olympic MOA, aircraft operated on instrument flight rules (IFR) under positive control of the Seattle Center aircraft traffic control at altitudes of between 6,000 and 23,000 feet above ground level. Within the MOA, the aircraft operated on visual flight rules (VFR) at altitudes ranging from surface to 6,000 feet. Aircraft continued to fly as VFR traffic at altitudes ranging from SFC to 6,000 feet into R-6707 (Munsell, 1992).

Statistics on the number of days per month and days per year that A-6 aircraft originating from Whidbey Island and the Pacific Fleet used Sealion Rock from 1986 through 1992 is presented in Figures 51 and 52, respectively. Usage of Sealion Rock has declined from 18 to 5 days per year from 1986 to 1992. Likewise, the number of hours in which A-6 bombers have maneuvered over Sealion Rock has declined from 31.35 hours in 1986 to 9 hours in 1992. The number of aircraft from the Pacific Fleet carriers that actually dropped inert ordnance on Sea Lion Rock is unknown.

Permission to use Sealion Rock and three other coastal islands and rocks located in each of the three National Wildlife Refuges was granted to the Navy by the Secretary of the Interior in May, 1944. The Navy was denied permission to use a fifth rock, Carroll Island, because of nesting activity. The Navy's use of the islands was to cease six months after the end of World War II. In July, 1949, the permission was amended to allow the Navy to use Sealion Rock indefinitely, while permission to use the other three coastal islands and rocks was rescinded.

The Navy funded a study conducted by the Washington Department of Game during 1984-85, to evaluate the impact of inert bombing activities on wildlife in the Sea Lion Rock study area which extended from near Pt. Grenville north to Destruction Island. It was bounded on the east by the shoreline and extended out to the west approximately seven kilometers. The primary study area was located between Pt. Grenville and Tunnel Island.

As a result of the study, existing flight patterns were changed to limit all departures to the west to minimize any flights over adjacent islands and rocks (e.g. the flight pattern

Enclosure 2

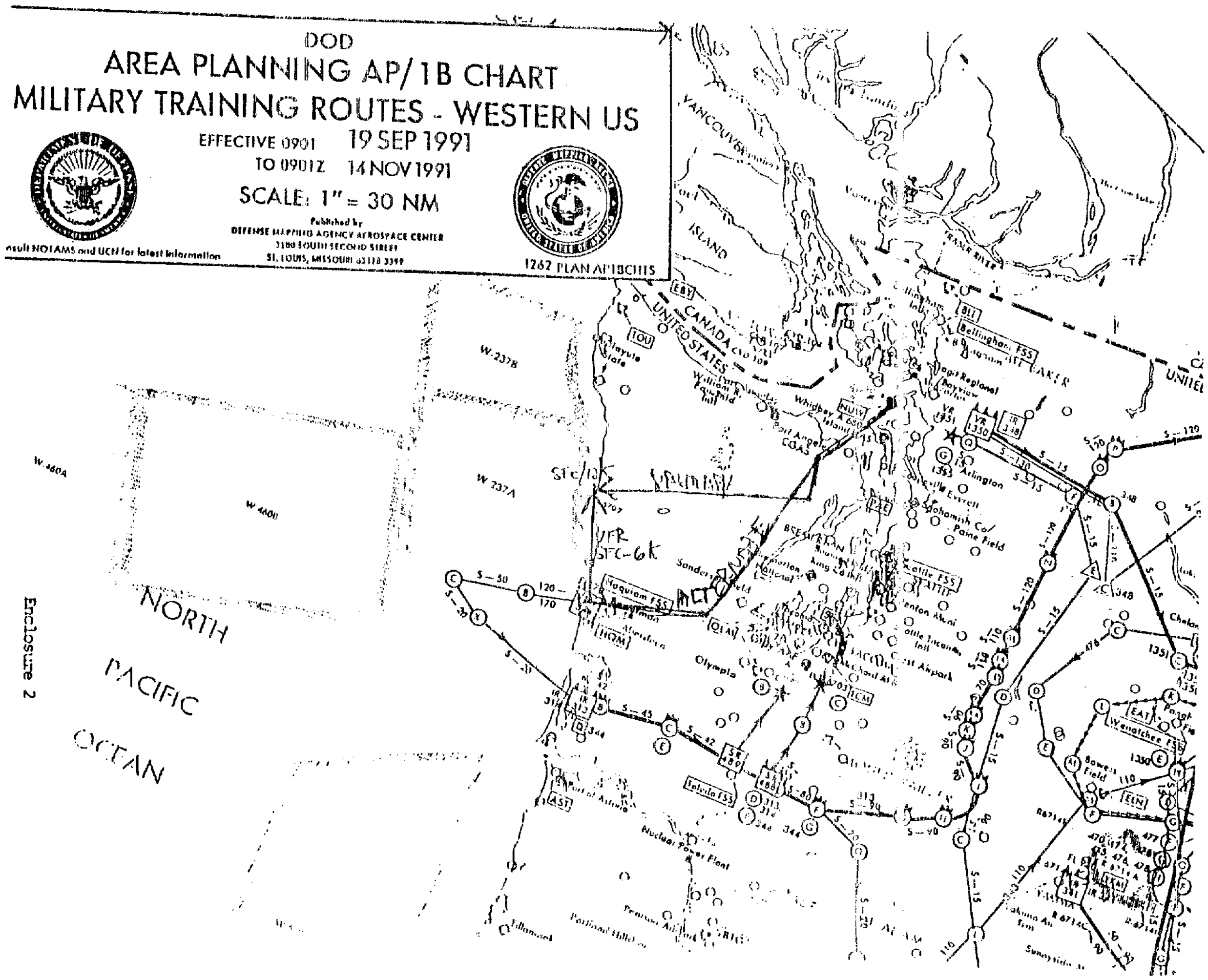
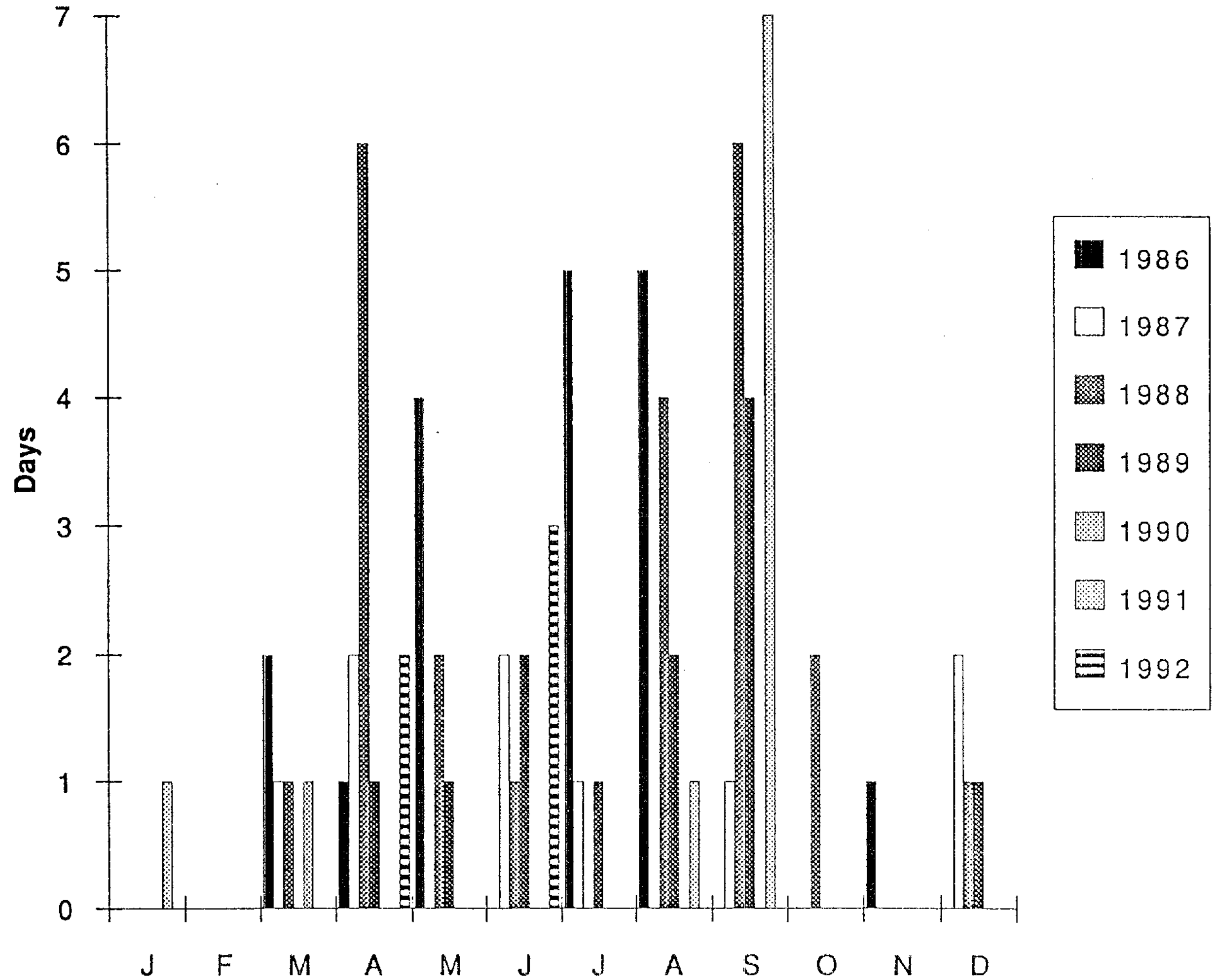


Figure 50. Flight Paths by Aircraft Transiting from Whidbey Island Naval Airforce Base to R-6707 (Whidbey Island Naval Air Station, 1992)

NAVY USE OF SEALION ROCK FROM 1986-1992 (DAYS/MONTH)



Source: Whidbey Island Naval Air Station, 1992

Figure 51. Number of Days/Month Navy has Used Sealion Rock From 1986-1990 (Whidbey Island Naval Air Station, 1992).

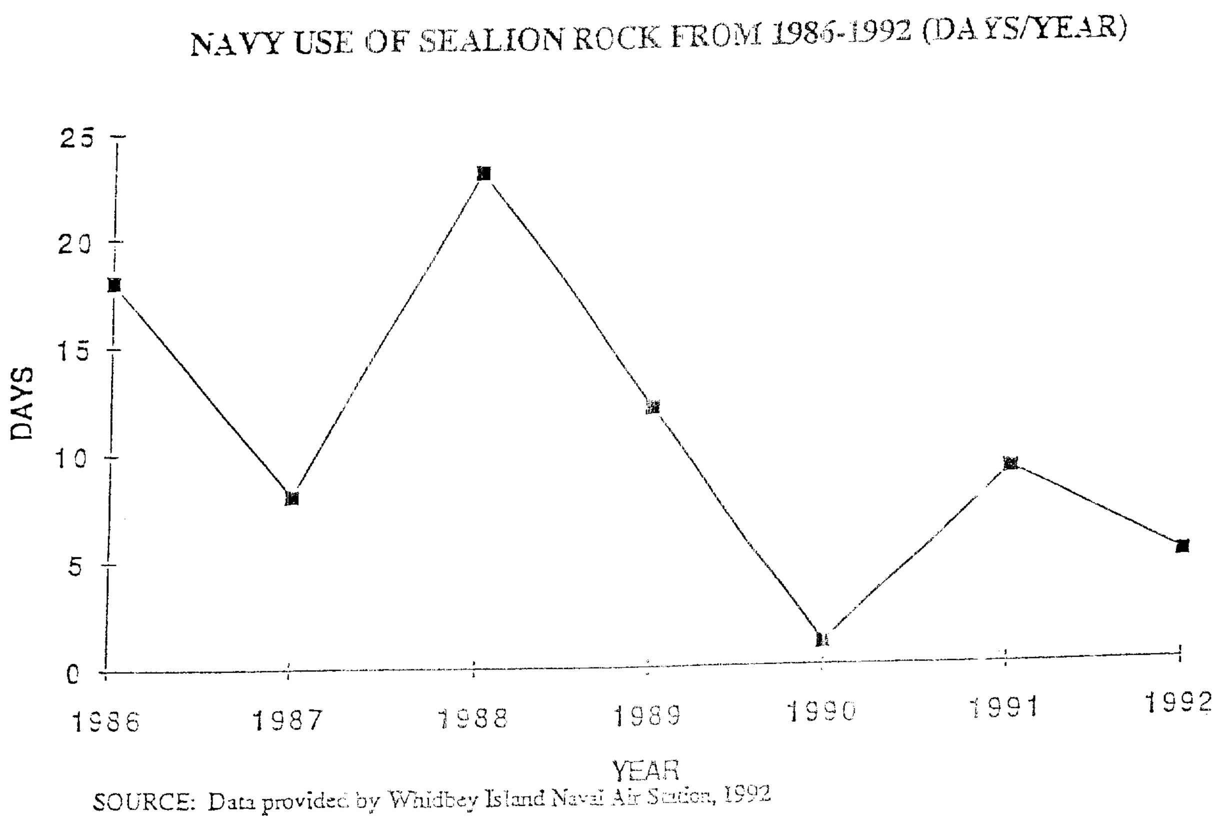


Figure 52. Number of Days/Year Navy has Used Sealion Rock from 1986-1991 (Whidbey Island Naval Air Station, 1992).

was altered to reduce noise levels reaching wildlife habitats on rocks 3.5 miles away). The study also confirmed that nearby Split Rock and Willoughby Rock wildlife habitat areas, 3.5 miles to the South of Sealion Rock, had been mistaken for the target sometime in the past. The study concluded that "A-6 activities conducted in accordance with the Operations Plan (i.e., all departures are to be to the west) result in minimal, and apparently insignificant, impacts on wildlife."

The study's conclusions and methodology, however, have been widely criticized because: 1) the study was conducted during an El Nino year; 2) the study should have conducted population studies of birds and mammals for a much longer period of time to account for variation in environmental conditions; 3) the study did not include an examination of a "no-use" alternative, and thus comparative analysis was absent; and 4) the researchers were unaware of all military overflights in the area during the study, and therefore total impacts of military overflights were not accounted for (Troutman, 1993). The environmental impact of bombing activities under the revised flight operations plan has not been investigated.

Although the Navy agreed to certain mitigating measures requested by USFWS to reduce the impacts of practice bombing activities (increased pilot education, radar monitoring, consultation with the NMFS for purposes of obtaining "incidental take" authorization under the MMPA and the ESA), it would not agree to a seasonal cessation, i.e., during the breeding season, of its bombing activities.

The regional office of the USFWS and the Marine Mammal Commission requested that the Department of Interior either rescind or modify the Navy's permit to prevent bombing during the breeding season for seabirds. The regional office of the USFWS, pursuant to its responsibilities under the Refuge Administration Act, performed a compatibility determination and found that the Navy's use of Sealion Rock was incompatible with the purposes for which the refuge was established. Notwithstanding the regional USFWS office's determination of incompatibility and the Navy's refusal to cease bombing practice during the breeding season, the Director of the USFWS did not rescind the Navy's permit because of national defense considerations.

On October 22, 1992, several environmental groups (Defenders of Wildlife, Natural Resources Defense Council, Inc., National Audubon Society, American Oceans Campaign, the Wilderness Society and Washington Environmental Council) filed suit in the U.S. District Court for the Western District of Washington against the Department of Interior, USFWS and the Navy to enjoin the Navy's practice bombing activities over Sealion Rock. Thereafter, the Navy announced that it would no longer use Sea Lion Rock for aerial target practice. On August 18, 1993 the Secretary of the

Interior rescinded the permit issued in July, 1949 authorizing Navy access to Sea Lion Rock for practice bombing activities. As a result of the Secretary of Interior's action, the Navy can no longer use Sea Lion Rock for practice bombing excercises.

The Navy regards Pacific Fleet operations off the northern coast of Washington as essential to Fleet readiness. Navy environmental protection policy precludes discharge of fuel oil, medical wastes, plastics, and other pollutants into the water, and prescribes immediate containment and clean up procedures in the event of accidental discharge. Fuel dumping by aircraft is also precluded except as necessary for safety of flight, and then only above 6000 feet.

5. Ocean Waste Disposal

Regulation of dumping of materials, including dredged material, into ocean waters falls under sections 102 and 103 of the MPRSA. These sections of the law are jointly administered by the EPA and COE. Responsibility for designation of sites and permitting of disposal other than dredged material has been delegated to EPA Region 10. The COE, in consultation with Region 10, is the permitting authority for dredged material.

Management of ocean dredged material disposal sites, including necessary monitoring, is a shared responsibility between the appropriate Corps district (Portland or Seattle) and EPA Region 10. Dredged material proposed for ocean disposal must comply with criteria in 40 CFR 220-228. In February 1991, the COE and EPA released Evaluation of Dredged Material Proposed for Ocean Disposal: Testing Manual (the Green Book) which provides a framework for testing of dredged material. Many of the techniques described in the Green Book have been standard practices in Region 10 for several years. Based on past and current testings of dredged material disposed in open water and monitoring at open water sites, no significant adverse environmental effects have resulted from past or ongoing disposal (Findley, 1991).

The regulation of point source discharges in Washington through EPA NPDES permits is the responsibility of the WDOE. NPDES permits for tribes, however, are granted directly from EPA. WDOE classifies the waters of the state into different categories. Washington's coastal waters are classified class AA which is the highest water quality rating. The waters in the estuaries of Grays Harbor and Willapa Bay are classified class A, a slightly lower water quality rating.

Because of the undeveloped nature of land adjacent to the sanctuary study area, it is a relatively unspoiled area. Pollution from traditional sources (e.g., wastewater treatment plants, industry and urban runoff) is very low. Drainage areas which eventually feed into the sanctuary study area are shown in Appendix C (Map 3). There are no major industrial dischargers within the study area. There are seven major dischargers that discharge adjacent to study area 7 including two pulp mills, two sewerage systems, and three seafood processing plants (Appendix C, Figure 3, Tables C1-C4). Pesticide use is very low relative to other areas of the U.S. west coast (Appendix C, Figure 4). Except for inputs of "total suspended solids" from paper mills, the greatest source of suspended solids in the sanctuary watershed is from non-point source runoff from forest land.

(a) Point-Source Discharges

Based on information collected in 1985 by NOAA's National Coastal Pollutant Discharge Inventory Program, there are 72 point source discharges in the watersheds draining into the sanctuary study area (Appendix C, Table C1). Fifty-six of these are industrial or commercial dischargers; sixteen are wastewater treatment plants (WWTS). Five of the fifty-six industrial/commercial dischargers are classified as major dischargers. Two are large pulp and paper mills discharging to the Grays Harbor estuary, and three are seafood processing and canning plants. Two of the seafood processors discharge to Willapa Bay, while the other discharges to Grays Harbor.

The two pulp mills discharging near the study area rank in the top half of the 21 major pulp, paper and paperboard mills on the west coast with respect to pollutant discharges. They rank seventh and ninth out of 21 facilities with respect to volume of wastewater discharged, and fourth and sixth out of 21 plants with respect to discharge of oxygen demanding materials.

Of the nine major seafood processors discharging to the U.S. west coast, the plants discharging near the study area are the top three in terms of volume of flow and oxygen demanding materials discharged. The DOMSEA Farms plant in Rochester is the most important seafood processor on the West Coast in terms of discharges.

Only two of the fourteen WWTPs are classified as major facilities. Both discharge into the Grays Harbor watershed. Relative to other major WWTPs on the west coast, these are very small dischargers.

A tribal sewage treatment plant on the Makah Reservation presently discharges primary treated wastewater into the Waatch River. The National Fish Hatchery discharges recycled water into the Tso-Yess River. The Makah are planning to upgrade their treatment facilities by either creating a lagoonal treatment system on land which would achieve at a minimum secondary treatment, and during low usage times of the year, tertiary treatment or repairing their discharge pipe and discharging into the Strait of Juan de Fuca just east of Koitlah Point.

The sewage system at Taholah on the Quinault reservation is near capacity utilization. Sewage lagoons at Queets are threatened with erosion from the nearby Queets River.

Sewage disposal on the Hoh reservation is via septic tank and is considered inadequate. The Tribe is evaluating a more systematized treatment process. Solid waste is now transported to Sequim, east of Port Angeles. This procedure is considered expensive and alternatives are being sought.

The sewage system on the Quileute Reservation is in desperate need of repair. The collection system consists of approximately 12,100 ft. of gravity sewer, 3,900 ft. of forcemain, and three pump stations. The treatment system is biological and consists of three mechanically aerated concrete cell/lagoons, a gas chlorination contact chamber, and discharge to a beach drainfield. The community sewer system is operational even though many of the system components are no longer functional. The system is presently being operated manually as many of the automatic controls are non-functional. The system has a history of failures due to malfunctioning equipment and/or deterioration from salt air corrosion. Overflows have occurred to the boat basin and in the street. High water and rough ocean wave action has caused exposure of pipes in the drain field. It is postulated that the beach drainfield has damaged the once existing razor clam beds (Schaftlein, 1992).

The Quileute Tribe is in the process of hiring a consulting firm to develop a wastewater facility plan. The plan will analyze the existing sewage system and provide recommendations and cost estimates for improvements to the sewage collection, sewage treatment, and sewage disposal systems. Particular areas of concern include; sludge handling and disposal, identification of the most appropriate sewage treatment and disposal methods, and reduction of present operations and management burdens.

(b) Non-Point Source Discharges

The greatest source of non-point source discharge is runoff from forest lands (Appendix C, Figures 5-7). The coastal counties adjacent to the proposed sanctuary study area (areas 4 and 7) may be characterized as having relatively minor agricultural activity, with an average agricultural acreage by county of only 3.6%. The major crops, excluding pasture/range, are alfalfa, barley, corn, wheat, and peas. According to NOAA's National Coastal Pollutant Discharge Inventory, which maintains a data base of estimates of pesticide use for 28 commonly applied agricultural pesticides, the highest application of pesticides by county for areas 4 and 7 occurs in Grays Harbor county, with 6,836 pounds (base year of 1982). This is a relatively low amount compared to a major agricultural area such as San Joaquin county in California (98 percent agricultural), where an estimated 658,000 pounds of the 28 agricultural pesticides were applied. As is typical with most pesticide application, herbicides make up the majority of the amount applied in the sanctuary area. It should also be noted that Clallam and Jefferson counties extend inland to Puget Sound, thus the total amount of agricultural pesticides applied in drainage areas feeding the waters of the sanctuary study area is probably less than the estimates above which use whole county figures.

(c) Ocean Dumping of Industrial and Dredge Material

Although no ocean dumping currently takes place within the proposed sanctuary, the coastal and offshore waters of Washington have been used for the disposal of various materials. Low-level radioactive wastes were disposed of prior to 1970 at several sites over 300 miles northwest of Cape Flattery, well outside of the proposed sanctuary study area. This dumping was discontinued in 1970. Explosives and toxic chemical munitions have been dumped in the past at one site 66 miles and another site 34 miles west of Cape Flattery.

Industrial wastes have been dumped at two sites off Cape Flattery. One site, located within the boundaries of the proposed Olympic Coast National Marine Sanctuary, was only 5 miles from shore; the other, located outside the boundaries, was 75 miles offshore. An exhaustive search of the literature and records of the EPA and COE to determine exactly when and what materials were dumped at these sites yielded nothing more definitive than information included in a report prepared for EPA by a private contractor entitled Ocean Disposal of Barge and Solid Wastes From U.S. Coastal Cities (Smith and Brown, 1971). Although the report does not specify the types and quantities of wastes dumped at the site, it indicates that the wastes were classified as industrial, which could include refinery wastes, spent acids, pulp and paper mill wastes, chemical wastes, oil drilling wastes, and waste oil and sewage sludge. There is no indication as to when the wastes were dumped. However, given that the report only includes sites active during the period 1951 to 1971, it can be assumed that industrial wastes were dumped sometime during that period.

Information on these dumpsites from NOAA Hazmat, EPA and the COE is limited because much of the documentation the Corps maintained on marine waste dump sites in the Pacific Region was lost/destroyed during the transfer of the ocean dumping program from the COE to EPA in the early 1970s. The regional COE office has indicated that it is unaware of any dumping activity occurring off the Washington Coast between the years 1971 and 1988.

Dredged material is the only material currently being dumped in coastal waters. Spoils from the maintenance dredging of Grays Harbor are deposited near the entrance to the harbor where they are flushed out by tidal currents. Spoils from dredging of the Columbia River are dumped at the mouth of the river and at three sites located two to four miles offshore. The annual average amount of dredged material disposed off the mouth of the Columbia River exceeded 5 million cubic yards per year between 1974 and 1987. The dredged spoils from a proposed major channel deepening project at Grays Harbor are proposed to be deposited at three sites: the current maintenance site near the harbor entrance, a site 3.9 nautical miles offshore and to the southwest west of the harbor entrance (Southwest Navigation site), and a site 7.1 nautical miles offshore and west-northwest of the harbor (Eight-Mile site). These latter two sites were officially designated by EPA Region 10 as ocean disposal sites for dredged materials, effective August 6, 1990 (FR, Vol. 55. No. 129, July 5, 1990, pp. 27635-8cv).

6. Hard Mineral Extraction

Under the Outer Continental Shelf Lands Act of 1982, as amended, the Department of the Interior is charged with administering the mineral development of the OCS. The Secretary of Interior is authorized to lease any minerals, other than oil, gas, and sulphur, on the OCS on the basis of competitive bonus bidding. The Secretary also has the responsibility for the design, implementation, and management of OCS minerals development. In the U.S., industry interest in OCS mining has been focused on eight heavy metal placers, strategic minerals, sand and gravel, and phosphorate. Furthermore, gold is being recovered in State waters near Nome, Alaska, and sand and gravel in New York State Waters.

Marine mineral resources known to exist along the outer coast of Washington include gravel and titaniferous black sands. To date, there has been no production of these offshore minerals in either state or federal waters.

Gravel deposits are found in Federal waters from Cape Flattery to Grays Harbor, with large deposits concentrated off Cape Flattery and offshore from the Hoh, Quinault, and Chehalis Rivers. Gravel at depths of less than 50 meters can be mined with a suction dredge. Lasmanis (1988) estimates that at least 144 million cubic yards of gravel exist at this depth or shallower, and these deposits have the highest potential of any offshore minerals for exploitation by the year 2000.

Titanium and iron-rich black sand deposits are found south of the proposed sanctuary. Large deposits have been found from the intertidal areas out to two miles from shore near the mouth of the Columbia River and off of Willapa Bay. Sands have also been found at Copalis and Moclips that contains minor amounts of gold. It is unlikely that mining these sand deposits will be economically viable in Washington waters within the next 20 years.

The only mineral-related activities that have taken place in state waters have been the exploration for and attempted development of the black sands. Five companies have been involved in commercial activities: National Lead Company explored in Grays Harbor in 1949; NARECO, Inc. explored near the mouth of the Columbia River in 1959; Washington Mineral Products, Inc. and Beach Mining, Inc. explored in the Cape Disappointment area; and Columbia Ocean Minerals, Inc. explored off Benson Beach and Ilwaco in 1986.

Onshore production of gold from beach sands did occur from about 1894 to 1908 on a strip of beach from 10 miles south of Cape Flattery to 6 miles south of the mouth of the Ozette River (Weissenborn and Snavely, 1968). Presently, no onshore mining is occurring in these counties except at Twin River quarry on the Strait of Juan de Fuca.

7. Overflights

All aircraft flying over the Sanctuary can legally fly unrestricted. When there are military operations within the MOA over the Peninsula, non-military airplanes stay below 1,200 feet. Most aircraft that land at airports on the Peninsula (Sekiu, Quileute, Copalis) are small recreational airtaxi or commuter planes.

The 1992 statistics compiled by the Federal Aviation Administration (FAA) indicate that the total number of operations (landings and takeoffs) at the Quileute Airport for a 12 month period ending July 18, 1992 totalled 4,800. Included in this statistic is one scheduled cargo plane per day 5 days per week. There were 2,600 operations recorded at the Sekiu airport for the 12 months ending March 20, 1991. Copalis Airport, located on the beach is accessible only at low tide and could be closed due to obstruction from drift wood. There are an estimated 300 operations at Copalis Beach per year with most planes recreational or chartered flights that land on the beach for short periods of time.

Other overflight activity over the Sanctuary include those engaged in enforcement activities (USCG) and marine mammal and seabird monitoring efforts conducted by the NMFS and the USFWS.

8. Research and Education

Although the diverse habitats and pristine nature of the outer coast provide outstanding opportunities for scientific research and education, much of the area has not been studied in detail. The 60 mile stretch of shoreline within Olympic National Park is virtually unstudied despite its relative accessibility (Dethier, 1988). Research programs have been and are being conducted by several universities, the USFWS, NPS, NOAA's NMFS, and the Northwest Indian Fisheries Commission (NWIFC). This research has provided valuable baseline data on the resources present and on the impacts associated with recreational uses and potential offshore oil and gas development.

Researchers with the NPS surveyed the invertebrate and algal species associated with intertidal zones, and monitored the recreational impacts on intertidal biotic communities at three sites along the Pacific Coastal Area of the Olympic National Park (Kendrick and Moorhead, 1986). The University of Washington has conducted research on the biological and oceanographic characteristics of the coastal and offshore waters of the outer coast. Dethier (1988) studied and classified the marine habitats along the Pacific coastline of Olympic National Park and gathered baseline data on abundances and diversities of the biota in these habitats. Permanent transects were set up across four intertidal areas to allow for periodic monitoring. Landry and Hickey (1989) present the results of research sponsored by the Department of Energy (Washington Sea Grant is sponsoring the publication of results) on the physical, chemical, geological, and biological processes occurring on the continental shelf off of these two states.

Western Washington University (Terich and McKay, 1988) researchers studied transport along the coastline of Olympic National Park. Using a sediment budget approach, the researchers studied the shoreline as a sediment system, with sediment sources, sinks, and exchanges.

In anticipation of the planned Federal oil and gas lease sale 132, the State of Washington appropriated $400,000 to Washington Sea Grant and requested that they conduct studies that would enable the State to be better able to address the issues associated with potential oil and gas development off its shores. The resulting Ocean Resources Assessment Program (ORAP) synthesized existing information from past and current studies, including the research mentioned above. Projects funded under ORAP provide information on data gaps and research needs, state and local influence over offshore oil decisions, the oil and gas potential of the Washington OCS, and a conceptual framework for guiding future OCS research.

The NWIFC provides technical and coordination support to the Washington Indian tribes in the management and preservation of fishery resources. The NWIFC conducts a salmon and steelhead tagging program, and conducts annual and long-range fish harvest planning and catch monitoring programs.

NPS interpreters conduct guided walks to the numerous tidepools at several locations in Olympic National Park, including Starfish Point near Kalaloch, and Hole-in-the Wall near Rialto Beach.

MMS, Pacific OCS Region, has contracted for numerous studies to support the Environmental Studies Program. Some of the most recent studies, and their current status as of June,1990 are:

Monitoring of Olympic National Park Beaches to Determine Fate and Effects of Spilled Bunker C Fuel Oil; Dept. of Energy; Active.

Inventory and Evaluation of Washington and Oregon Coastal Recreation; NPS; Active.

An Evaluation of Spawning and Recruitment Patterns of Fishes off N. CA, Oregon, and Washington; IA-NOAA; Active.

Biological Impacts of Translocated Sea Otters; Univ. of Minnesota; Active.

Effects of OCS Oil and Gas Production Platforms on Rocky Reef Fishes and Fisheries; Marine Research Specialist; Active.

Potential Social and Economic Effects of OCS Oil and Gas Activities on Oregon and Washington Indian Tribes; Central Washington University; Active.

Conference/Workshop on Recommendations for Studies in Washington and Oregon Relative to Offshore Oil and Gas Development; Bio/Tech Communications; Completed.

Coastal Circulation Along Oregon and Washington; Envirosphere Company; Completed.

Summary and Analysis of Environmental Information of the Oregon and Washington Coastal Zone and Offshore Areas; Univ. of Washington; Completed.

Workshop: Recommendation for Baseline Research in Washington/Oregon Relative to Offshore Resource Development; Research Triangle Institute; Completed.

9. Protected Areas

Most of the offshore rocks and islands are included in three National Wildlife Refuges: Quillayute Needles, Flattery Rocks, and Copalis. All three refuges, established by Theodore Roosevelt on October 23, 1907 by Executive Order 704, are managed and maintained by the USFWS. They were established as a place

"...reserved and set aside for the use of the Department of Agriculture (now Interior) as a preserve and breeding ground for native birds and animals."(Executive Order 704, October 23, 1907). Refuge system goals are fivefold:

1) To preserve, restore, and enhance in their natural ecosystem (when practicable) all species of animals and plants that are endangered or threatened with becoming endangered;
2) To perpetuate the migratory bird resource;
3) To preserve a natural diversity and abundance of fauna and flora on Refuge lands;
4) To provide an understanding and appreciation of fish and wildlife ecology and humankind's role in the environment, and to provide Refuge visitors with high quality, safe, wholesome, and enjoyable recreational experience oriented toward wildlife to the extent these activities are compatible with the purposes for which the Refuges were established; and
5) To support the Regional Resource Plan and Regional Marine Bird Policy.

Pursuant to the Wilderness Act of 1964 (Act of September 3, 1964; P.L. 88-577, 78 Stat. 890, 16 U.S.C. 1131, et seq.) the Refuges were designated as Wilderness areas on October 23, 1970, except for Destruction Island which was excluded because of Coast Guard facilities on the island. Additionally, most of the coastline within the Olympic National Park and north of the Hoh River was designated as Olympic Park Wilderness in 1988. The Quinault Indian Nation has designated most of the coastal area within the reservation as a Wilderness Area, which includes a prohibition on the development of land. Classification of areas as "wilderness" results from individual Acts of Congress to roadless lands managed by the Departments of Agriculture or Interior. Wilderness is the most protective form of designation that can be applied to Federal resource lands. The Wilderness Act stipulates that management of designated areas should be such as to "leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas,..." To this end, the Act generally prohibits any construction of roads or facilities, any use of motorized vehicles, motorized equipment or motorboats. The Act recognizes that "[a] Wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." The definition lists as one of an area's attributes that it "has outstanding opportunities for solitude or a primitive and unconfined type of recreation." (Siehl, 1991).

Except for the USCG, only those who have a permit from the USFWS may visit the offshore islands. Pursuant to an MOU between the USFWS and the USCG, the USCG may visit Destruction Island to service and maintain the lighthouse and buildings during the non-nesting season. Other than the USCG activities, use of the islands is limited to wildlife surveys conducted by the USFWS.

Olympic National Park includes much of the shoreline, the offshore refuge islands in the Flattery Rocks and Quillayute Needles including adjacent intertidal habitat to the lower low tide, rain forests, and mountains of the Olympic Peninsula. It is managed by the Department of the Interior, NPS. The Park was designated a Biosphere Reserve by UNESCO in 1976 and as a World Heritage Site by UNESCO in 1981 based upon an evaluation by the International Union for the Conservation of Nature. The objectives of Biosphere Reserves are:

1) to conserve for present and future use, the diversity and integrity of biotic communities of plants and animals within natural ecosystems, and to safeguard the genetic diversity of species upon which their continuing evolution depends;

2) to provide for ecological and environmental research including baseline studies, both in and adjacent to these reserves, such research to be consistent with objective (1) above; and

3) to provide facilities for education and training.

10. Recreational Activities and Tourism

The rugged, pristine environment and variety of habitats found along the Olympic Coast with its abundant natural resources provides ample opportunity for recreation for both residents and tourists. The Washington outer coast is an isolated area that has always depended on its natural resources for its economy, including tourism. Recreational activities include fishing, clamming, camping, hiking, whale-watching, boating, sightseeing, beachcombing, and diving.

In 1984, there were 95 public recreation areas in Clallam and Jefferson counties and 78 in Grays Harbor and Pacific counties. Most of these areas are small areas managed by local governments, but the Federal government manages most of the acreage because of the large national parks, forests, and wildlife refuges. In 1984 there were over 1.2 million acres of public recreation land in Clallam and Jefferson counties and over 185,000 acres in Grays Harbor and Pacific counties. Over 99.6% of the acreage in Clallam and Jefferson counties and 92.6% of the acreage in Grays Harbor and Pacific counties was managed by the Federal government.

Recreational fishing takes place from charter boats, skiffs, jetties, sandy beaches, and rocky shores. Figure 41 (p. 95) shows the more intensively fished offshore recreational fishing areas for salmon and bottomfish. The ocean recreational fishery for salmon operates primarily out of Westport, Ilwaco, La Push, and Neah Bay. The charter boat industry is centered at these ports with Westport being the most popular location for ocean salmon fishing north of the Columbia River (Squire and Smith, 1978). In 1986, the NMFS estimated that 295,000 recreational fishermen did saltwater fishing in the state of Washington. About 16% of the recreational fishing trips were taken in Washington, resulting in recreational harvest of over 9 million fish. About 11% of all trips and 22% of all catch in Washington, Oregon and California takes place in Washington. Over 60% of all trips and catch are by boat modes.

The decline of the salmon stocks in recent years has also caused a major decline in the charter fishing business. The number of charter fishermen has dropped from half a million in 1977 to a low of 40,000 in 1984, while the number of charter boats has dropped from 228 to 60 (Strickland and Chasan, 1989). The charter boats remaining now emphasize bottomfishing and whalewatching in addition to trolling for salmon. Black rockfish and lingcod are the main species caught, with other species of rockfish, cod, halibut, and flounder also of importance. Charter trips for bottomfish in 1987 totalled 1,686 from Ilwaco, 21,381 from Westport, 452 from La Push, and 21,058 from Neah Bay (ibid.). The reduction in charter boat fishing is corroborated by the reduction if fishing trips for party/charter boats reported by the NMFS for all of Washington. From 1979 to 1986 party/charter boat trips in Washington dropped about 42% (45,000 trips in 1979 to 26,000 trips in 1986). However, total saltwater recreational fishing trips increased over 23% from 1979 to 1986. Trips by private/rental boats increased over 55%, while shore based fishing trips increased over 26%.

Facilities at La Push and Westport rent skiffs and boat-launching facilities. La Push is the only small-boat harbor along the coast between Grays Harbor and Neah Bay. Additionally, the harbor is the only place in the area where offshore small-boat fishing is possible with some degree of safety. Chinook, coho, and pink salmon, as well as rockfish, lingcod, greenling, flounder, halibut, and jack mackerel are all caught off La Push. The area north of La Push to near Cape Alava experiences little ocean and shore recreational fishing because of its remoteness from any small-boat harbor and lack of shore access roads. However, boats from Neah Bay frequent the area off Cape Alava and northward to reap the benefits of the coastal salmon resources.

Sandy beach and rocky shore fishing is popular at many sites where access to shore is possible. Surf fishing on sandy beaches at places like Mukkaw Bay yield redtail and striped surfperch, flounder, and halibut. Surf smelt and night smelt are caught with dip nets along the shore between Kalaloch and the Hoh River during the summer months. Shore fishing from rocky areas is excellent for rockfish, lingcod, and kelp greenling. Fishing from the jetties at La Push and Westport produces redtail surf perch, starry flounder, black rockfish, greenling, lingcod, and cabezon. Large numbers of coho and chinook salmon are caught from the south jetty at Westport (Haw and Buckley, 1971).

Razor clams are the most important shellfish harvested recreationally on the outer coast. Their harvest, however, has dropped dramatically in recent years. An average of about ten million razor clams was harvested annually from 1950 to 1980. The harvest averaged only four million clams annually between 1981 and 1987, with the season being closed entirely because of NIX virus during 1984 and 1985 (Butts, 1988). Hardshell clams (native littleneck and manila clams) are harvested from Willapa Bay, Grays Harbor, and Hoh Head. Oysters and mussels are also harvested: oysters from Grays Harbor, and mussels from rocky areas north of Moclips (WDF, 1983). Dungeness crab are taken recreationally by wading in intertidal lagoons along the coast, and by ring nets and crab pots in Willapa Bay and Grays Harbor.

Recreational divers, primarily using SCUBA, harvest both shellfish and finfish. Dungeness and red rock crab are the main shellfish taken, while black rockfish and lingcod are the favorites for spearfishing (Bargmann, 1984).

Because many of the wilderness beaches on the outer coast are accessible only by foot, they have become increasingly popular for hiking, camping, and beachcombing. The three most popular areas for beach hikes are between the Hoh River and La Push; north of La Push to the Ozette Ranger Station above Cape Alava; and from Cape Alava to Shi Shi beach just south of the Makah Indian Reservation (Washington Public Shore Guide, 1986).

Olympic National Park is a major tourist attraction of the Pacific Northwest. There were 3.36 million visits to the Park in 1988 (Strickland and Chasan, 1989). The 60 miles of wilderness coast within the National Park have approximately 800,000 visits each year (NPS, 1989). A summer 1989 survey of the coastal areas of Olympic National Park (Leeworthy, Schruefer, and Wiley, 1990) found that 46% of the visitors to the park were out-of-state visitors. On average, visitors to Olympic National Park travelled 1,050 miles from their homes to visit the park compared to 452 miles for all other sites surveyed on the west coast. Per person trip expenditures were over $700 resulting in a direct economic impact associated with trips to the coastal areas of Olympic National Park of over $560 million in 1989.

A major visitor/interpretive center is planned by the NPS at Kalaloch. The center will provide exhibits and audio/visual and interpretive programs that will emphasize the wilderness nature of the coastal beaches and serve as a learning center for visitors and students.

The WDNR manages beaches on the outer coast that are open to the public. The Washington State Parks and Recreation Commission manages state parks on the coast that include public camping and picnic areas. Public beaches and campgrounds between Grays Harbor and Cape Flattery are shown in Figure 25. Islands within the National Wildlife Refuges are closed to the public.

The Strait of Juan de Fuca offers popular recreational diving areas. A wreck located off Tongue Point is accessed by Clallam County Park facilities at Observatory and Tongue Points. Recreational divers can access the Strait directly from shore from these parks. The Washington Department of Natural Resources supports a park at the Lyre and Pyscht Rivers. Boating and fishing are popular recreational activities in the Strait as well. There are very few access points to the public beaches along the Strait by boat or shore.

PART III: Alternatives Including the Preferred Alternative

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PART III. ALTERNATIVES, INCLUDING THE PREFERRED ALTERNATIVE

Part of the process for designating a portion of the Olympic Coast as a National Marine Sanctuary involves the analysis of institutional, boundary, management, and regulatory alternatives. These alternatives have been considered in terms of achieving optimum protection of the ecosystem, improving scientific knowledge of the area, and promoting public understanding of the value of Olympic Coast resources. The following describes and analyzes the major alternatives considered in the evaluation process.

The fundamental choice is between two institutional alternatives: (1) no action, or continuing the status quo; and 2) the preferred alternative of sanctuary designation as a complementary measure to existing programs. Boundary, management, and regulatory options for the Sanctuary are evaluated within the sanctuary designation alternative.

I. Section: Boundary Alternatives

A. Introduction

Figure 53 shows the study area of the Olympic Coast National Marine Sanctuary considered in both the DEIS/MP released in July, 1991 and as modified in this FEIS/MP. The study area generally follows the 100 fathom isobath at the edge of the continental shelf, extending from the U.S./Canada international boundary to the mouth of the Columbia River. The boundary of the study area, as proposed in the DEIS/MP, extended into the Strait of Juan de Fuca to a line drawn due north from Koitlah Point to the international border. The study area proposed in this FEIS/MP extends to a line drawn due north from Observatory Point to the international border. The landward boundary proposed in the DEIS/MP extended to the mean higher high water line, up rivers and streams to the point of tidal influence, except when adjacent to Indian Reservations in which case the boundary was at the mean lower low tide line, cutting across the mouths of any rivers. Harbors were excluded and estuaries included in the study area. The landward boundary of the study area has been modified to be at the lower low water line when adjacent to State lands. The boundary remains at the lower low water line when adjacent to Tribal lands, and at the mean higher high water line when adjacent to lands under the jurisdiction of the NPS or the USFWS. The study area has been further modified to cut across the mouths of all rivers and streams. Grays Harbor and Willapa Bay are not included within the study area since NOAA's National Estuarine Research Reserve System (NERRS) or EPA's National Estuary Program (EPA) would be better tailored to meet the needs of these estuarine habitats.

The most significant amendment to the DEIS/MP was the addition of the Strait of Juan de Fuca in the study area of the

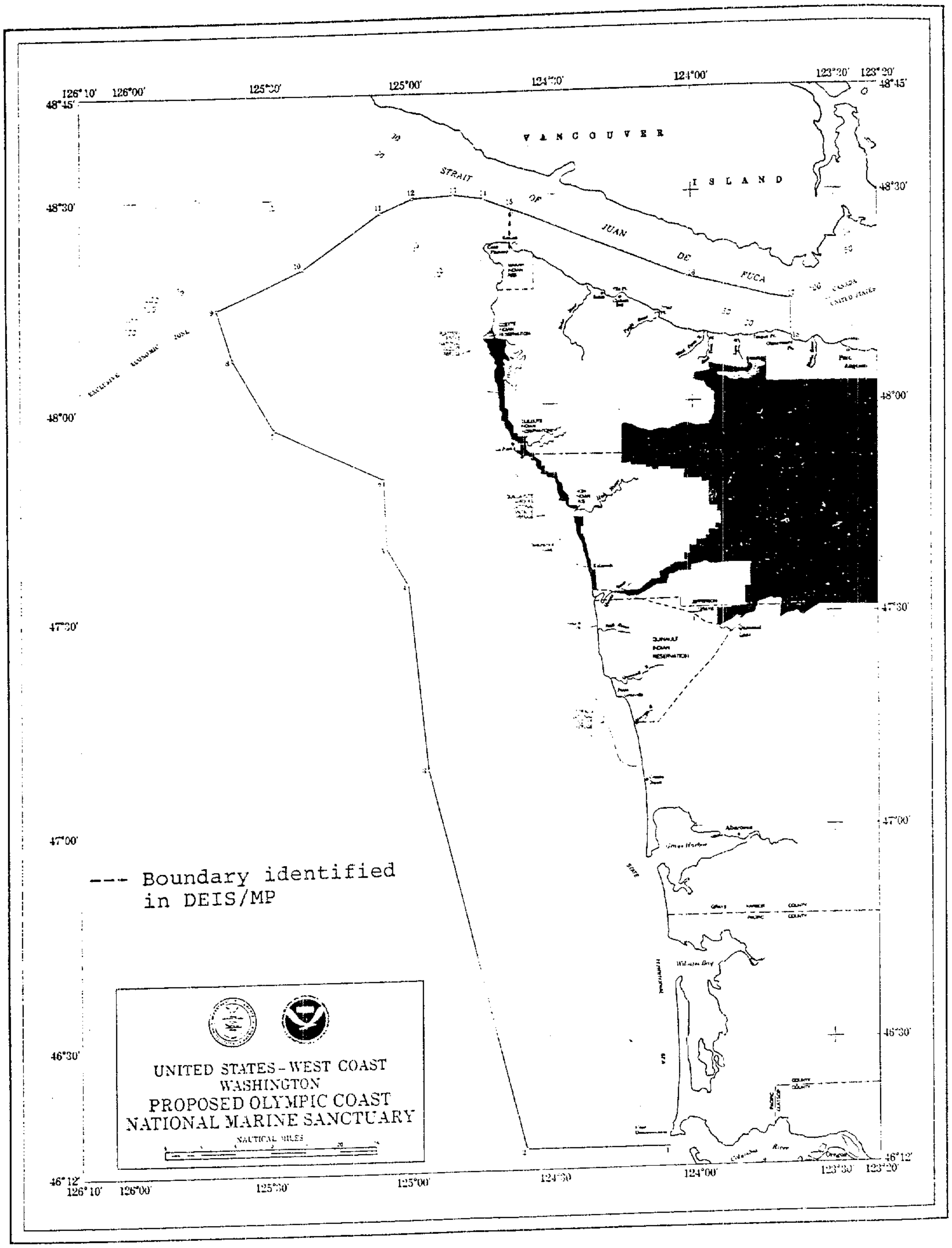

Figure 53. Study area Proposed in the DEIS/MP and FEIS/MP.

Olympic Coast National Marine Sanctuary. The inclusion of the Strait to Observatory Point resulted from comments on the DEIS/MP and an analysis of resources and uses occurring in the Strait. NOAA has analyzed, but rejected, the Strait of Juan de Fuca as part of the preferred alternative because: 1) the public has not had an adequate opportunity to comment on the addition of the Strait in the preferred alternative; and 2) further analysis considering the Strait for Sanctuary status will be included in the DEIS/MP for the proposed Northwest Straits National Marine Sanctuary. If, through the fulfillment of either of these processes, Washington State and NOAA agree that the Strait should be included within the boundaries of the Olympic Coast National Marine Sanctuary, the Sanctuary boundaries may be amended accordingly.

NOAA has developed five boundary options based upon an evaluation of several factors including: 1) the distribution of living resources and habitats; 2) geological, chemical, and physical oceanographic parameters; 3) human uses; 4) land use practices along the adjacent coastline; 5) prior site evaluations (e.g., NOAA's 1983 Site Evaluation List); and 6) management logistics. NOAA found during its analysis of these factors that it was useful to consider the entire study area as being subdivided into eight separate areas. Each area may be characterized by its living resources, human uses, or any other factors analyzed. NOAA's Strategic and Environmental Assessment Branch (currently referred to as the Strategic Assessment Branch (SAB) analyzed each subarea to determine its relative significance for selected invertebrates, fish, invertebrates, mammals, and seabirds with respect to the contiguous U.S. west coast (subarea 1a which encompasses the Strait of Juan de Fuca was not included in this analysis).

The scores are presented in Appendix C in a series of tables (Tables 3 through 9) that allow the reader to compare sub-areas according to selected assemblages of marine fauna. While these tables do not provide an exhaustive list of species for each subarea, they do exemplify the general biological profile of each region. The results of this analysis are used in developing and evaluating boundary options for the Sanctuary, as well as assessing the potential impacts of human activities occurring in the area.

Various combinations of these sub-areas result in the five boundary alternatives considered by NOAA. The resources and uses associated with each area are described in "Part II: Environmental Setting and Human Uses". Following is a description of the five boundary alternatives which are derived from various combinations of the sub-areas.

B. Boundary Alternative 1

1. Geographic Scope

This boundary alternative generally corresponds to the boundary of the "Western Washington Outer Coast" site described in NOAA's 1983 SEL (Figure 54). This alternative represents the smallest area that would be considered for sanctuary status, encompassing approximately 315 nm^2 (1,082 km^2). It extends seaward from Koitlah Point to the edge of Washington State waters (3 nautical miles from shore) south from Koitlah Point to Point Grenville. This boundary alternative includes the nearshore coastal waters adjacent to Olympic National Park, and surrounding the Quillayute Needles, Flattery Rocks, and Copalis National Wildlife Refuges and Wilderness Areas.

2. Distinguishing Characteristics

This boundary alternative includes significant intertidal and subtidal resources around Tatoosh Island and Cape Flattery, and birds and mammals which depend on the offshore rocks and islands. Over 60% of the colonial seabirds in Washington use the offshore islands and coastal cliffs in this region as nesting areas. This boundary, however, excludes the important seabird foraging areas. The boundary alternative encompasses significant habitat for several species of marine mammals including the sea otter, California sea lion, northern elephant seal, harbor seal, killer whale, gray whale, Right whale, Dall's porpoise, and the endangered Stellar sealion. Most of the sport fishery areas for salmon and groundfish, a portion of the razor clam beds, concentrations of giant octopus, spot shrimp, and fat gapers, and some of the commercial crabbing areas are included within this boundary option.

Recreational fishing, clamming, kayaking, beach hiking, and nature viewing are the major human uses which are conducted within this sanctuary boundary option. Vessel transits within this boundary are primarily from ships traversing the northwest corner of the boundary when entering the Strait of Juan de Fuca from the south, and tugs and barges traversing within three nautical miles of the coast. The planning area for former Lease Sale #132 does not include the area within three nautical miles of the coastline, and Washington State has placed a five year moratorium on oil and gas activities occurring within state waters (Washington State House Bill No. 2242, Section 9).

C. Boundary Alternative 2

1. Geographic Scope

Boundary alternative 2 is essentially an expansion of the first alternative to the 50 fathom isobath, encompassing approximately 1100 nm^2 (3,770 km^2), and extending seaward from 7 to 19 nautical miles from the coastline (Figure 55).

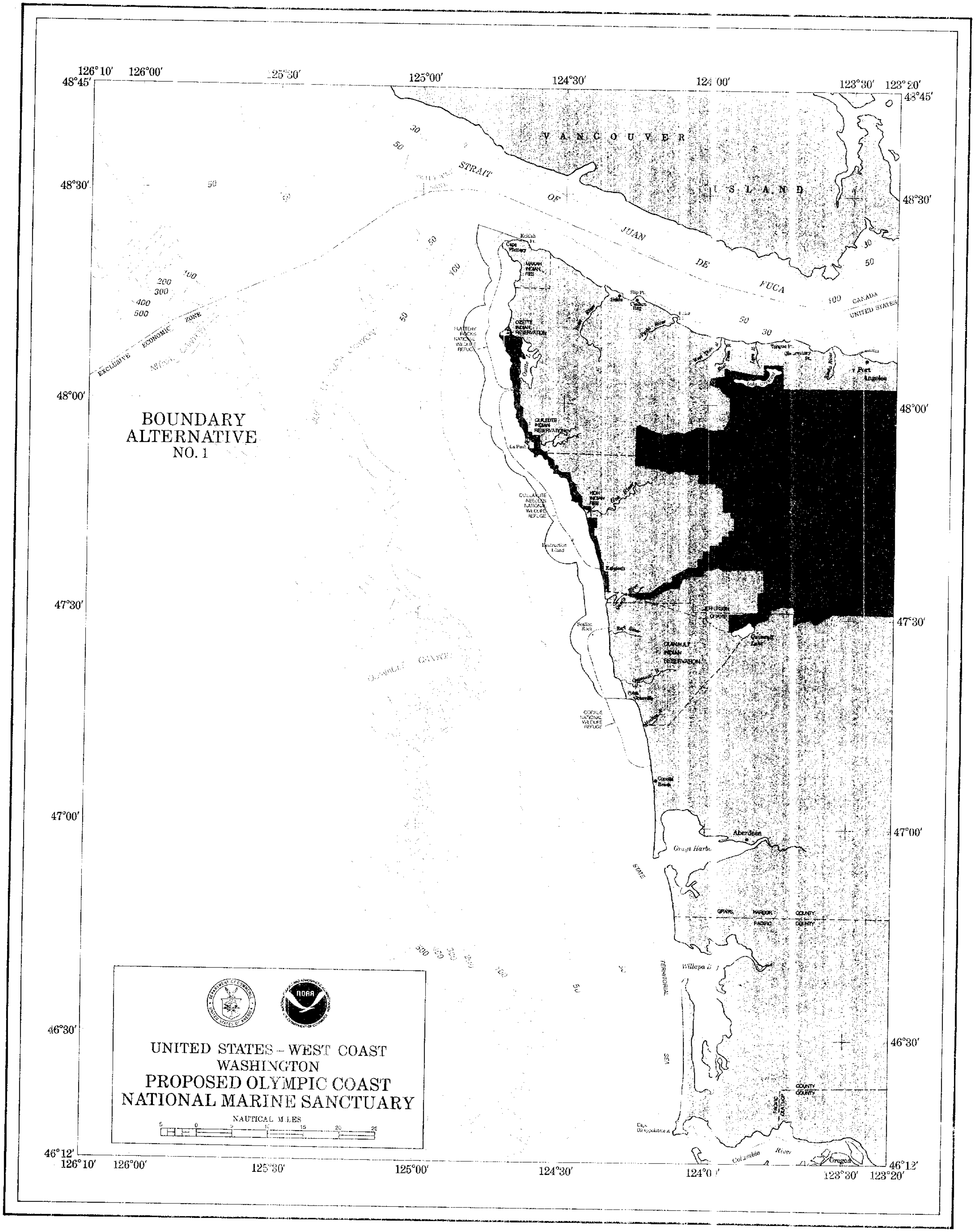

Figure 54. Boundary Alternative 1.

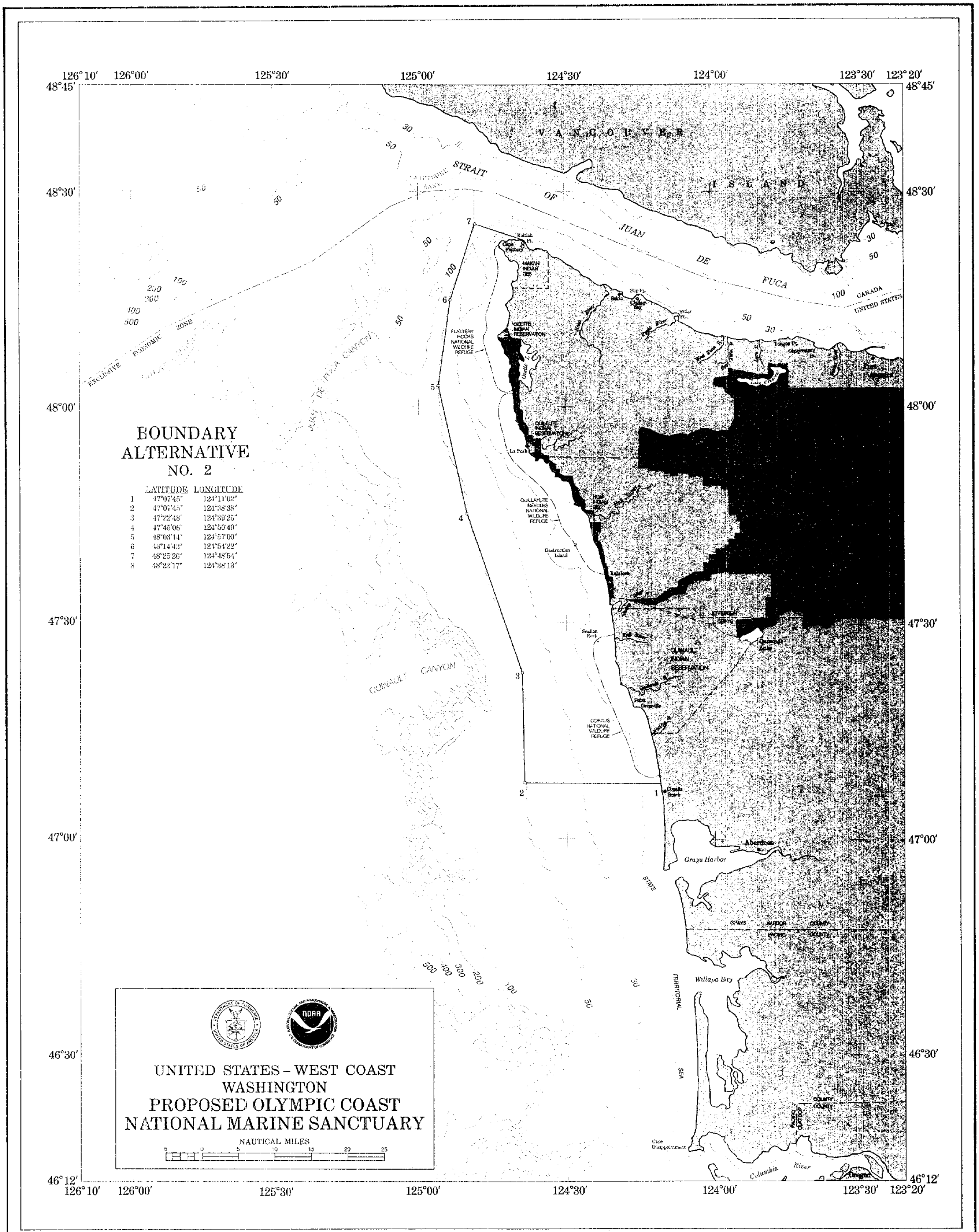

Figure 55. Boundary Alternative 2.

2. Distinguishing Characteristics

This seaward extension encompasses not only the large concentrations of marine resources near the coastline and offshore islands, sea stacks, and rocks, but also incorporates the commercial crab fishing grounds, migration routes for Gray whales and juvenile salmonids, and a large portion of the important commercial groundfish, salmon, and pink shrimp fishing grounds. It is estimated that only 5% of the potential hydrocarbon resources in the Sanctuary study area (or 1% of the total resources in the entire former Lease Sale #132) would be located within this boundary alternative (Martin, 1990). This boundary would encompass most of the routes transited by barge traffic and foreign product carriers.

This boundary alternative encompasses more of the important foraging habitat for colonial seabirds and pinnipeds using the offshore Islands than does boundary alternative 1. However, the boundary does not extend seaward to the edge of the continental shelf which is the generally recognized geographic range of significant foraging habitat.

D. Boundary Alternative 3

1. Geographic Scope

Boundary alternative 3 represents an extension of the first two alternatives seaward to the edge of the continental shelf (100 fathom isobath), including the heads of submarine canyons which incise the shelf, and establishes a sanctuary area of approximately 1,805 nm^2 (6,182 km^2) (Figure 56).

2. Distinguishing Characteristics

The resulting area is a homogeneous and clearly identifiable Sanctuary linking the nearly pristine, rugged, rocky coastal ecosystem with the nutrient rich offshore waters. The boundary includes areas of intensified upwelling occurring along the edge of the continental shelf, especially at heads of submarine canyons. The upwelling of nutrient enriched bottom waters result in increased biological productivity, especially when combined with periods of high solar radiation.

This boundary alternative, however, does not include the Juan de Fuca Canyon, nor the shallow banks bordering the northwest edge of the canyon known as Swiftsure bank and "the Plains.". These areas are extremely productive areas and support intensive commercial salmon and groundfishing and millions of foraging seabirds.

Many species of marine birds and mammals forage along upwelling fronts which occur along the edge of the shelf. The area over the outer edge of the shelf included in this boundary

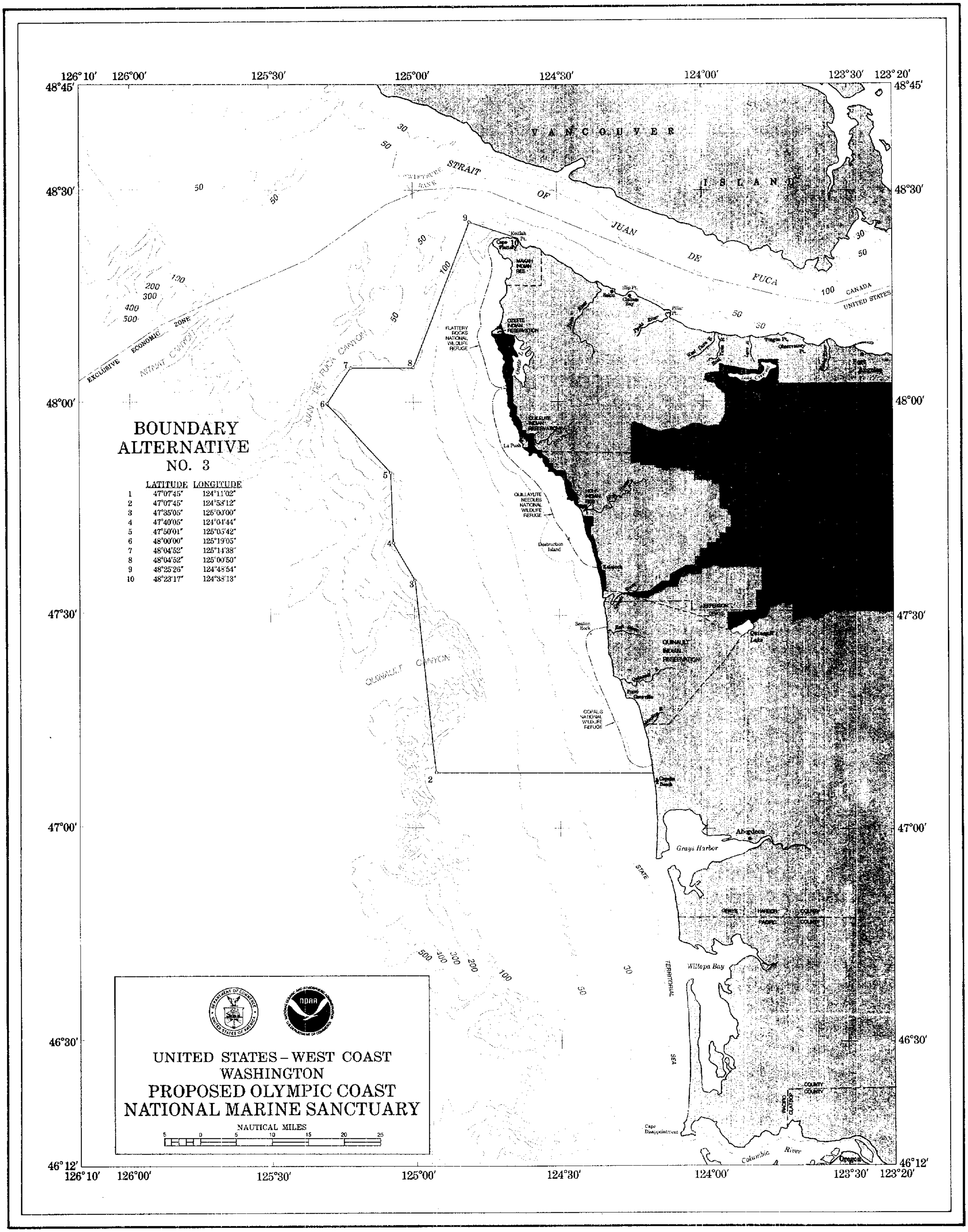

Figure 56. Boundary Alternative 3.

option is significant to pink shrimp, several seabirds (e.g., northern fulmar, black-legged kittiwake, common murre, and rhinoceros auklet), and several species of fish (e.g., spiny dogfish, steelhead, Pacific cod, walleye pollock, Pacific Ocean perch, widow rockfish, sablefish, lingcod, Pacific halibut, English sole, flathead sole, Petrale sole, Dover sole, and arrowtooth flounder) and mammals (e.g., northern sea lion, California sea lion, northern elephant seal, killer whale, Pacific white-sid dolphin, Baird's beaked whale, gray whale, Right whale, fin whale, Risso's whale and Dall's porpoise). Approximately 17% of the potential hydrocarbon resources of the Sanctuary study area (or 3.5% of the former Lease Sale #132) are estimated to lie within this boundary alternative.

E. Boundary Alternative 4 (Preferred)

1. Geographic Scope

Boundary alternative 4 encompasses the areas described in boundary alternatives 1-3 with the addition of the head of Juan de Fuca Canyon and the relatively shallow banks (50-80 fathoms) surrounding the submarine canyon and the Strait of Juan de Fuca. This area extends seaward approximately 35-40 nautical miles from the shoreline. Boundary alternative 4 as proposed in the DEIS/MP extends into the Strait to Koitlah Point, approximatley five miles from the entrance of the Strait. This original alternative focused completely on open ocean environments. The surface area of this alternative with a boundary at Koitlah Point is approximately 2,500 nm^2 (8,577 km^2). Various modifications to the easternmost boundary in the Strait of Juan de Fuca are examined including establishing the boundary slightly east of Pillar Point, Low Point, and Observatory Point (Figure 57). These alternative boundaries in the Strait encompass the tranisitional environment from a marine to an estuarine ecosystem.

a. Pillar Point (Pyscht River Estuary)

Pillar Point is the easternmost point of the headland just east of Neah Bay. It is located approximately 20 miles into the Strait and concentrates most of the energy from the open ocean waves entering the Strait. At the base of Pillar Point, the Pyscht River enters the Strait of Juan de Fuca forming the most extensive estuary and largest saltmarsh in the Strait. There is access to the saltmarsh and a small park supported by the WDNR along the banks of the Strait. A boat ramp provides access to the Strait. This alternative excludes the prolific kelp beds that lie off the Lyre and Twin rivers and the extensive subtidal rocky habitat between Pillar Point and Observatory Point. With this extension into the Strait, the area encompassed by boundary alternative 4A is approximately 2,635 sq. nautical miles (9,029 sq. kilometers).

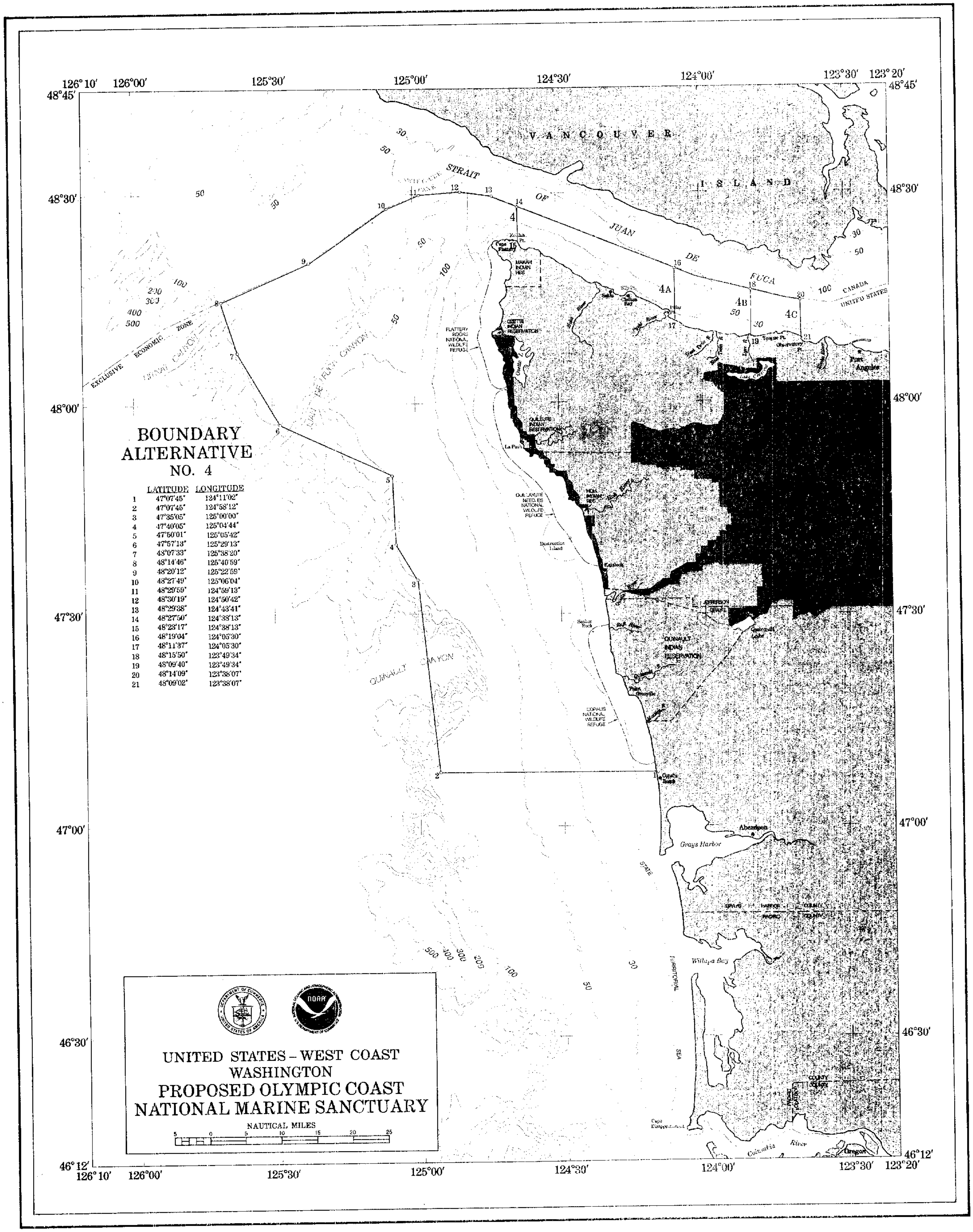

Figure 57. Boundary Alternative 4 with Alternative Boundaries.

b. Low Point

The macrocystis kelp beds off the Lyre River are the densest kelp beds in the Strait of Juan de Fuca. Inclusion of this area would encompass some of the most significant kelp beds in the Pacific Northwest. This boundary extends to the head of the Juan de Fuca Canyon although the effects of canyon upwelling extend the entire length of the Strait. This boundary alternative excludes the extent of subtidal rocky habitat and the historic shipwreck that lies between Low Point and Observatory Point. With this extension into the Strait, the area encompassed by boundary alternative 4B is approximately 2,710 sq. nautical miles (9,293 sq. kilometers).

There is a park supported by the WDNR at the mouth of the Lyre River which is included in this alternative. There are remarkable intertidal habitats along this stretch of the Strait supporting, among others, shorebirds, bald eagles, and colonies of cormorants.

c. Observatory Point

This boundary extends eastward to Observatory Point, located approximately 60 miles into the Strait. The boundary includes the easternmost extent of the functioning community representative of open ocean environments, characterized by macrocystis kelp beds, green anemone, gooseneck barnacles and California mussels. These organisms cease to exist eastward of Observatory Point as a functioning community indicating that Observatory Point represents the inland extent of the transition from open ocean to estuarine environments. Observatory Point is the eastern point on the most inland headland on the Strait of Juan. With this extension into the Strait, boundary alternative 4C encompasses 2,750 sq. nautical miles (9,434 sq. kilometers).

There is a county park at Tongue and Observatory Point. These Clallam County parks are well developed with picnic areas and boat ramps. The ramps are utilized by recreational SCUBA Divers, among others, who dive at the wreck of an historic ship wreck located in approximately 130 feet of water off Tongue Point. The subtidal rocky and kelp habitats of the entire Strait provide exceptional environments for recreational SCUBA Divers.

2. Distinguishing Characteristics of Boundary Alternative 4 Including the Strait of Juan de Fuca to Observatory Point

Oceanographic conditions, including the upwelling of nutrient-rich water at the head of Juan de Fuca Canyon, result in enhanced biological productivity over "the plains" and Swiftsure banks which are considered by local fishermen to be extremely productive groundfish and salmon fishing areas. The Strait also serves as a transit and migration corridor for marine birds, mammals and ocean organisms entering from the outer coast. Up to 300,000 common murres may enter northern Puget Sound in any given year during the molting season. Since molting birds are mostly flightless, they use the Strait to swim to their overwintering grounds. Changes in biota, geology, and topography all seem to coalesce between Crescent Rock and Observatory Point.

The Pyscht River estuary and saltmarsh support one of the richest juvenile salmon habitats in the Strait. Further, the kelp habitats in the Strait, particularly off the Lyre and Twin Rivers are some of the densest and most diverse in the Pacific Northwest.

This alternative includes about 25% of the estimated potential hydrocarbons in the Sanctuary study area (or 5% predicted to be in formerLease Sale #132). The Strait is a corridor for fishing vessels and larger product carriers and tank vessels entering and exiting Puget Sound. There is a very well coordinated Vessel Traffic System established in the Strait and its approaches which is operated by the U.S. and Canadian Coast Guards. Radar coverage from Tofino Coast Guard Station covers all waters north of approximately Cape Alava and seaward 60 nautical miles.

F. Boundary Alternative 5

1. Geographic Scope

Boundary alternative 5 includes the entire sanctuary study area, encompassing approximately 4,155 nm^2 (14,249 km^2) (Figure 58). This alternative essentially spans the entire coastline and continental shelf of Washington State. This alternative expands upon the preferred alternative to include the large area (approximately 1,655 nm^2, or 5,672 km^2) south of Copalis National Wildlife Refuge extending seaward to the edge of the continental shelf, and south to the mouth of the Columbia River.

2. Distinguishing Characteristics

This southern area is characterized by a coastal geomorphology that is clearly distinct from the area to the north. The shoreline consists of sandy beaches and estuaries (Grays Harbor, Willapa Bay) in contrast to the northern rugged, rocky coastline with high bluffs, pocket beaches, and rock islands. Land use in the southern area is more heavily developed than in the nearly pristine northern area. Living resources include oyster beds in the estuarine areas, razor clams along the sandy beaches, pink shrimp and Dungeness crab fishing areas, Gray whale migration routes, and commercial, tribal, and sport fishing areas for numerous finfish species (including the major sport salmon fishing areas). The coastal waters lying adjacent to Grays Harbor and Willapa Bay are enriched by these extremely

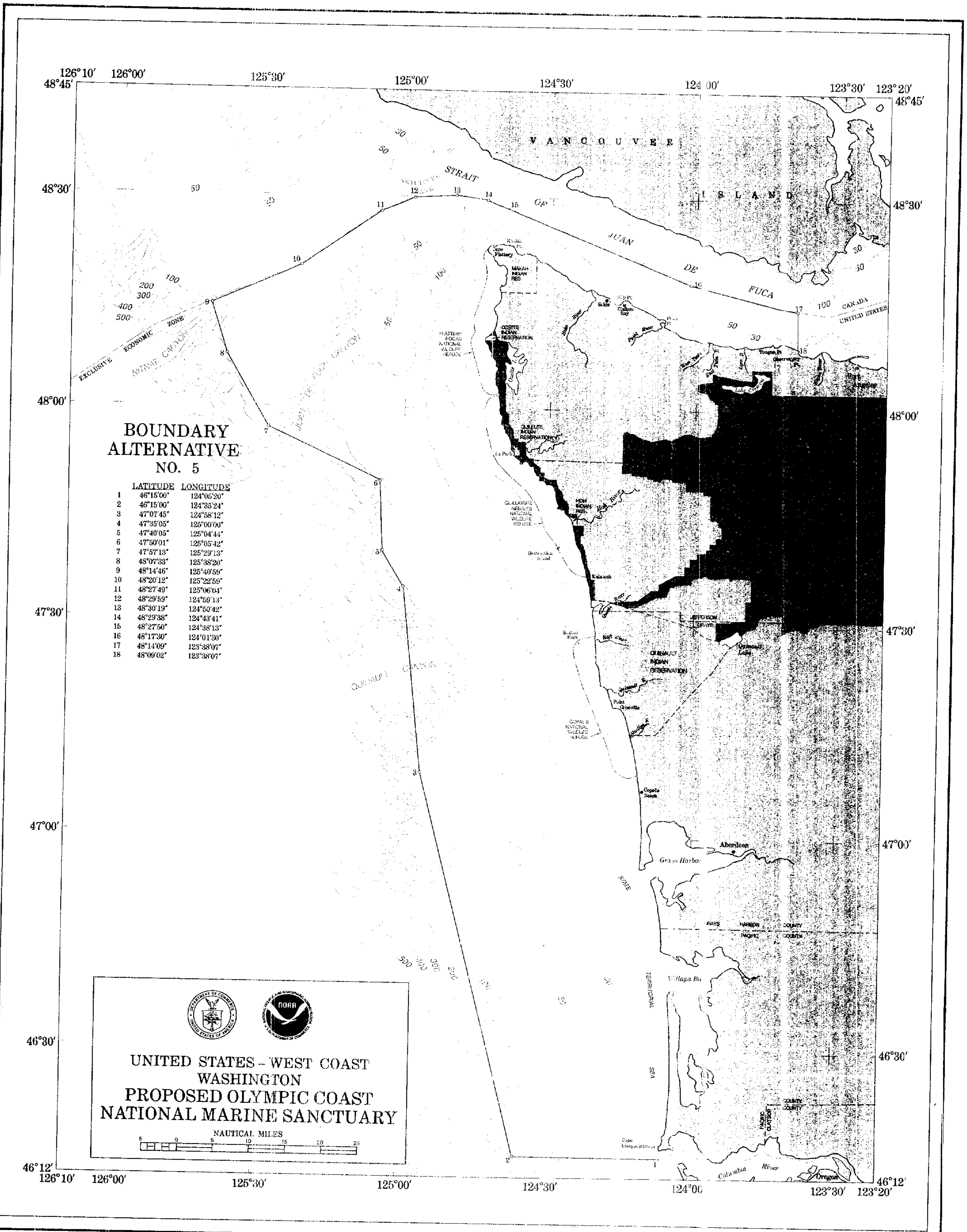

Figure 58. Boundary Alternative 5.

productive estuarine environments. Estuaries are important breeding grounds for numerous species of aquatic plants and animals and provide food for these plants and animals either directly or indirectly through a complex food web.

It is estimated by MMS that this area encompasses 20% of the potential hydrocarbon reserves in the entire former Lease Sale #132 (MMS, 1990a). Most of this hydrocarbon potential (15% of the total lease sale area) lies within the sedimentary basins south of Copalis National Wildlife Refuge which extend seaward from Grays Harbor and Willapa Bay estuaries.

II. Section: Regulatory Alternatives

A. Introduction

Regulatory alternatives governing different types of potential or current uses of the Sanctuary (oil, gas and mineral activities; discharges and deposits; moving, removing or injury of historical resources; alteration of, or construction on, the seabed; taking of marine mammals, turtles and seabirds; overflights; and vessel traffic; and fishing, kelp harvesting and aquaculture) were evaluated in terms of need and effectiveness for resource protection.

In formulating the sanctuary regulatory regime, NOAA analyzed the study area with respect to: 1) the resources and human activities; 2) the existing regulatory regime with regard to protection of the resources and qualities from possible harmful human activities; 3) proposed alternative regulatory regimes, including relying on the existing regulatory regime, to protect the sanctuary's resources and qualities; 4) the environmental consequences of each regulatory alternative on sanctuary resources, including no additional regulatory action; and 5) proposed regulations based on the preferred course of action deemed necessary to protect Sanctuary resources and qualities.

The choice of proposed regulations is based on environmental consequences of each action and constraints set by the MPRSA, which states in Section 304(c):

(1) Nothing in this title shall be construed as terminating or granting to the Secretary the right to terminate any valid lease, permit, license, or right of subsistence use or of access if the lease, permit, license, or right-

(A) was in existence on the date of enactment of the Marine Sanctuary Amendments of 1992, with respect to any national marine sanctuary designated before that date; or

(B) is in existence on the date of designation of any national marine sanctuary, with respect to any national marine sanctuary designated after the date of enactment of the Marine Sanctuaries Amendments of 1992.

(2) The exercise of a lease, permit, license, or right is subject to regulation by the Secretary consistent with the purpose for which the sanctuary is designated.

The prohibitions set forth in the Sanctuary regulations would not apply to (see the regulations themselves for the exact provisions):

1) Any activity authorized by any valid lease, permit, license, approval, or other authorization in existence on the effective date of Sanctuary designation and issued by any Federal, State, local or tribal authority of competent jurisdiction, or by any valid right of subsistence use or access in existence on the effective date of Sanctuary designation, provided that the holder of such authorization or right complies with sanctuary regulations regarding the certification of such authorizations and rights (e.g., notifies the Secretary or designee of the existence of, requests certification of, and provides requested information regarding such authorization or right) and complies with any terms and conditions on the exercise of such authorization or right imposed as a condition of certification by the Secretary or designee as he or she deems necessary to achieve the purposes for which the Sanctuary was designated.

Pending final agency action on the certification request, such holder may exercise such authorization or right without being in violation of any prohibitions set forth in the Sanctuary regulations, provided the holder is in compliance with sanctuary regulations regarding certifications.

2) Any activity authorized by any valid lease, permit, license, approval or other authorization issued after the effective date of Sanctuary designation by any Federal, State or local authority of competent jurisdiction, provided that the applicant complies with Sanctuary regulations regarding notification and review of applications (e.g., notifies the Secretary or designee of information regarding the application), the Secretary or designee notifies the applicant and authorizing agency that he or she does not object to issuance of the authorization, and the applicant complies with any terms and conditions the Secretary or designee deems necessary to protect Sanctuary resources and qualities. Amendments, renewals and extensions of authorizations in existence on the effective date of Sanctuary designation constitute authorizations issued after the effective date.

The authority granted the Director to object to or impose terms or conditions on the exercise of any valid lease, permit, license, approval or other authorization issued after the effective date of Sanctuary designation may not be delegated or otherwise assigned to other Federal official below his or her level.

3) Any activity conducted in accordance with the scope, purpose, terms, and conditions of a National Marine Sanctuary permit issued by the Secretary or his or her designee in accordance with the Sanctuary regulations. Such permits may only be issued if the Secretary or designee finds that the activity for which the permit is applied will have only negligible, short-term adverse effects on Sanctuary resources and qualities and will: further research related to Sanctuary resources; further the educational, natural or historical resource value of the Sanctuary; further salvage or recovery operations in or near the Sanctuary in connection with a recent air or marine casualty; assist in managing the Sanctuary; or further salvage or recovery operations in connection with an abandoned shipwreck in the Sanctuary title to which is held by the State of Washington.

4) Any activity conducted in accordance with the scope, purpose, terms, and conditions of a Special Use permit issued by the Secretary or designee in accordance with Sec. 310 of the Act.

When the preferred Sanctuary action is to rely on the status quo to govern the activity either by including the activity in the scope of regulations by not regulating with designation (i.e. kelp harvesting, aquaculture and vessel traffic), or by excluding the activity from the scope or regulations entirely (i.e., fishing), the activity would continue to be subject to regulations of other authorities.

5) Any activity necessary to respond to emergencies threatening life, property or the environment.

6) With regard to Department of Defense activities: All Department of Defense activities shall be carried out in a manner that avoids to the maximum extent practicable any adverse impacts on Sanctuary resources and qualities. The prohibitions in paragraphs (a)(2)-(9) of § 925.5 of the regulations do not apply to existing military activities carried out by the Department of Defense, as specifically identified in this FEIS/MP for the proposed Olympic Coast National Marine Sanctuary. New activities may be exempted from the prohibitions in paragraphs (a)(2)-(9) of that section by the Director of the Office of Ocean and Coastal Resource Management or designee after consultation between the Director or designee and the Department of Defense.

Notwithstanding the above, in no event under the Sanctuary regulations, would the Secretary or designee be allowed to issue a permit authorizing, or otherwise approve, (1) the exploration, development or production of oil, gas or minerals within the Sanctuary, (2) the discharge of primary-treated sewage within the Sanctuary (except for certification, pursuant to section 925.10 of valid authorizations in existence on the effective date of

Sanctuary designation and issued by other authorities of competent jurisdiction), or (3) the disposal of dredge material within the Sanctuary. Any purported authorizations issued by other authorities after the effective date of Sanctuary designation for any of these activities within the Sanctuary would be invalid.

Each type of activity proposed to be regulated by the Sanctuary is stated below and described in terms of its impact to resources and uses. The status quo is also given in terms of existing laws, regulations and their impacts to the resources and uses of the waters off the Olympic Peninsula.

B. Oil, Gas and Mineral Activities

1. Status Quo

a. Existing Regulatory Framework

Pursuant to the 1992 reauthorization of the MPRSA (P.L. 102-587), no oil or gas leasing or pre-leasing activity shall be conducted within the area designated as the Olympic Coast National Marine Sanctuary. Thus, the preferred alternative regarding the regulation of oil and gas activities has been statutorily mandated.

b. Impact to Resources

The existing regulatory framework protects the Sanctuary resources from the harmful effects of oil and gas activities. It has been concluded that many uncertainties regarding potential impacts from OCS activities still exist, even in marine areas for which there is far more information than for the Olympic Coast (NAS, 1989; EPA, 1985; and NAS, 1985). However, some potential risks to the Olympic Coast from OCS oil and gas activities, and the transportation of hydrocarbon products can be evaluated.

Offshore hydrocarbon exploration, development, and production activities, including the transshipment of crude oil to the mainland, may cause unforeseen and potentially substantial discharges of oil, both chronic and catastrophic, into the marine environment. The sensitive marine resources of the Olympic Coast may be threatened by: (1) well "blow-outs" caused by equipment failure or damage, or geologic hazards; (2) oil spills and pipeline leaks; (3) noise and visual disturbances caused by drilling, the presence of drill rigs or platforms, work crews, supply boats, and helicopters; (4) pollution associated with aquatic discharges; and (5) short-term pipeline construction upheaval. The impacts of oil and gas on the coastal and offshore environment may be intensified because of the remoteness of the area. There are very few access points along the coast. Further, most of the coastline is characterized by rocky intertidal habitat which, when impacted by oil and gas, does not recover for many years.

Normal hydrocarbon operations can result in unintentional, chronic, or small oil spillage. Since the Olympic Coast area has had little history of hydrocarbon production, direct evidence does not exist to illustrate the effects of exploration, development, and production spills in these waters. Petroleum products are, however, transported along the coast and through the Strait of Juan de Fuca. Two oil spills, one from the General M.C. Meiggs and the other from the Nestucca, have occurred recently in coastal waters off Washington State. Oil spilled from the barge Nestucca oiled beaches found within the boundary of the Sanctuary. The reports of damages from these incidents, as well as data from spills in other marine waters, serve as examples of the types of impacts that can result from oil related accidents. Known threats to marine organisms that may result from offshore oil and gas exploration, development, and production are presented in Table 6.

OCS oil and gas activities that would take place offshore in Federal waters can negatively effect state territorial waters and coastal environments. In addition to affecting marine organisms, these activities can disrupt human uses of the marine environment and the socioeconomic structure of coastal communities (MMS, 1990). Potential negative impacts to nearshore and coastal areas include: the presence of processing facilities which also involves problems of air pollution and disposal of processing wastes; interference with port operations and stress on existing port facility space and services; conflict with shore-based operations which use offshore waters (e.g., commercial and recreational fishing, whale-watching operations); and socioeconomic impacts on affected coastal communities (Mead and Sorenson, 1970; Cican-Sain, 1985; Freeman, 1985, MMS, 1990).

Further, the activities associated with oil and gas exploration and development would introduce into the viewshed of the Olympic Peninsula an interference with what is known and valued as a nearly pristine undeveloped coastline. This value is what makes the Olympic Peninsula aesthetically one of the most magnificent natural environments remaining in the continental U.S.

c. Impact to Uses

The status quo prevents offshore development of the outer continental shelf within the Sanctuary and the introduction of 1-2 offshore platforms into the area for the first time. Associated with this direct development would be numerous indirect increases in human activities such as increase in vessel traffic, either servicing the platforms or transporting oil (unless pipelines are used to offload the discovered resources), increases in overflights from helicopters, increasing levels of discharges, and increased urban development. Prevention of this development will have a positive impact on fishing, and

Table 6. Known Threats to Marine Organisms from Oil and Gas Exploration and Development.

Activity/Facility	Chronic Hazard	Episodic/Catastrophic Events
Exploration		
Seismic Profiling	Noise, "startle effect"	Sub-surface noise, Concussion
Drilling		Siltation, Turbidity increase
Boat Traffic	Sub-surface noise and propeller hits	
Operation		
Offshore facilities		
Platforms	Intrusion	
Well head	Leakage/seepage	Blow-out
Support		
Supply boats	Sub-surface noise and propeller hits	
Aircraft	Noise in the air	
Transport		
Pipelines	Leakage	Rupture
Pumping buoys	Leakage	
Barges/Tankers	Bilge oil intrusion	Collision or grounding
Clean-up		
Oil on water	Intrusion	
Skimmers		
Burn-off		Pollution--air
Chemicals	Toxicity of Chemical	Pollution--water
Grounded oil		Pollution--sediments
Booms	Dispersants	Disturbance to sensitive bird and mammal populations on beaches by human intrusion and aircraft activity
Straw		
Chemicals		
Presence of crew and equipment		Habitat destruction

recreational and tourist activities in the area.

Exploration and development of oil, gas and mineral resources involves extensive study of the offshore ecology and geology. These studies will need to be undertaken by other institutions.

2. Sanctuary Alternative

a. Sanctuary Action (Preferred Alternative)

Exploring for, developing or producing oil, gas or minerals within the Sanctuary is prohibited.

b. Impact to Resources

The resources and qualities of the Sanctuary, particularly the sea otters, pinnipeds and seabirds, kelp forests, rocky shores and offshore islands, and the high water quality of the area, are especially vulnerable to oil and gas activities. Only partial protection would be provided due to the remaining threat from potential oil and gas development outside of the Sanctuary boundary and from vessel traffic, particularly oil tankers, transiting through and near the Sanctuary. However, NOAA is working with the Coast Guard to address the threats from vessel traffic. A prohibition on oil and gas activities within the proposed Sanctuary is consistent with the prohibition on alteration of, or construction on, the seabed as discussed below.

The prohibition will prevent activities in the Sanctuary which could result in discharges associated with petroleum and other mineral development potentially harmful to wildlife (including many endangered species) in the area. This alternative adds further protection than P.L 102-587 by prohibiting mineral development (e.g., sand and gravel development) which can have detrimental impacts to the benthic and aquatic environments.

c. Impact to Uses

There is presently no oil and gas development taking place in the study area. Lease Sale #132 has been canceled and no additional Lease Sale activity is proposed through the year 2000. The Sanctuary prohibition will eliminate all potential future direct and indirect oil, gas and mineral activities in the area. Activities such as tourism and fishing should benefit by the prohibition.

C. Discharges or Deposits

1. Status Quo

a. Existing Regulatory Framework

Numerous laws and regulations administered by many local, state and Federal agencies exist governing the contamination of coastal and ocean waters by discharges and deposits from a variety of sources including point and non-point source discharges, discharges of oil and hazardous substances (e.g., oil from vessel bilges and toxic chemicals), overboard trash disposal (e.g., discarded fishing nets and plastic trash), and ocean dumping of dredge material.

The primary Federal, state and local laws, policies and plans governing discharges include but are not limited to: the Federal Water Pollution Control Act (the "Clean Water Act", CWA); Title I of the MPRSA; the Coastal Zone Management Act; the Rivers and Harbors Act; the Act to Prevent Pollution from Ships, (which implements MARPOL 73/78, Annexes I and II); the Marine Plastic Pollution Research and Control Act (MPPRCA) (which amends the Act to Prevent Pollution from Ships and implements Annex V of MARPOL 73/78); the Oil Pollution Act of 1990 (OPA 90); the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (which, together with section 311 of the CWA, provides for the National Contingency Plan); EPA's Administrative Regulations; the Washington State Forest Practices Act (FPA) (RCW Chapter 76.09) (which addresses the environmental impacts of forestry on the coastal zone); and the State Water Pollution Control Act of 1973 (RCW Chapter 90.48) which implements the Federal Water Pollution Control Act at the state level (Many of these authorities are discussed in more detail in Appendix I).

Responsible agencies for implementing appropriate regulations and plans include, but are not limited to, the NOAA, the EPA, COE, USCG, WDOE, and WDNR.

i. Point Source Discharges

NPDES permits are required by all municipal and industrial dischargers that discharge pollutants from a point source into navigable waters of the U.S., the waters of the contiguous zone, or ocean waters. The WDOE is responsible for the protection of the quality of the state's waters through the development of water quality control plans and the issuance of waste discharge permits. The coastal tribes receive their NPDES permits directly from EPA and do not network through the State agency.

The State of Washington is also responsible for ensuring that dischargers of water pollutants comply with the conditions of the issued NPDES permits. Thus, the WDOE works with EPA in a program commonly referred to as the "Compliance Assurance Program." Pursuant to an MOA between EPA and WDOE, each agency's policies and responsibilities directed to enforcing effluent limitations and compliance schedules for NPDES were delineated. The MOA sets forth the manner and extent to which the program elements of inspections, tracking, enforcement, and evaluation are carried out.

ii. Non-Point Source Discharges

EPA has provided Washington State guidance on implementing the provisions of EPA's Anti-degradation Policy (40 CFR 131.12) which is applicable to non-point source pollution as well as point source pollution. Specifically, "where high quality waters constitute an outstanding National resource, such as waters of National and State Parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected" (40 CFR 131.12 (a)(3)). The non-point source provisions of the CWA 205(j), 208, 303(e) and 319 are subject to the anti-degradation policy and EPA is developing additional guidance in this area.

Washington State manages non-point source pollution through the FPA. The WDNR is the state agency with primary responsibility to implement the Act. The FPA declares that it is in the public interest for public and private commercial forest lands to be managed consistent with sound policies of natural resource protection and that coincident with the maintenance of a viable forest products industry, it is important to afford protection to forest soils, fisheries, wildlife, water quantity and quality, air quality, recreation, and scenic beauty.

The FPA created the Forest Practices Board to adopt rules and regulations governing the details of forest practices management consistent with the provisions of the Act and the Forest Practices Advisory Committee. The Advisory Committee appointed two regional advisory committees to recommend region-specific rules and regulations.

The FPA establishes a permit process governing forest practices on private and public forest lands in the state, except on Federal lands. The FPA gave counties in which forest practices are proposed a significant role in the process. DNR may not approve portions of applications concerning conversion to another use to which counties object, though the Department may appeal the county's objection to the Forest Practices Appeals Board which was created by FPA to hear such disputes. Both Clallam and Jefferson Counties have waived their right to review forest practices not involving conversion to another use under the FPA in an effort to streamline the process.

In terms of coastal zone management, the FPA supersedes the Shoreline Management Act in some cases. FPA specifies that in relation to "shorelines", the forest practice regulations to be adopted by the Forest Practices Board "...shall be the sole rules applicable to the performance of forest practices, and enforcement thereof shall be solely as provided..." in the FPA. It is further stipulated that no substantial development permit "...shall be required under chapter 90.58 RCW for the construction of up to five hundred feet of one... road or segment of a road provided such road does not enter the shoreline more than once," and except under unusual conditions. And finally, FPA provides that "[a]ny powers granted by chapter 90.58 RCW pertaining to forest practices...are expressly limited to lands located within 'shorelines of the state' as defined in RCW 90.58.030. DNR and DOE (for water quality) are empowered to make an inspection after any forest practice.

iii. Hazardous waste, oil and trash disposal

Discharges of oil and hazardous substances are regulated under the CWA, OPA 90 and CERCLA, with discharges by seagoing ships of oil, oily mixtures and noxious liquid substances also regulated under the Act to Prevent Pollution from Ships. The CWA and CERCLA provide for the National Contingency Plan (40 CFR Part 300), under which the Coast Guard serves as the lead agency for responding to discharges of oil and hazardous substances.

Discharges by ships of plastics and other garbage is regulated under MARPOL by the USCG (regulations appear at 33 § CFR 151.51 to 151.77.

iv Ocean Dumping

The COE has permitting authority, with EPA review and approval, over dumping of dredged material in waters lying seaward of the baseline from which the territorial sea is measured pursuant to Title I, section 103 of the MPRSA. COE also issues permits for discharge of dredged material into navigable waters in internal waters pursuant to section 404 of the CWA. EPA has permitting authority for ocean dumping of materials other than dredged materials pursuant to Title I, section 102 of the MPRSA.

The regulations under Title I of the MPRSA provide for special recognition of nationally significant marine areas, such as marine sanctuaries established pursuant to Title III of the MPRSA.

b. Impact to Resources

Although water quality off the Olympic Peninsula is considered to be good, there is evidence of potential water quality problems in limited parts of the Sanctuary. There is also pressure to develop the coastline of the sanctuary. Faced with severe economic hardships and limited development alternatives, the populations in the coastal watersheds are seeking ways to diversify their timber-based economies. This includes plans to expand harbors, build casinos, restaurants, hotels and other recreational facilities as well as promote eco-tourism. With this development comes the associated need for dredging and dredge disposal activities, and expanded point and non-point source pollution.

Further, there are some efforts to manage non-point source pollution from upland uses in portions of coastal watershed pursuant to the FPA. However, there is little associated coastal monitoring of the health of the kelp and eel grass beds of the Strait and coastal areas to assess the effectiveness of the management initiatives. There also lacks sediment standards for streams entering the proposed sanctuary.

Ocean dumping, municipal outfalls, and dredged material disposal can smother benthic biota and introduce substances into the marine environment, which may affect fish, bird, mammal, and algae resources. In addition to reducing overall water quality and lessening the aesthetic appeal of the area, the discharge of litter may harm marine mammals that sometimes ingest or become entangled in such litter.

Thus, under the existing regulatory regime, the coastal ecosystem will continue to receive little attention due to the multi-jurisdictional nature of the coastal watersheds, the low priority assigned to it by state and Federal agencies due to its remoteness and assumed pristine quality, and the immediate need for economic development. Management efforts will continue in a piece-meal fashion with no coordinated comprehensive planning and regulatory watershed initiatives.

c. Impact to Uses

The status quo alternative would continue to provide for increasing development in the watersheds adjacent to the Sanctuary with no overall plan to minimize the impacts on the coastal ecosystem. Although the population is expected to grow very slowly, efforts are underway to diversify the economy and attract increased tourism to the coast.

2. Sanctuary Alternative (Preferred)

a. Sanctuary Action

Discharging or depositing, from within the boundary of the Sanctuary, any material or other matter is prohibited except:

(i) fish, fish parts, chumming materials or bait used in or resulting from traditional fishing operations in the Sanctuary;
(ii) biodegradable effluent incidental to vessel use and generated by marine sanitation devices approved in accordance with Section 312 of the Federal Water Pollution Control Act, as amended, (FWPCA) 33 U.S.C. 1322 *et seq.*;
(iii) water generated by routine vessel operations (*e.g.*, cooling water, deck wash down and graywater as defined by Section 312 of the FWPCA) excluding oily wastes from bilge

pumping;
(iv) engine exhaust;

Discharging or depositing, from beyond the boundary of the Sanctuary, any material or other matter that subsequently enters the Sanctuary and injures a Sanctuary resource or quality is prohibited except those listed in (i-iv) above.

b. Impact to Resources

The intent of this prohibition is to protect the Sanctuary resources and qualities from the harmful effects of land and sea-generated point and non-point source pollution, such as, but not limited to, trash and oil disposal by vessels and pollutant loading from adjacent land use practices.

By maintaining the high water quality of the ecosystem off the Olympic Peninsula, the organisms responsible for primary productivity at the base of the food chain, the coastal wetlands and estuarine habitats will be protected from the direct effects of pollutant loadings. Benthic biota will be protected especially from smothering and turbidity increases from the dumping of dredge material. Fish, seabirds, turtles, and marine mammals will be protected from direct negative impacts such as entanglement in discarded trash and infection from degraded water quality, and will benefit from the indirect effects of protected habitats and enhanced prey abundance.

c. Impact to Uses

Overall, the impact of this regulation on human uses as well as the Sanctuary resources and qualities is expected to be beneficial. No existing human uses will be terminated with designation and in the long-term, many activities such as fishing and tourism will continue to benefit from the maintenance of the high water quality of the area.

In accordance with section 304(c)(1) of the MPRSA, 16 U.S.C. 1434(c)(1), NOAA may regulate existing permits through certification which may include imposition of terms and conditions consistent with the purposes for which the Sanctuary is designated. Permits issued after the date of designation are subject to a review process which may include added terms and conditions or objection to issuance, as necessary to protect Sanctuary resources and qualities. Any application for an amendment, renewal or extension to an existing permit is considered a new permit in which case NOAA must approve of the issuance of the permit.

NOAA will work within the existing process, rather than create an entirely new regulatory review and approval procedure, governing discharge activities in the Sanctuary and coastal watersheds. NOAA intends to minimize any additional administrative burden on those dischargers that are required to obtain a NPDES permit for discharges that affect, or may affect the Sanctuary, while at the same time, ensure that the existing process addresses the special concerns of the Sanctuary and it's resources and qualities. In addition, a close working relationship between the Sanctuary and existing authorities and affected users will necessitate the identification and exchange of information relevant to the maintenance of the area's high water quality, and the protection and conservation of resources and qualities of the Sanctuary.

Consistent with the MPRSA primary objective of protecting the Sanctuary and its resources, (Section 301(b)(5) of the MPRSA, 16 U.S.C. § 1431(b)(5)), the Sanctuary regulations address discharges within the Sanctuary boundary (15 CFR 925.5(a)(2)) as well as those discharges outside of the Sanctuary boundary that enter and injure Sanctuary resources and qualities (15 CFR 925(a)(3)).

Specific impacts to uses of the area that involve discharge into the Sanctuary are discussed in more detail below.

i. Vessels

The impact of this regulation on vessel operations is expected to be minor. Oil discharges are presently regulated under, e.g., the CWA, OPA 90 and MARPOL. The disposal of non-biodegradable and other potentially harmful trash is already regulated by MARPOL. The exemptions from this regulation are designed to allow continued use of the Sanctuary by vessels that do not appear to threaten Sanctuary resources and qualities. Thus, fish, fish parts, chumming materials and bait used in, or resulting from, traditional fishing operations within the Sanctuary (exhaust, vessel cooling waters, and approved marine sanitation wastes) are specifically exempted from the prohibition.

ii. Dredge Disposal Activities

There are no dredge disposal activities occurring in, or near the Sanctuary at the time of designation. The regulation would prohibit the designation and use of any new dredged material disposal sites within the Sanctuary. Dredge disposal activities outside the boundaries of the Sanctuary that enter and injure Sanctuary resources and qualities are prohibited.

iii. Point Source Discharges

There are no point-source discharges entering directly into the Sanctuary. Discharges and deposits from point sources entering indirectly into the Sanctuary, pursuant to any valid permit existing on the effective date of these regulations, are allowed subject to all prohibitions, restrictions and conditions validly imposed by any other authority of competent jurisdiction, provided, however, that NOAA may regulate the exercise of these existing permits as necessary to achieve the purposes for which the Sanctuary was designated.

In consultation with scientific institutions and local, State, Tribal and Federal governments, NOAA will consult with the permittees and the relevant permitting authorities to determine means of achieving the Sanctuary purposes. If additional constraints are necessary, NOAA will work with the permittees and permitting authorities to determine the necessary level of terms and conditions to provide adequate protection of the Sanctuary's resources and qualities.

The requirement of NOAA certification of existing permits for, e.g., municipal and industrial sewage, will ensure NOAA consideration of potential impacts on Sanctuary resources and qualities.

New proposals for permits, licenses, or other authorizations after the effective date of Sanctuary designation, e.g., allowing the discharge of municipal and industrial sewage would be subject to Sanctuary review to ensure that Sanctuary resources and qualities are protected from injury.

When existing permits are submitted for renewal, they would be reviewed as a new permit. NOAA will evaluate the activity to determine whether there would be any negative effects to water quality or resources, whether the permittee has complied with permit standards, and, if necessary, decreased discharges and/or increased treatment standards due to the presence of the Sanctuary.

This regulation could thus result in additional costs to existing and future dischargers if the Sanctuary were to determine that a higher level of treatment or other, more expensive disposal methods were preferable in order to ensure Sanctuary resources and qualities are protected. The requirement of Sanctuary certification or approval of permits for point source dischargers will ensure that these potentially harmful activities receive special consideration from the Sanctuary's perspective.

iv. Non-Point Source Discharges

Land-based non-point source discharges within watersheds adjacent to the Sanctuary that drain into the Sanctuary will be monitored to ensure the activity is consistent with the goals of the Sanctuary and that Sanctuary resources and qualities are protected. If evidence arises that Sanctuary resources and qualities are threatened, NOAA intends to work with existing regulatory agencies and responsible parties to determine appropriate measures to prevent the threat of injury to Sanctuary resources and qualities.

D. Historical Resources

1. Status Quo

a. Existing Regulatory Framework

Under this alternative any historical resources (as defined by Sanctuary Program and Sanctuary regulations to include, *inter alia*, archeological, paleontological, or cultural resources) will remain subject to the existing management regime. The existing Federal regulatory regime includes the National Historic Preservation Act of 1966 (NHPA), 16 U.S.C. 470 *et seq.*, the Archeological and Historical Preservation Act of 1974, 16 U.S.C. 469 *et seq.*, the Abandoned Shipwreck Act (ASA) of 1987, 43 U.S.C. 2101 *et seq.*, and the Archeological Resources Protection Act of 1979 (ARPA), 16 U.S.C. 470aa *et seq.* Permits are issued by the State Office of Archeology and Historic Preservation, within the WDCD, for those historic resources in State waters pursuant to the State Historical Societies-Heritage Council-Archeology and Historic Preservation Act (Chapter 25-48 WAC and Title 27 RCW).

Before any archeological excavation of a site of tribal significance, the State Office of Archeology and Historic Preservation consults with the Tribe regarding mitigation measures to be incorporated into the permit. Title 43 CFR Part 7 of the ARPA requires that before issuing a permit a Federal land manager shall provide notice to the interested tribes, and within a 30-day period discuss tribal interests, including ways to avoid or mitigate potential harm or destruction such as excluding sites from the permit area. Such agreed upon mitigation measures shall be incorporated into the terms of the permit. The Federal land manager may enter into agreements with an Indian tribe to determine locations for which the tribe wishes to receive notice of permits.

Within the framework of the status quo, any historical resources known to be within the proposed sanctuary, especially those that are on the National Register listing under the NHPA, will be carefully monitored by Sanctuary staff. In addition, any activity that could lead to the discovery of historical resources will be carefully monitored. The Sanctuary manager will try to ensure that adequate information is available regarding the national significance of these resources and appropriate management measures are in place.

b. Impact to Resources

Existing regulatory authorities provide some protection for underwater historical resources in the Sanctuary. Guidelines published by the NPS assist the states and Federal agencies in developing legislation and regulations to carry out their management responsibilities regarding shipwrecks in accordance with the provisions of the ASA.

The NHPA mandates that Federal agencies consult with the Advisory Council on Historic Preservation before engaging in any undertaking that could affect historic resources. Consultation with the expertise of this Council provides Federal agencies with an opportunity to ensure their proposed activities are technically adequate and that any plans to salvage historical resources take into account preservation requirements for the long-term protection of the resources.

Under the state permitting process, archeological and historical/cultural resources can be excavated and as much as 90% of the value of the salvaged objects may remain in private ownership. The State has priority in determining which of the 10% of the artifacts are to remain in the public domain. This regime provides the public access to the historical resources for educational or research purposes before being turned over to private ownership. Further, guidelines in permits granted to permitees ensure that the marine benthic environment is protected during salvage or research activities on historical resources within State waters pursuant to the State Environmental Protection Act (SEPA).

c. Impact to Uses

Salvage operations in State waters are subject to permits by the WDCD as described above. Salvors are required to obtain a permit after consulting with the coastal tribes (if excavations involved artifacts of tribal interest) and assessing the impacts to resources in the vicinity of the operation. The salvor may retain up to 90% of the value/artifacts salvaged following inspection by the State Archeologist. There is no coordination in policy for salvage operations occurring in State and Federal waters.

2. Sanctuary Alternative (Preferred)

a. Sanctuary Action

Moving, removing or injuring, or attempting to move, remove or injure, a Sanctuary historical resource is prohibited. This prohibition does not apply to moving, removing or injury resulting incidentally from traditional fishing operations.

b. Impact to Resources

Under this alternative, moving, removing or injuring or attempting to move, remove, or injure a Sanctuary historical resources without NOAA approval will be prohibited (see the introduction to Part III). Sanctuary management of historical resources under the authority of the MPRSA shall be consistent, to the extent practicable, with the Federal archeological program by consulting the Uniform Regulations, ARPA (43 CFR Part 7), the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (48 CFR 44716, Sept. 29, 1983) and other relevant Federal regulations. NOAA also intends to work closely with the WDCD and the State Historic Preservation Office (SHPO) regarding approval to move or remove abandoned shipwrecks, title which is held by Washington State.

Management of historical and cultural resources of significance to the tribes will be managed so as to protect other Sanctuary resources and the interests of the governing body of an Indian tribe(s) in such historical resources. If an Indian tribe determines that a historical resource of tribal significance should be researched, excavated or salvaged, the Sanctuary manager may issue a Sanctuary permit if the criteria for issuance have been met. The terms and conditions of the permit will ensure that the Sanctuary program has access to artifacts and research results for education purposes and that the artifacts are placed in a location agreed upon by the interested Indian tribes.

This regulation is necessary in order to protect these valuable resources for research and interpretation. In addition, during its review of a request for a Sanctuary permit, NOAA would consider the impacts of the proposed activity on adjacent Sanctuary resources and qualities such as benthic communities and associated fish populations.

c. Impact to Uses

Human activities that "take" a historical resource would require Sanctuary approval (however, see exception in regulation for certain fishery activities). Such approval would only be given under specific circumstances such as for research or education purposes. Where this responsibility overlaps with other state and Federal agencies the Sanctuary would coordinate its review with the appropriate agency. Most archeological work being conducted is related to the culture and history of the coastal tribes. Shipwrecks that have occurred along the coast have disintegrated due to the high energy environment that characterizes the Pacific Northwest. As only a few uses "take" historical resources, the impact of this regulation on uses is expected to be minor.

E. Alteration of or Construction on the Seabed

1. Status Quo

a. Existing Regulatory Framework

The most relevant legislation pertaining to the alteration of, or construction on, the seabed includes Section 10 of the Rivers and Harbors Act; Section 404 of the CWA; Title I of the MPRSA; the Submerged Lands Act; the Outer Continental Shelf Lands Act; and the Washington State Submerged Lands Act.

The primary Federal agencies affected include, but are not limited to, the COE and EPA. The WDNR is the primary state agency.

b. Impact to Resources

Under this alternative, the benthic resources and the various substrates of the Sanctuary will continue to be protected by the existing management regime and existing state and Federal regulations governing activities on the seabed will still apply. There will be no special consideration of the seabed as an environment that provides a variety of habitats that, in turn, support the rich colonies of kelp and other algae, benthic invertebrates and associated organisms dependent upon these habitat assemblages.

Activities such as sand and gravel mining and dredge disposal may cause loss of sediment and associated disruptions in benthic, kelp and algae communities from erosion of habitat and smothering of organisms from increased turbidity and particle deposition. The benthic communities off the northern Olympic Peninsula are rich feeding grounds for marine mammals and seabirds and development activities could seriously interfere with marine mammal and seabird ecology.

c. Impact to Uses

Harbor maintenance activities are predicted to increase, particularly at Neah Bay and La Push including dredging. The alternatives for dredge disposal sites may include ocean disposal. There is also interest in mining gravel deposits off of Cape Flattery which may result in loss of fish habitat and fishing grounds. These activities may diminish the ecological and aesthetic value of the Sanctuary.

2. Sanctuary Alternative (Preferred)

a. Sanctuary Action

Drilling into, dredging or otherwise altering the seabed of the Sanctuary; or constructing, placing or abandoning any structure, material or other matter on the seabed of the Sanctuary, is prohibited except as an incidental result of:

(i) Anchoring vessels;
(ii) Traditional fishing operations;
(iii) Installation of navigation aids;
(iv) Harbor maintenance in the areas necessarily associated with Federal projects in existence on the effective date of Sanctuary designation, including dredging of entrance channels and repair, replacement or rehabilitation of breakwaters and jetties; or
(v) Construction, repair, replacement or rehabilitation of docks or piers.

b. Impact to Resources

The intent of this prohibition is to protect the resources and qualities of the Sanctuary from the harmful effects of activities such as, but not limited to, archeological excavations, drilling into the seabed, strip mining, laying of pipelines and outfalls, ocean mineral extraction (including but not limited to sand mining), and dumping of dredge spoils and offshore commercial development that may disrupt and/or destroy sensitive marine benthic habitats.

c. Impact to Uses

New activities, for example, development of new breakwaters, new applications or requests for offshore commercial development projects such as, but not limited to, placement of artificial reefs, gravel mining and dredge disposal would be prohibited. No new dredge disposal sites will be allowed within the Sanctuary.

Since harbors are excluded from the Sanctuary boundary, all harbor activities within the exclusion zones would be excluded from the scope of regulations. The construction of new docks and boat ramps in the Sanctuary will require NOAA approval.

F. Taking Marine Mammals, Turtles, and Seabirds

1. Status Quo

a. Existing Management Regime

The MMPA, ESA, and the MBTA are the principal Federal authorities, and the Wildlife Code (RCW 77), the Fisheries Code (RCW 75), and the Hydraulic Code (RCW 75.20) are the Washington State authorities for the protection and conservation of marine wildlife. Agencies involved in the administration of these measures include the NMFS, the USFWS, WDF, and WDW.

b. Impact to Resources

Under this alternative the MMPA and the ESA would provide protection to the marine mammals, turtles and seabirds of the Sanctuary--both prohibit the taking of specific species protected under those Acts. Taking is defined as meaning: 1) for any sea turtle, marine mammal or seabird listed as either endangered or threatened pursuant to the Endangered Species Act, to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect or injure, or to attempt to engage in any such conduct; and 2) for any other sea turtle, marine mammal or seabird, the term means to harass, hunt, capture, kill, collect or injure, or to attempt to engage in any such conduct.

The MBTA codifies a series of conventions between the U.S. and Great Britain, Mexico, Japan and the states that comprised the former USSR providing protection of the migratory birds, and their nests and eggs from taking, killing, possessing, selling and other specified forms of exploitation. Such acts are allowed only via permits (regarding marine mammals except sea otters, see the discussion of fishing for information on the five year incidental take exemption for commercial fishermen established by the 1988 amendments to the MMPA due to expire in October of 1993). These resources will continue to be protected on a species basis but not under the special purview of the Sanctuary management regime which provides the authority to manage uses for the protection of the ecosystem.

c. Impact to Uses

All users of the Sanctuary are prohibited from taking any marine mammal or endangered or threatened seabirds and turtles unless in possession of a permit. For instance, incidental taking of an endangered species in the course of fishing is prohibited except under special circumstances. All taking of migratory birds is prohibited by the MBTA without a permit, and permits are not granted for taking in the course of fishing.

2. Sanctuary Alternative (Preferred)

a. Sanctuary Action

Taking any marine mammal, turtle or seabird in or above the Sanctuary is prohibited, except as authorized by the National Marine Fisheries Service or the United States Fish and Wildlife Service under the authority of the Marine Mammal Protection Act, as amended, (MMPA), 16 U.S.C. 1361 et seq., the Endangered Species Act, as amended (ESA), 16 U.S.C. 1531 et seq., and the Migratory Bird Treaty Act, as amended, (MBTA), 16 U.S.C. 703 et seq., or pursuant to any treaty with an Indian tribe to which the United States is a party, provided that the treaty right is exercised in accordance with the MMPA, ESA and MBTA.

Taking is defined as meaning: 1) for any sea turtle, marine mammal or seabird listed as either endangered or threatened pursuant to the Endangered Species Act, to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect or injure, or to attempt to engage in any such conduct; and 2) for any other sea turtle, marine mammal or seabird, the term means to harass, hunt, capture, kill, collect or injure, or to attempt to engage in any such conduct.

b. Impact to Resources

The proposed prohibition would overlap with the MMPA, MBTA and ESA but strengthen protection by imposing Sanctuary fines for violations of the provisions of the Acts. This regulation includes all marine mammals, sea turtles, and seabirds in or above the Sanctuary.

This regulation would not affect any users other than those already regulated. However, upon violation of this Sanctuary regulation the MPRSA (Section 307) allows NOAA to assess civil penalties as high as $100,000 for each violation. The status quo sets maximum sanctions as follows: The MBTA sets maximum criminal fines at either $500 or $2,000 per violation, depending on the violation. The MMPA sets maximum civil penalties at $10,000 and maximum criminal penalties at $20,000. The ESA sets maximum civil penalties at $500, $12,000, or $25,000 per violation, depending on the violation and maximum criminal fines at $50,000 (the statutes also provide for imprisonment for criminal violations). Thus this Sanctuary regulation may further deter violations. In addition, since civil penalties received for violation of Sanctuary regulations go back into the Marine Sanctuary Program, more directed efforts can be implemented to protect these valuable natural resources.

c. Impact to Uses

As indicated above, this regulation will not affect any uses other than those already regulated which include fishing, whale watching, overflights and commercial development that may take marine mammals, seabirds or turtles.

G. Overflights

1. Status Quo

a. Existing Regulatory Framework

Overflights are regulated by the Federal Aviation Administration (FAA). Current FAA regulations specify minimum altitudes over open water, unpopulated and populated areas which are codified in 14 CFR Parts 91-95. The only restrictions for aircraft flying over the Sanctuary are minimum altitudes of 500 feet from any person, vessel, vehicle or structure. Helicopters may be operated less than 500 feet from the ground if the operation is conducted without hazard to persons or property on the surface. Each person operating a helicopter must comply with any routes or altitudes specifically prescribed for helicopters by the Administrator of the FAA. The FAA has established a 2000 ft. advisory for aircraft flying over National Parks, Wildlife

Refuges and Wilderness Areas.

Thus, all aircraft flying over the Sanctuary can legally fly unrestricted. When there are military operations within the MOA's over the Peninsula, non-military airplanes stay below 1200 ft. Most aircraft that land at airports on the Peninsula (Sekiu, Quileute, Copalis) are small recreational airtaxi or commuter planes.

b. Impact To Resources

Compared to areas around more congested population centers, the air traffic patterns above the Sanctuary are light. However, the minimum altitude requirements do not prevent aircraft from disturbing the marine mammal, pinniped and particularly sensitive seabird colonies of the Sanctuary. Low level overflights of ecologically sensitive coastal areas are know to cause disturbance and even fatalities of marine wildlife. Nesting colonial seabirds are especially vulnerable to noise disturbance from overflights in that a startle reaction may result in egg destruction, or vulnerability of chicks to prey. Migrating and foraging cetaceans are also known to change their behavior patterns when approached by aircraft flying at low levels.

c. Impact To Uses

Under the status quo, recreational and commuter aircraft will continue to fly over the Peninsula and the Sanctuary. There will be no regulations of overflights that protect the ecologically sensitive habitats of the Sanctuary.

2. Sanctuary Alternative (Preferred)

a. Sanctuary Action

Flying motorized aircraft at less than 2,000 feet above the Sanctuary and within one nautical mile of the Flattery Rocks, Quillayute Needles, or Copalis National Wildlife Refuges or at less than 2,000 feet above the Sanctuary within one nautical mile seaward from the coastal boundary of the Sanctuary is prohibited, except as necessary for valid law enforcement purposes, for activities related to tribal timber operations conducted on reservation lands, or to transport persons or supplies to or from reservation lands as authorized by a governing body of an Indian tribe.

b. Impact to Resources

The prohibition on overflights below 2000 feet (610 m) is designed to limit potential noise impacts, particularly those that might startle hauled-out seals and sea lions, sea otters or birds nesting along the shoreline margins of the Sanctuary. Intrusive overflights during sensitive biological periods will therefore be minimized. The 2000 foot minimum was chosen to be consistent with the already existing FAA advisory over the National Park and Wildlife Refuge areas adjacent to the Sanctuary.

c. Impact to Uses

Overflights over the Sanctuary within one nautical mile seaward of the offshore islands and the coastal boundary will be required to remain at least 2000 ft. above ground level. Exceptions will be allowed, if necessary, to respond to an emergency threatening life, property, or the environment, landings or takeoffs from Copalis, Quileute, or Sekiu airports, or for valid law enforcement purposes. Further, tribal operations that involve overflights to facilitate access to tribal lands are exempt from the regulation pursuant to treaty rights of access to reservation lands.

H. Vessel Traffic

1. Status Quo

a. Existing Regulatory Regime (Preferred)

NOAA does not propose to promulgate vessel traffic regulations. Vessel traffic, however, will be placed in the scope of regulations. This preferred alternative, to give NOAA the authority to regulate vessel traffic in the future, but to work within the existing management framework with designation, will enable NOAA to work with the USCG, Washington State OMS, and WDOE on appropriate action to protect the resources of the Sanctuary.

The principal legislation and conventions governing vessel traffic include: OPA 90 (P.L. 101-380); MARPOL 73/78 and its Annexes I, II, and V; Ports and Waterways Safety Act; International Convention to Prevent Collisions at Sea; and the Washington State Oil and Hazardous Substance Spill Prevention and Response Act (RCW 90.56, RCW 43.21I, and RCW 88.46). The responsible agencies are the USCG, Canadian Coast Guard, IMO, Washington State OMS, and WDOE (Appendix I). The resource assessment discusses the roles and authorities of each agency in greater depth.

There is a CVTMS in the Strait of Juan de Fuca with designated inbound and outbound lanes on the U.S. and Canadian sides of the international border, respectively. No vessel greater than 125,000 dead weight tons may pass east of Port Angeles and all tankers passing into Puget Sound must be accompanied by a pilot and one (and soon to be two) escort tugs.

Outside of the Strait of Juan de Fuca there are voluntary agreements by maritime associations to coordinate the movement of coastwise tanker traffic and tank barge traffic. Under these agreements, tankers transiting along the coast remain at least 50 nautical miles from shore unless entering a port of call. Barges follow agreed upon lanes within 5 and 10 miles from shore pursuant to the crabber-tugboat agreements negotiated yearly. The future of these agreed upon lanes, however, is uncertain.

There are no tugs specifically dedicated for emergency response in Puget Sound, the Strait of Juan de Fuca or Grays Harbor. There have been a number of near misses when vessels have lost power either off the coast or in the Straits. Likewise, there have been collisions off the Strait of Juan de Fuca (Tenyo Maru in 1991) and barges punctured off the coast (Nestucca, 1988) which have resulted in oil spills. However, the Strait of Juan de Fuca Emergency Towing Vessel Task Force has been formed and is charged with the mission of establishing, maintaining, and operating an emergency towing vessel in the Strait of Juan de Fuca.

NOAA has been working closely with the USCG on recommendations to the IMO to designate an area from the shoreward boundary of the Sanctuary to 25 nautical miles off the outer coast as an Area to be Avoided (ATBA). This ATBA will ensure enough time, in the event of an engine failure aboard a vessel or other disabling accident, for a tug to intercept the possibly eastwardly drifting vessel during a worst-case storm before it grounds on the shoreline of the Sanctuary.

The USCG will recommend to the IMO in June, 1994 that an ATBA be established off the western Washington coast. ATBA's are areas within defined limits in which either navigation is particularly hazardous or in which it is exceptionally important to avoid casualties, and which should be avoided by all ships, or certain classes of ships (IMO, 1991). Should the request to establish an ATBA not be forwarded to the IMO, or not approved by the IMO, NOAA will reconsider it's options to address vessel traffic issues at that time.

The ATBA would, in effect, create a "buffer zone". This zone would provide sufficient time for response vessels to arrive on the scene of a maritime emergency. Additionally, creation of such a zone would provide time for emergency teams ashore to be notified, contingency plans to be activated, and should there be a spill, some weathering to occur which would reduce the risk of damage to the shoreline.

b. Impact to Resources

With the projected increase in the number of vessels approaching the Strait of Juan de Fuca, it is only a matter of time before the coast experiences another vessel related accident. Such an event, either collision or a grounding due to loss of power or steering control or human error, would likely result in a spill of hazardous material. The rocky intertidal areas and the productive food chain off the Pacific coast are extremely sensitive to damage by oil or other pollutants. This is an area with little coastal access and most booms are ineffective during common winter storms.

c. Impact to Uses

Under the Status Quo, uses will be subject to the outcome of the contingency and response planning initiatives by Regional Marine Safety Committees of the OMS, WDOE and the USCG. There will continue to be no restriction on vessel traffic movement along the coast, and barges and foreign vessels will be able to transit as close to shore as they choose. However, OMS requires all vessels to comply with contingency and prevention plan requirements. If a spill occurs, as it has in the past, there will be serious consequences to the region. Spills interfere with subsistence gathering of intertidal biota, as well as treaty and non-treaty fisheries for salmon, groundfish, halibut, and shellfish. There are substantial impacts to shore birds, seabirds, and marine mammals. Tourism to the coast will also be affected.

The USCG and the OMS are studying various prevention and response proposals to increase marine safety in both inshore and offshore waters. Escort tugs for tanker traffic inside the Strait of Juan de Fuca, tanker free zones, contingency plans, etc., have all been considered and regulations have been implemented.

2. Sanctuary Alternative

a. Sanctuary Action

NOAA will regulate vessel traffic either by prohibiting all vessels, or vessels carrying hazardous substances, from transiting the Sanctuary, or by creating defined vessel traffic lanes for vessels to follow when transiting along the coast.

b. Impact to Resources

Sanctuary regulations would ensure that Sanctuary resources are protected from vessel related incidences occurring as a result of domestic vessel traffic. Regulations would likely apply to ships carrying hazardous cargo, appropriate distances from shore, contingency plans, and vessel and crew standards. However, Sanctuary regulations would have no applicability to foreign vessels.

c. Impact to Uses

A prohibition on vessel traffic within the Sanctuary, or the regulation of vessel traffic within the Sanctuary, can seriously undermine the ongoing efforts to address vessel safety, cause undue economic hardship to a point where the costs outweigh the benefits, or increase the risk of collisions at sea. Further, another management layer will cause added confusion to an already complicated but well coordinated vessel management regime.

This is an alternative that highlights the delicate balance between too much and too little vessel traffic regulation. The entrance to the Strait is a highly congested area due to the presence of tankers, freighters, tugs and barges, and fishing vessels. Any regulations or management actions that further restrict vessel traffic on the approaches to the Strait, especially if promulgated by multiple authorities, will cause greater risk of an accident, especially given the multilingual profile of mariners entering the Strait.

A prohibition on vessel traffic, or establishment of specific lanes along the coast will also minimize the flexibility of barges to negotiate the area in various weather conditions. At a certain point, decreasing flexibility among mariners, and complicating the management regime increases the risk of an accident and consequent damage to Sanctuary resources.

I. Fishing, Kelp Harvesting, Aquaculture

1. Status Quo (Preferred)

a. Existing Regulatory Framework

Fishing and aquaculture are not listed in the scope of regulations. Principal fishing legislation and regulations include: Washington Fish and Game Code, Fishery Management Plans (FMP's) promulgated pursuant to the MFCMA (16 U.S.C. §§ 1801 et seq (Groundfish Management Plan, Salmon Management Plan), International Pacific-Salmon Treaty, and the International Halibut Treaty, and the Boldt Decision. The implementing authorities include the NMFS, the PFMC, the WDF, the WDNR, and the International Halibut Commission. (Appendix I). Kelp harvesting, however, is in the scope of regulations.

b. Impact to Resources

The fishery management regime is highly coordinated and extremely complex. The harvest of fish stocks are coordinated between Oregon, California, Alaska, Canada, and within Washington State, between treaty (among 23 tribes along the outer coast, Strait of Juan de Fuca and Puget Sound) and non-treaty fishers (sport and commercial). The management regime for salmon allocates harvest by fish originating from specific watersheds. Management coordinates hatchery production and monitors the status of the weakest natural runs originating from specific river systems.

Currently, there is no salmon or shellfish aquaculture occurring within the Sanctuary. However, there are numerous tribal and state operated hatcheries that release salmon into streams entering the Sanctuary.

There is very limited kelp harvesting occurring within the Sanctuary. The Lummi and Klallam Tribes harvest small amounts of Kelp near Neah Bay for a limited herring-roe-on-kelp fishery. There is interest in commercially harvesting kelp in the Strait of Juan de Fuca and the WDNR is working on a kelp harvesting management plan. Sea grasses and kelp resources are under the jurisdiction of the WDNR.

Fishing activities in the Sanctuary are extensive in the Strait of Juan de Fuca and its approaches. Commercial and recreational salmon and halibut fishing occurs along the coast and in the approaches of the Strait. Sport fishing is concentrated around Neah Bay, Pillar Point at the mouth of the Pyscht River and off Freshwater Bay at Observatory Point. Salmon are harvested off the coast using the trolling method and in the Strait of Juan de Fuca by gillnets and purse seines. Halibut are harvested by hook and line. Significant halibut grounds are located in the Strait of Juan de Fuca. The halibut quota established by the International Halibut Commission is divided among treaty and non-treaty recreational fishers. Groundfish are harvested by trawling.

Invertebrates are harvested in the Strait of Juan de Fuca and along the outer coast in the intertidal and subtidal areas. Treaty members harvest barnacles, chitons, sea urchins, sea cucumbers and other invertebrates as part of their subsistence economies. Sea urchins are harvested by non-treaty commercial divers around Neah Bay and managed by WDF through rotation of beds. Sea cucumbers are harvested in the Strait in the commercial dive, limited beam trawl, and treaty subsistence fisheries. Sea cucumbers are also managed through the rotation of beds in the Strait of Juan de Fuca. Octopus are harvested from the Strait subtidally by recreational divers, tribal subsistence fishers and incidental to other dive fisheries. Harvests are only permitted if done by hand, or with instruments that do not penetrate the skin.

The FMP's are drafted by the PFMC. The FMP's establish catch limits for groundfish and specifies the duration of the fishing season and catch and size limits for salmon. Commercial fishing-gear restrictions are specified for both the groundfish and salmon fisheries. Trolling and trawling are the only permissible gear on the outer coast for salmon and groundfish and set nets, gill nets, trolling and purse seines are permissible in the Strait of Juan de Fuca for salmon, and trawling for groundfish. Research has shown that the impacts of these gears on the benthic communities is minimal since trawls are designed to be used on soft bottom habitats, and to roll over rocky substrate. Pots are used to harvest crab.

The MFCMA provides for enforcement of FMP's prepared by the PFMC and approved by the Secretary of Commerce after review by the NMFS. Fishery regulations are enforced by the USCG, NMFS and WDF.

The 1988 Amendments to the MMPA established a five year exemption for commercial fishermen to take marine mammals (except sea otters) incidental to their fishing activities. Marine mammals, except sea otters, may be taken incidentally to commercial fishing pursuant to 16 U.S.C. § 1383a until October 1993, after which rulemaking pursuant to 16 U.S.C. §§ 1371, 1373, and 1374 may be required. The amendments require the NMFS to establish an exemption, observer, and reporting system to document incidental captures of marine mammals by fishermen that are expected to take marine mammals. Based on reports of the fishermen, the NMFS is to submit to Congress its recommendations to manage commercial fishing activities in a way that reduces adverse impacts to marine mammals. The interim exemptions will expire in October, 1993. NMFS, the fishing industry and environmental groups are currently developing a permanent management plan. The revised management plan will address the Makah Tribe's treaty right to hunt whales and marine mammals.

The taking of sea otters was specifically excluded from the five year interim incidental take exemption for commercial fishing operations. During the interim period, intentional lethal taking is prohibited for Alaskan sea otters (which is the stock off Washington) rather than a total prohibition (which only applies to southern (California) sea otters) (50 CFR 229.4(b)(2) and 50 CFR 229.6(c)(6)).

In general, fishing activity is extensively regulated to ensure continuous production of fish stocks for long-term harvest and to reduce potential conflict with marine mammals, seabirds, and the benthic communities.

c. Impact to Uses

Fishing in the Sanctuary would be regulated other than under the Sanctuary regulatory regime by Federal and state authorities of competent jurisdiction. ("Fishing regulation" means a regulations that is directed specifically at fishing activities or fishing vessels. This does not include a regulation that is applicable to all types of vessels or activities.)

Under the status quo fishing would continue without any additional regulation under the Sanctuary regulatory regime. As a result of other sanctuary regulations aimed at improving water quality and fish habitat it is expected that the Sanctuary would have a positive impact on fishing activities.

The Sanctuary regulations include four regulations that (if written without the exemption) could potentially have an indirect effect on fishing activities. However, each of the four regulations specifically exempts traditional fishing activities from the scope of the prohibitions to the extent consistent with other existing state and Federal regulations.

The four regulations are: (1) discharges and deposits (including those from fishing vessels) are prohibited except for stated discharges and deposits including ones intended to allow traditional fishing activities; (2) moving, removing, or injuring or attempting to move, remove, or injure a Sanctuary historical resource is prohibited, except resulting incidentally from traditional fishing operations; (3) drilling through, dredging or otherwise altering the seabed or the Sanctuary or constructing, placing or abandoning any structure, material or other matter on the seabed of the Sanctuary is prohibited, except resulting incidentally from traditional fishing operations i.e., the use of traps and bottom trawls, and gear recovery; and (4) taking of marine mammals, reptiles, and seabirds is prohibited, except as permitted by regulations promulgated under the MMPA, the ESA, and the MBTA. Thus, each regulation otherwise potentially affecting traditional fishing activities is specifically designed to exclude such activities from the effect of the regulation. However, if in the future NOAA determines that these exemptions are resulting in injury to Sanctuary resources or qualities from aquaculture, kelp harvesting or traditional fishing activities, changes to the Sanctuary regulations may be undertaken pursuant to the Administrative Procedure Act's (APA) notice-and-comment rulemaking process and the applicable requirements of NEPA and the MPRSA.

Aquaculture activities would also be unaffected by the regulatory regime. NOAA will work with the WDF and DNR and kelp harvesting and aquaculture user groups if new activities are proposed or increases in current levels to determine the impacts, if any, of the activity on the resources and qualities of the Sanctuary.

There are many existing regulations and restrictions on fishing activities in the Sanctuary designed to protect the long-term health of fisheries and other resources and qualities of the region. Therefore, NOAA does not believe it is necessary to promulgate any additional regulations.

In its evaluation of the issue, NOAA considered whether, under the present regulatory structure, sufficient protection for Sanctuary resources existed. NOAA has determined, after consultation with the USFWS, NMFS, PFMC, WDF, and DNR that fishing in the Sanctuary, including fishing for shellfish and invertebrates, shall not be regulated as part of the Sanctuary management regime. Fish resources of the Sanctuary are already extensively managed by existing authorities and NOAA does not envision a fishery management role for the Sanctuary at this time. Instead the Sanctuary will provide research results and recommendations to existing fishery management agencies in order to enhance the protection of fishery and other Sanctuary resources.

Furthermore, in its decision advising NOAA to proceed with the preparation of a DEIS/MP for the Sanctuary, the PFMC also recommended that the regulation of fishery resources remain under the jurisdiction of the State of Washington, the NMFS, the Tribes, and the PFMC.

2. Sanctuary Alternative

a. Sanctuary Action

If NOAA were to consider regulating fishing in the Sanctuary it would first provide the PFMC with an opportunity to prepare draft regulations for fisheries within the EEZ should the need arise to protect Sanctuary resources and qualities from specific fishing activities. Any changes to Sanctuary regulations would be undertaken pursuant to the APA's notice-and comment rulemaking process and the applicable requirements of the NEPA and MPRSA. In the future the Sanctuary will work with fishermen and management agencies including the WDF, the PFMC, and the coastal tribes to determine any additional management measures that may be necessary to protect the resources and qualities of the Sanctuary. Such actions will be submitted in draft for public review and comment on any specific measures taken to address threats from fishing to Sanctuary resources and qualities. Finally an MOA has been prepared between NMFS and NOS regarding fisheries and protection of Sanctuary resources (Appendix J).

b. Impact to Resources

Actions promulgated under this authority will be targeted at protecting specific resources, qualities and habitats shown to be injured by fishing activities, aquaculture or kelp harvesting. Such injury could include, but is not limited to, destruction of benthic habitat from bottom trawling, incidental take of marine mammals and seabirds from gill nets, evidence of reductions in fish stock size, degradation in water quality and disruption of the seabed from aquaculture and negative impacts to sea otter habitat during kelp harvesting operations.

c. Impact to Uses

Under this alternative NOAA will work with affected fishing, aquaculture and kelp harvesting entities to assess the level of impact of their activities. Actions will be taken to minimize negative consequences while at the same time addressing any threat to Sanctuary resources and qualities.

J. Naval Inert Bombing Practice at Sealion Rock
1. Status Quo
a. Existing Regulatory Framework

The Navy voluntarily ceased practice bombing activities over Sealion Rock. On August 18, 1993, the Secretary of Interior rescinded the permit authorizing the Navy to use Sealion Rock as an alternate practice bombing site. Therefore, the Navy may not use Sealion Rock for practice bombing exercises unless it receives a new authorization from the Secretary of the Interior.

b. Impact to Resources

The Navy's past bombing activities over Sealion Rock had the greatest impact on seabirds and marine mammals. Seabirds and marine mammals exhibit startle reactions to the loud noise of the A6 bombers. When seabirds flush from their nests in a startle reaction they often knock their chicks from nests, leave them vulnerable to prey by other birds such as gulls, or in the case of common murres which hold their egg in their feet, drop their eggs. All three reactions are extremely detrimental to seabird populations which are vulnerable to population impacts because they are colonial, mature late in their development, and produce only a few offspring at a time. Most of the colonial seabird populations in the Sanctuary are showing signs of serious decline due to a variety of factors. Perhaps most indicative of this decline are the common murres, whose population has plummeted from approximately 30,000 in 1980 to approximately 3,000 in 1992 (Table 7).

Marine mammals also react in a startle response in such a way as to endanger the young. When startled, pinnipeds stampede into the water often crushing the young in the process.

c. Impact to Uses

Under this alternative the Navy may not use Sealion Rock without a new authorization for the Secretary of the Interior.

2. Sanctuary Alternative (Preferred)
a. Sanctuary Action

The Navy's use of Sealion Rock as a practice bombing target is determined to be incompatible with Sanctuary designation. Therefore, the Sanctuary will prohibit all bombing activities within the Sanctuary. Further, the regulations will provide that no exemption from this prohibition may be issued.

b. Impact to Resources

This prohibition will provide maximum protection to the seabirds and marine mammals by ensuring that they are undisturbed

Table 7. Number of Common Murres at Major Breeding Sites on the Outer Coast of Washington, 1979-1992.

COLONY LOCATION	YEAR													
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	199
White Rock	120	--	--	630	--	--	--	--	55	--	--	450	175	175
Jagged Isl.	--	--	155	--	--	--	655	--	800	450	480	250	25	250
Petrel Isl.	480	1600	--	855	1200	620	--	350	1480	--	--	--	--	--
Quillayute Needles	1555	1590	300	900	30	--	175	450	2370	2650	1870	2210	1450	2120
Rounded Isl.	2130	3435	850	2180	200	800	300	--	--	--	--	--	--	--
Middle Rock	--	--	--	--	--	--	1800	450	--	--	--	--	--	--
Willoughby Isl.	5300	3115	3800	5270	850	--	--	40	--	35	200	15	75	--
Split Rock	9150	3075	8350	10450	--	--	100	--	450	50	75	--	150	--
Point Grenville Isls.	3800	3595	1650	3640	910	1050	300	1600	450	50	75	125	425	500
Grenville Arch	8965	5825	3250	5015	--	--	50	15	5050	250	75	850	25	50
TOTALS	31520	22235	18355	28940	3190	2470	3380	2905	10655	3895	3675	3900	2325	309

during the most sensitive time in their ecology.

c. Impact to Uses

This alternative could place an operational inconvenience on the Navy. The prohibition on bombing activities within the Sanctuary will provide a more positive experience for those individuals living on the Peninsula or visiting the Olympic National Park, and Olympic Coast National Marine Sanctuary.

III Section: Management Alternatives

A. Introduction

Three management alternatives were identified and considered in terms of (1) resource protection, research, and education requirements, and (2) cost-effectiveness. The Management Plan (Part V) includes a detailed discussion of the proposed Sanctuary management regime regarding resource protection, research, education and administration.

B. Alternatives

1. Status Quo

Under this alternative protection and management of the Sanctuary will remain entirely under the existing regime of Federal, state and local authorities, and existing research and education facilities and programs with no NOAA presence.

2 Sanctuary Management Alternative 1 (Preferred)

Under this alternative, NOAA would establish an independent management and administrative system for the Sanctuary in a headquarters that is managed and operated directly by NOAA. The location of the headquarters will initially be in Seattle at NOAA's Sand Point Facility. Staffing will initially include a NOAA Sanctuary and operations manager and phase in an assistant manager, research and education coordinator and a joint position of an interpreter/enforcement official.

The office would coordinate directly and actively with other state and local agencies in decision making and implementation of Sanctuary regulations. The priority in the first two years would be to establish the Sanctuary Steering Committee and initiate a comprehensive planning initiative to identify research, education and administrative priorities and siting of offices on the Olympic Peninsula.

3. Sanctuary Management Alternative 2

This alternative establishes Sanctuary headquarters on the Peninsula soon after designation (within six months) and immediately provides full-staffing in the positions described for Sanctuary management alternative 1. The priority of this alternative is immediate full staffing and siting of headquarters and satellite offices immediately after designation rather than immediate investment in a watershed planning initiative. The feasibility of this alternative depends upon the availability of funding.

PART IV: Environmental Consequences of Alternatives

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ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES

This section evaluates the environmental consequences of each boundary, regulatory and management alternatives for the Sanctuary including the status quo (no action). The consequences of each action are discussed in the context of the predicted impacts to the affected activities and existing jurisdictions, and resources and qualities of the Sanctuary.

Appendix C evaluates each boundary alternative with respect to the distribution of colonial seabirds, marine mammals, invertebrates and fish. Because the study conducted by the Strategic Environmental Assessment Branch of NOAA was undertaken prior to the publication of the DEIS/MP, the Strait of Juan de Fuca is not part of the analysis presented in Appendix C. Pursuant to comments on the DEIS/MP, NOAA has undertaken a comprehensive analysis of the resources and uses of the Strait of Juan de Fuca. This analysis is presented in the following discussion of boundary alternative 4.

I. Section: Boundary Alternatives

A. Introduction

The five boundary alternatives analyzed will protect resources and attributes of the ecosystem off the Olympic Coast to varying degrees of aerial extent. Each boundary alternative is described on the basis of the resources and human uses encompassed by the alternative. The environmental consequences of each boundary alternative are discussed in the context of the preferred resource protection and management regime.

B. Boundary Alternative 1.

Boundary alternative 1 extends from Koitlah Point just west of Neah Bay to Pt. Grenville and seaward to the three nautical mile limit of state jurisdiction. This boundary encompasses an area of 315 sq. nautical miles. This boundary alternative focuses primarily on land/sea interactions and the protection of seabird colonies and pinniped haul-out sites. Most of the coast between Cape Flattery and Point Grenville is dominated by steep cliffs rising abruptly from shore 50 to 300 feet above a wave-cut platform. Interspersed among these cliffs are pocket beaches. Small islands, sea stacks, and rocks dot the coastal and offshore waters. Most of the rocks and islands are included within the boundary of the National Wildlife Refuges and Olympic National Park.

There is very little human development along this coastal boundary. The Makah, Quileute, Hoh and Quinault Tribes have reservations adjacent to the coastline and the remainder of the coastline is under the jurisdiction of the Olympic National Park and Washington State (between Pt. Grenville and Copalis Beach). The coastal area of the Makah and Quinault Reservations encompass the largest coastal areas of all four tribes, and their coastal regions adjacent to this boundary alternative are dedicated wilderness areas. Within the watersheds that drain into this coastal boundary, the two principal land uses are recreation associated with the Olympic National Park) and timbering operations. There is anecdotal evidence that upland forest practices are pressuring coastal resources such as kelp beds and estuarine areas. The largest sources of freshwater discharges are the Quinault, Queets, Hoh and Soleduck rivers.

Many tourists visiting the Olympic National Park travel to the coastal areas to participate in sports fishing, birding, hiking, kayaking, and razor clam digging. Tourism is economically important to the tribes. The tribes also depend on the coastal and intertidal resources for subsistence hunting and gathering. Degradation of the coastal environments would severely impact tribal economies.

Treaty and non-treaty fisheries are important human activities in this boundary. Treaty fishers use gillnets in the mouths of the coastal streams to harvest salmon returning to their spawning grounds. Treaty and non treaty fisheries for salmon, groundfish and shellfish occur offshore.

There are numerous archeological resources within this boundary which are significant to the coastal tribes. These include burial grounds, and other areas of cultural and spiritual significance. The Makah Archeological Museum documents some of the tribal archeological history of the area. Many artifacts recovered from the recently excavated Ozette Village are preserved and displayed at the museum. There have been numerous shipwrecks on the rocks and islands, however most have disintegrated from the high wave energy in this region. There is evidence that during the period of the last glaciation, there were human settlements seaward of the present day coastline. However, boundary alternative 1 excludes much of the region believed to contain offshore archeological resources.

Boundary alternative 1 includes Sealion Rock. The Navy has permission from the U.S. Fish and Wildlife Service to use Sealion Rock as a practice bombing target. Whidbey Island and Pacific Naval Fleet A6 bombers drop inert bombs on the island. While the Navy has voluntarily ceased their practice bombing activities over Sealion Rock, their ability to use Sealion Rock in the future depends upon the outcome of a lawsuit brought against the Navy and the USFWS. The lawsuit addresses the legality of the permit issued by the Department of Interior under which the Navy is authorized to use Sealion Rock.

There is minimal vessel traffic in this region due to the rocky nature of the shoreline and strong wave action. There may be an occasional tug and barge transiting the coast close to shore where there are few rocks, but most are likely to traverse seaward of the refuges. This boundary precludes the Sanctuary from addressing vessel traffic which, although predominately outside of 3 miles, threatens the coastal ecosystem.

The benthos off the coast is predominately sand which originates north of Point Grenville from sediments transported by the Strait of Juan de Fuca and upland drainage basins. South of Pt. Grenville sediments originate from drainage basins emptying into the Columbia River. Overlaying the bedrock along many areas of the coast are gravel deposits laid down by glacial streams during glaciation of the Olympic Mountains. The most extensive gravel deposits are found off Cape Flattery and just north of the Quinault River. Boundary alternative 1 would encompass the deposits off the Quinault River, but exclude those off Cape Flattery.

Extensive macrocystis kelp beds extend from Koitlah Point to Cape Alava and into the Strait of Juan de Fuca to Observatory

Point and boundary alternative 1 encompasses that portion of kelp on the outer coast. There is anecdotal evidence that in the recent past the kelp beds extended further south than Cape Alava. High sedimentation is believed among some to be the cause of the decline in kelp biomass. A lack of monitoring activities along the outer coast makes it difficult to substantiate this observation. Boundary alternative 1 includes the kelp resources along the outer coast, but excludes the extensive and diverse kelp beds located in the Strait of Juan de Fuca.

NOAA's analysis demonstrates that boundary alternative 1 is one of the least significant areas in the study are with respect to total aggregate fish resources (see Appendix C). Some commercial salmon, crab, and recreational groundfish fisheries occurs in this boundary, however significant fish resources and harvesting areas are excluded. Boundary alternative 1 includes much of the recreational fishing areas for bottomfish, some of the recreational areas for salmon, and excludes most of the halibut fishing grounds. This boundary alternative also excludes the seaward extent of the commercial salmon fishing grounds.

Boundary alternative 1 rates most significant with respect to invertebrates (Appendix C). This analysis, however, does not include the Strait of Juan de Fuca which has remarkable subtidal invertebrate communities. In fact, the intertidal areas of the Olympic Peninsula represents some of the most diverse intertidal habitats in the world. The intertidal habitats have been studied extensively at Tatoosh Island by researchers from several Universities.

When compared to the other boundary alternatives, Boundary alternative 1 is significant for offering haul out sites and rookery areas for pinnipeds, but, excludes many of the haulout sites in the Strait of Juan de Fuca. It is, however, one of the least significant boundary alternatives for marine cetaceans. This boundary does not encompass the foraging habitats or migration routes of the marine mammals and thus is incomplete from an ecosystem perspective.

This boundary alternative includes most of the colonial seabird nesting sites in the study area, and some of the largest number of seabird colonies in the contiguous United States. A small number of colonies exist slightly east of Koitlah Point outside of this boundary alternative. Boundary alternative 1 is limited in that it does not include the foraging areas of the seabirds. Seabirds such as the storm petrel forage for days at the shelf edge during the nesting season. Other seabirds forage at varying distances from the nesting sites. Thus, this boundary alternative offers no protection for these critical foraging and nesting habitats from the impacts of oil and gas exploration and development, or vessel traffic accidents. The coastal area of this boundary alternative is remote with few access points. This remoteness, coupled with the extreme sensitivity of rocky intertidal habitat, pinnipeds, and colonial seabirds, makes this coastal region particularly vulnerable to impacts from offshore development.

The few airstrips along the coastal boundaries of the Sanctuary include the Copalis Beach air strip (accessible at low tide when landings and takeoffs are not obstructed by driftwood), and an unstaffed airstrip at Quileute. One cargo plane daily uses the Quileute airstrip Monday through Friday. There are 40 additional operations per week at the Quileute airport. There is no radar coverage below 3000 ft and therefore no statistics available on the number of aircraft flying over the Sanctuary. Most aircraft are recreational craft or small air taxis which are believed to observe a 2000 ft. advisory over the National Park and National Wildlife Refuges. There are no altitude restrictions over the Sanctuary waters. During the nesting and breeding season, low flying aircraft present a threat to Sanctuary resources. This boundary alternative will protect the colonial seabirds and mammals of the Sanctuary by prohibiting overflights less than 2000 ft.

In summary, boundary alternative 1 surrounds some of the significant features that one can see from the shore, i.e., seabird nesting colonies, pinniped haul-out sites, part of the cetacean migration corridor, some of the kelp habitat, much of the rocky intertidal habitats and pocket beaches. It is, however, severely limited in encompassing the entire ecosystem in that is does not protect the extent of these resources, including those that exist further offshore and into the Strait of Juan de Fuca. This larger ecosystem supports the biological features visible from shore. This boundary alternative also provides no buffer against activities that could seriously impact the coastal resources.

Figures 59-62 depict boundary alternative 1 in relation to fisheries, marine mammal haulout sites, kelp habitat, seabird colonies and foraging areas, and human uses other than shipping.

C. Boundary Alternative 2

Boundary alternative 2 extends the seaward boundary of Boundary alternative 1 to the 50 fathom isobath and the southern boundary to Copalis Beach. It encompasses an area of approximately 1100 square nautical miles. It has all the features of boundary alternative 1 but includes more fishing grounds including all the crab fishing areas, and more of the commercial salmon and groundfish fishing grounds. When considering the relative density of fish species in the study area, based on commercial and recreational harvests, boundary alternative 2 contains approximately 27% of the density of fish in the study area (Appendix D). There is active vessel traffic

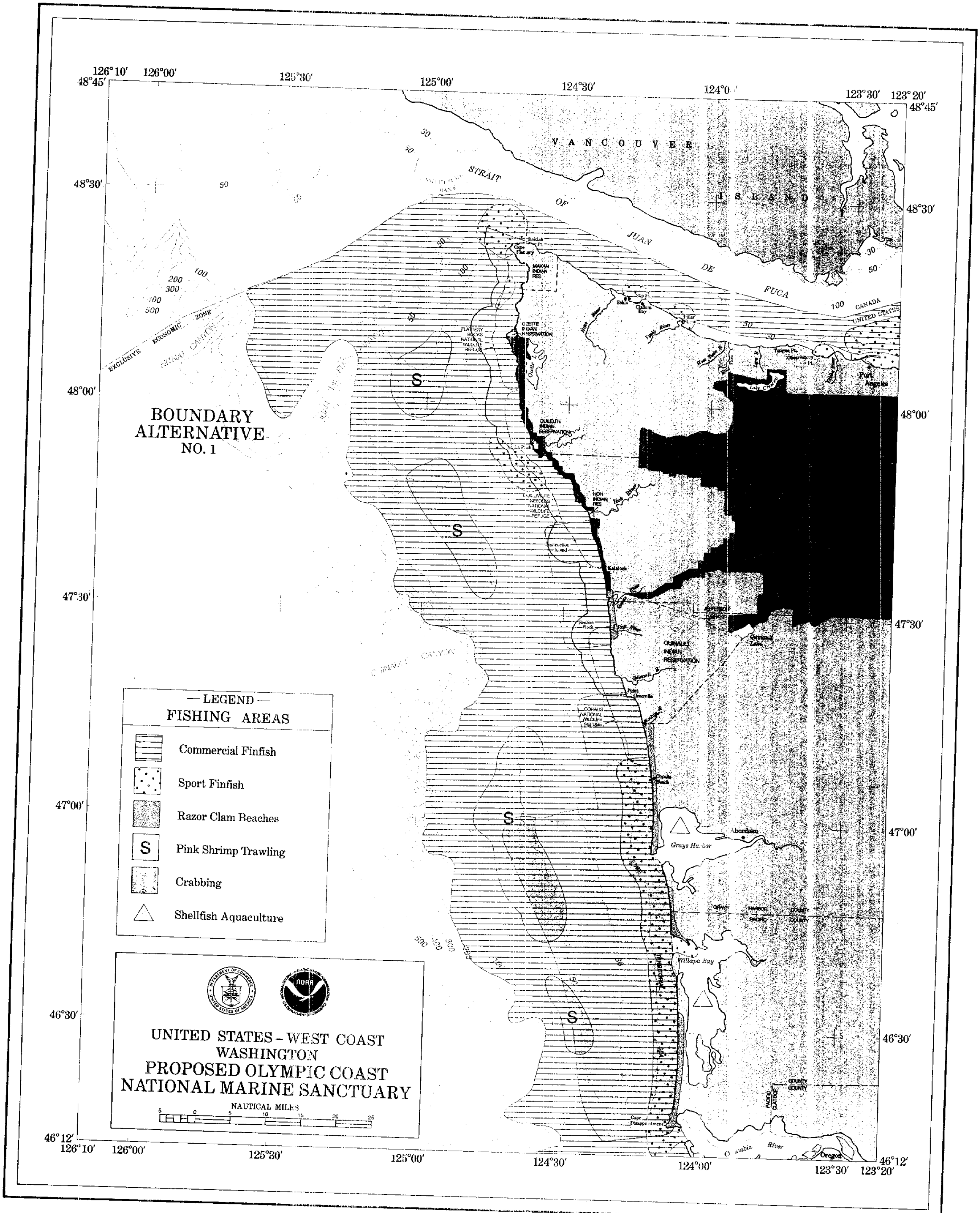


Figure 59. Boundary Alternative 1 in Relation to Fisheries.

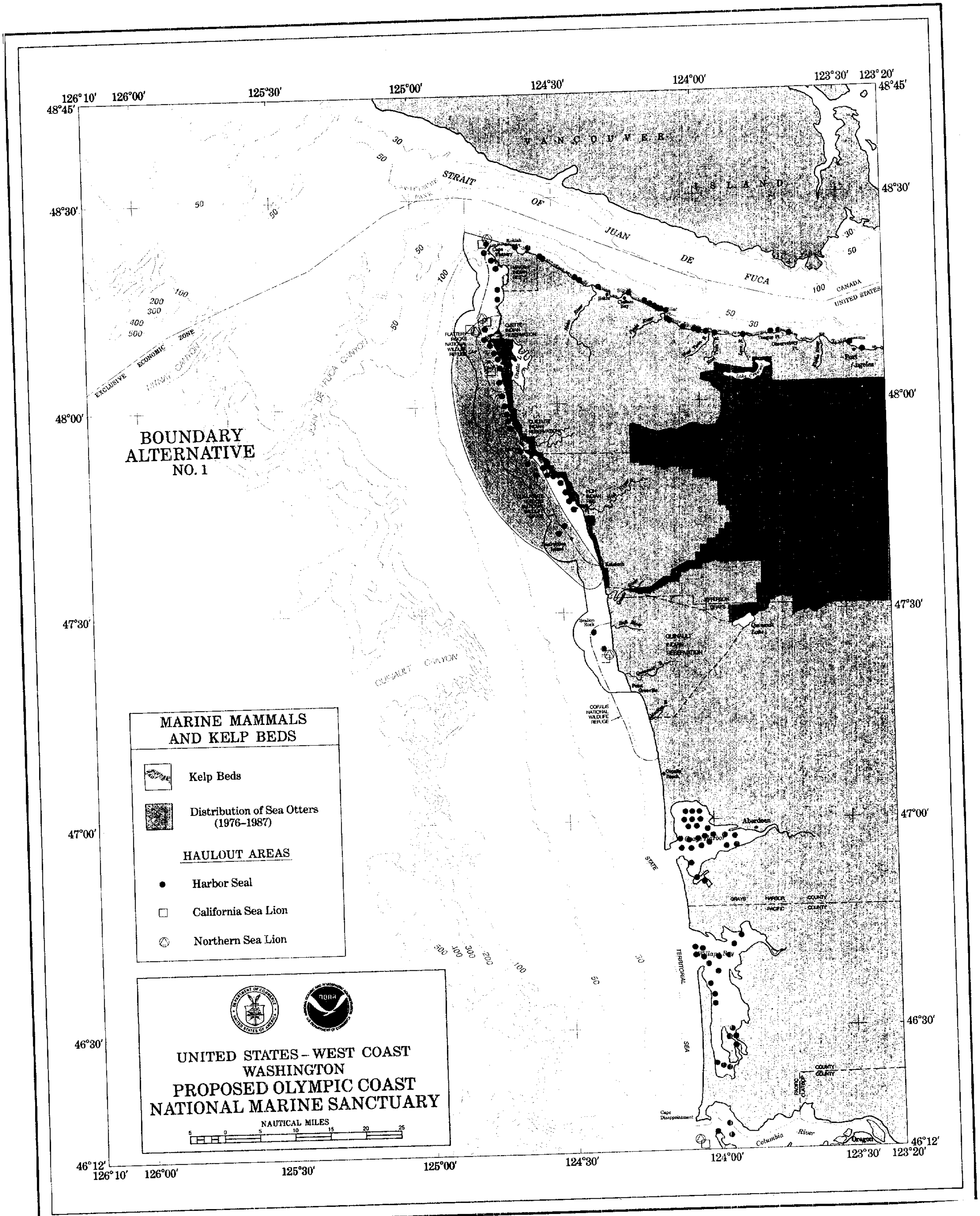


Figure 60. Boundary Alternative 1 in Relation to Marine Mammal Haulout Sites and Distribution of Kelp Habitat.

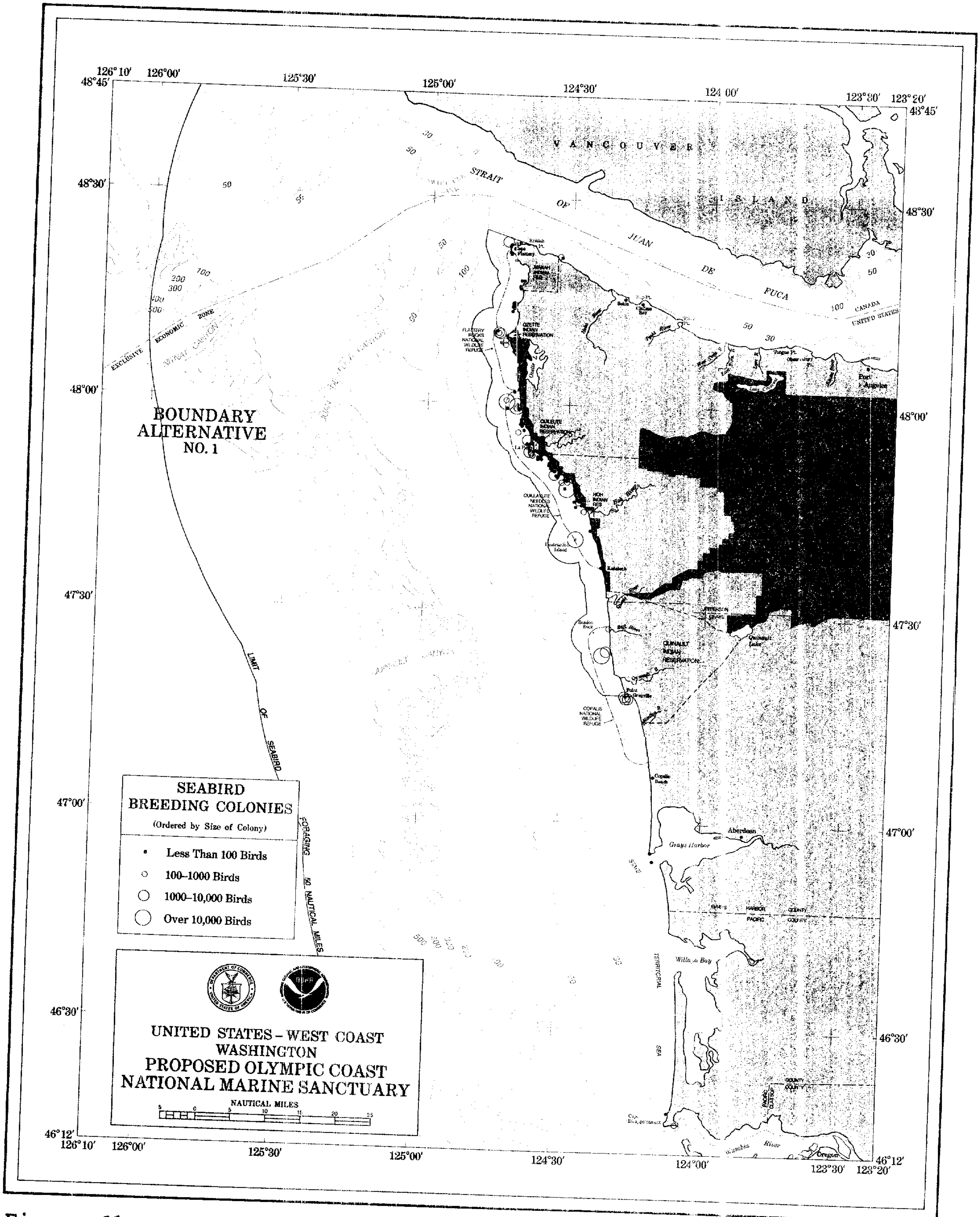


Figure 61. Boundary Alternative 1 in Relation to Seabird Colonies and Seabird Foraging Range.

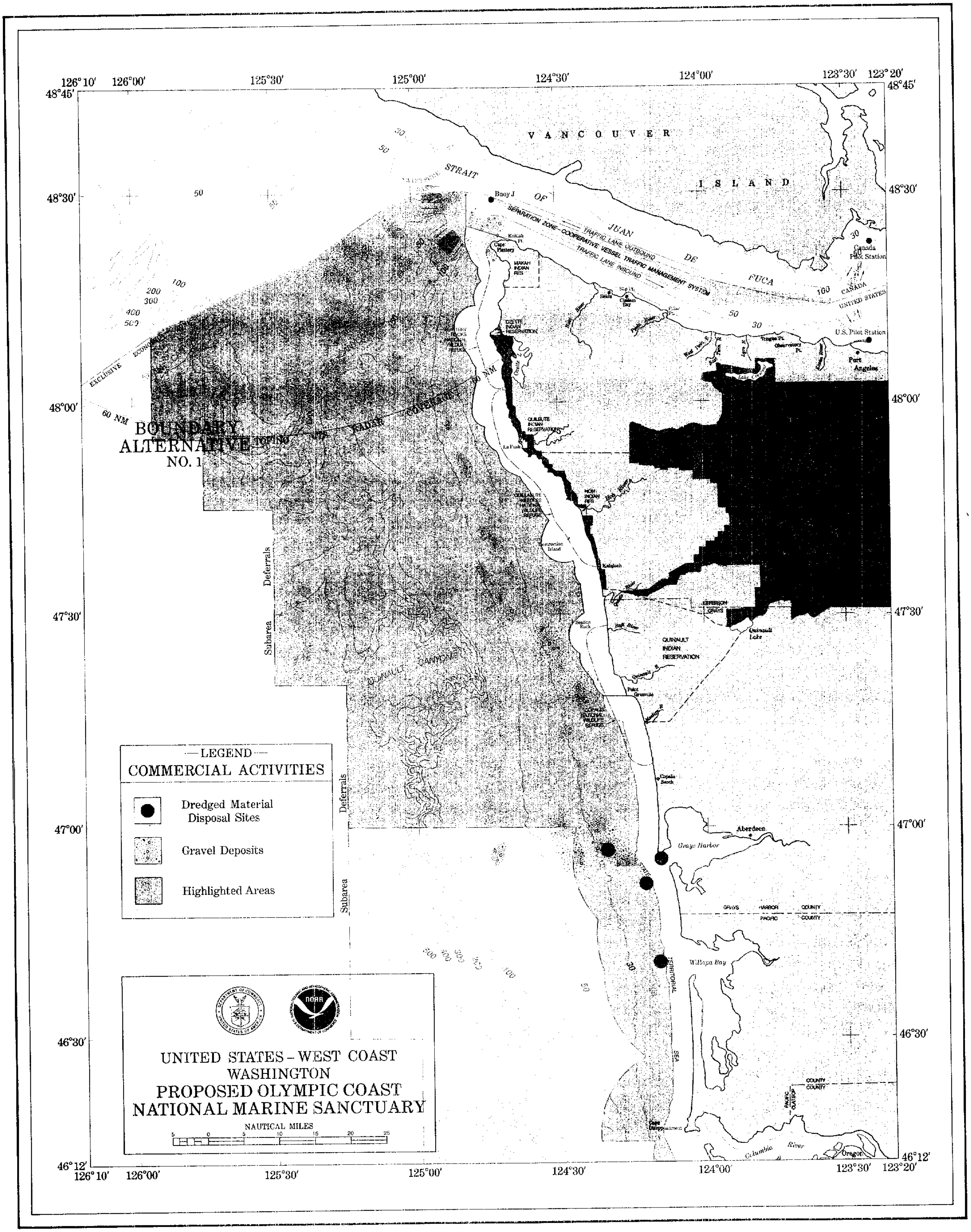


Figure 62. Boundary Alternative 1 in Relation to Vessel Traffic Management Regimes, Dredge Disposal Sites, Oil and Gas Resources and Gravel Deposits.

through this boundary including most of the tug and barge traffic, and foreign product carriers and foreign tankers. There are estimated to be oil and gas reserves under the Federal OCS.

Boundary alternative 2 contains approximately 30% of the density of invertebrates within the entire study area (excluding the Strait of Juan de Fuca). Dungeness Crab, ocean pink shrimp and giant octopus account for the majority of invertebrates within this boundary alternative.

With respect to marine mammals, boundary alternative 2 is only slightly more significant than boundary alternative 1. While it increases the area encompassing the whale migration routes, it fails to include the significant marine mammal foraging habitats and migration routes found near the edge of the continental shelf.

This boundary alternative encompasses more seabird foraging area as well. However, as with mammals, this boundary excludes the rich neretic zone environments near the shelf and canyon edges significant to seabird ecology. The boundary also excludes the intense foraging area right outside the Strait of Juan de Fuca over the Juan de Fuca canyon where millions of seabirds are found foraging during the summer months.

There are more vessels (tugs and barges and foreign product carriers) that transit the waters encompassed by boundary alternative 2 than boundary alternative 1. While domestic tankers transporting petroleum products in coastwise transit remain offshore well outside boundary alternative 2 pursuant to the voluntary agreement of the WSPA, many domestic barges engaged in coastwise traffic transit within boundary alternative 2. The Mukkaw Bay anchorage, where vessels anchor awaiting either available pilots in Port Angeles for entry into Puget Sound, or directions from home ports, is also located within boundary alternative 2. The Sanctuary would work with the Canadian and U.S. Coast Guards to undertake an educational campaign to inform mariners of Sanctuary status and the applicable regulations. This boundary alternative does not completely allow the Sanctuary program to address the impacts from vessel traffic since vessels including many tugs and barges transit further than the seaward extent of this boundary.

With respect to oil and gas development, boundary alternative 2 adds Sanctuary control over an additional percentage of the estimated oil and gas reserves in Federal water. Since there is a prohibition on oil and gas within the boundaries of the Sanctuary, this boundary provides a buffer for the coastal resources. But it does not encompass the reserves that extend seaward to the continental shelf.

In summary, boundary alternative 2 adds more resources and uses within the Sanctuary boundary than are encompassed by boundary alternative 1. Boundary alternative 2, however, excludes a significant amount of the coastal ecosystem and areas that support uses which threaten the integrity of the Sanctuary. The relationship of boundary alternative 2 with respect to the extent of resources and uses is depicted in Figures 63-66.

D. Boundary Alternative 3

Boundary alternative 3 expands upon boundary alternatives 1 and 2 by extending the seaward boundary to the continental shelf. It encompasses an area of approximately 1805 square nautical miles. While it cuts across the head of the Quinault Canyon, it excludes the more significant Juan de Fuca Canyon. As such, it is an area enriched by enhanced upwelling from the edge of the continental shelf and the Juan de Fuca Canyon which fuels the rich ecosystem over the shelf and near the shelf edge. This area encompasses significantly more fishing grounds including salmon trolling areas and groundfish trawling areas. It includes the productive banks that surround the Juan de Fuca Canyon along its southern edge. This alternative also encompasses the pink shrimp trawling areas near the shelf edge.

Boundary alternative 3 includes approximately 42% of the fish resources (Appendix C). Lingcod, rockfish, sablefish and salmon are common fish resources within this boundary alternative. This boundary alternative encompasses a significantly increased portion of the fishing grounds for sole, rockfish, halibut, sablefish, lingcod, hake, Pacific cod, and includes the entire pink shrimp trawling areas north of Point Grenville. It also encompasses more commercial salmon harvesting areas.

Invertebrate densities (of commercial and recreational significance) included by the seaward extension of boundary alternative 3 are dominated by pink shrimp concentrations found closer to the shelf edge and also added Dungeness crab populations. This boundary alternative includes approximately 42% of the total invertebrate density calculated by NOAA (excluding the Strait of Juan de Fuca).

The seaward portion of the study area added by boundary alternative 3 is one of the most significant with respect to marine mammals. Not only does it encompass significantly more of the cetacean migration corridor, but it also adds an area where there have been sitings of such rare whales that inhabit deeper ocean environments such as the sperm whale and right whale, the latter which is the most endangered of all whales.

Boundary alternative 3 adds significantly more colonial seabird foraging areas at the shelf edge, especially for the Leach's Storm Petrel. It also encompasses the mid-shelf and

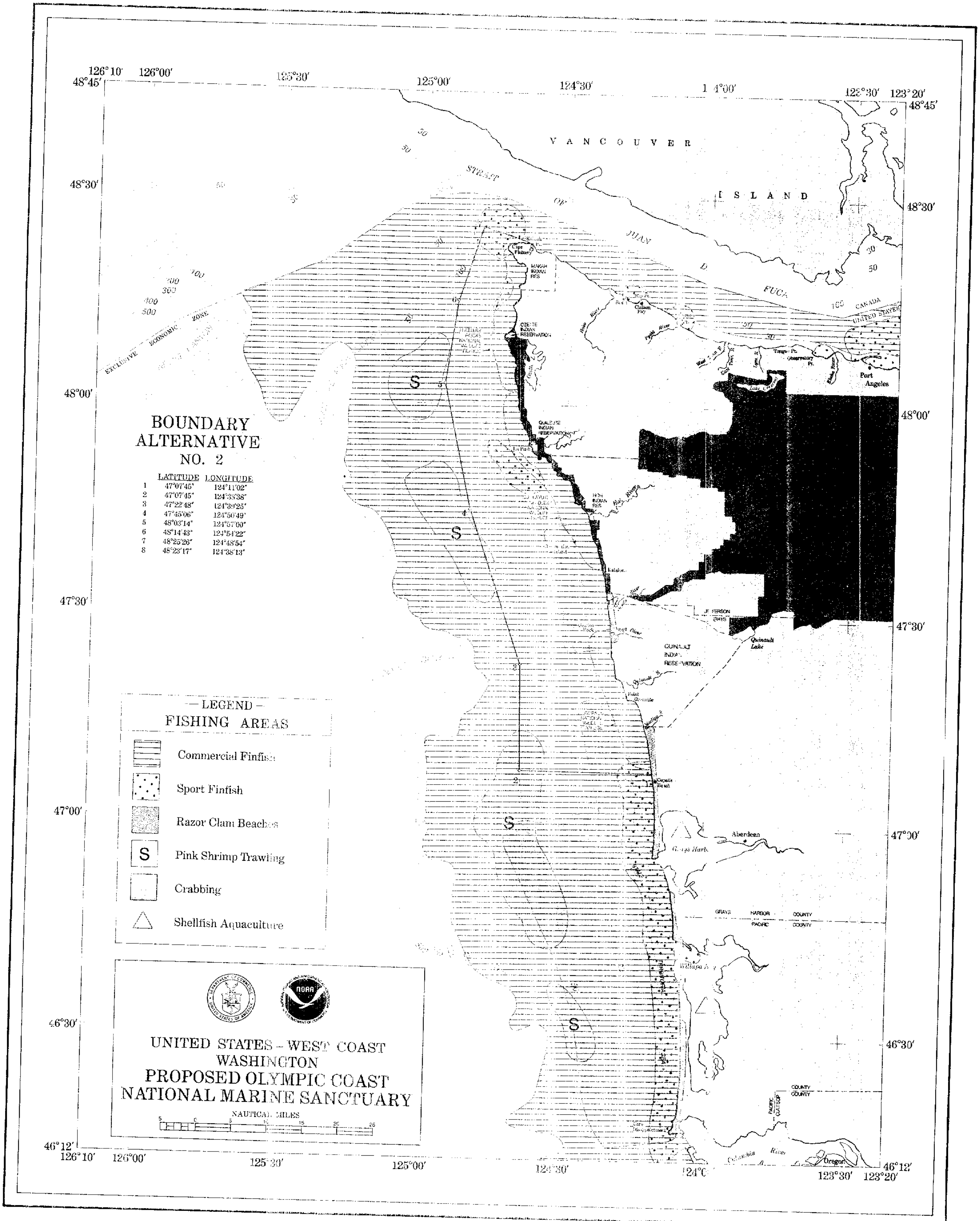


Figure 63. Boundary Alternative 2 with Respect to Fisheries.

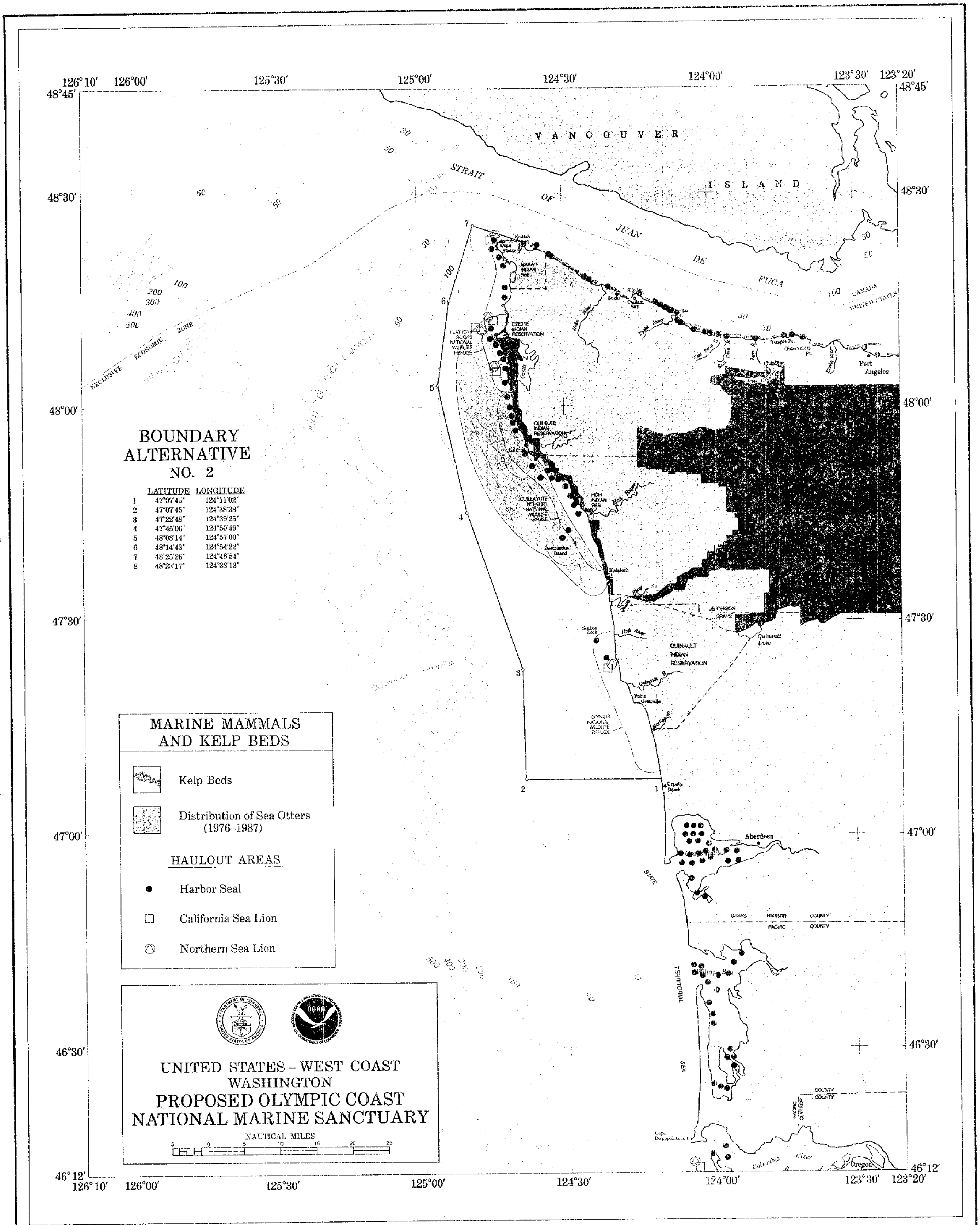


Figure 64. Boundary Alternative 2 with Respect to Marine Mammal Haulout Sites and Kelp Habitat.

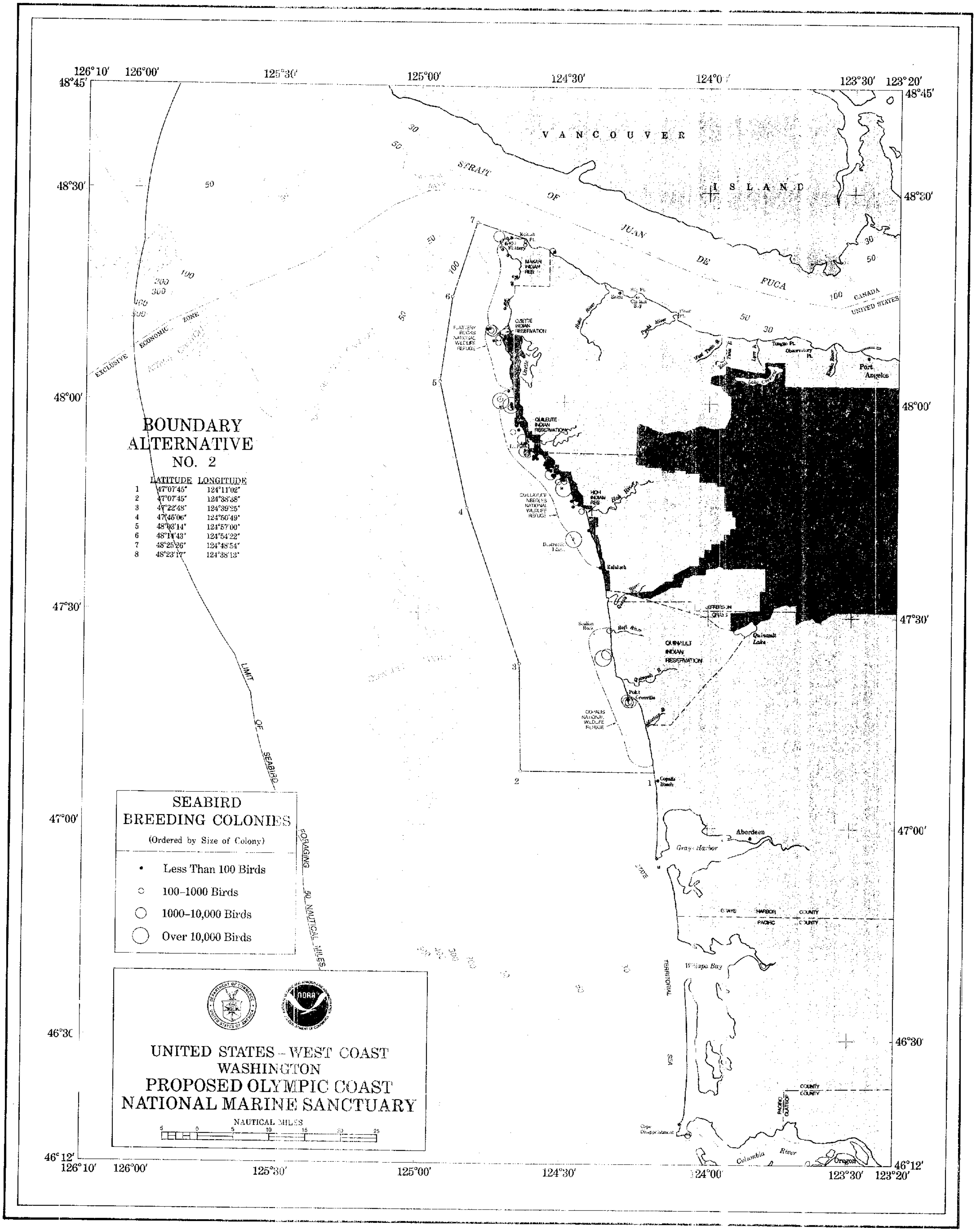


Figure 65. Boundary Alternative 2 with Respect to Seabird Colony Sites and Foraging Range.

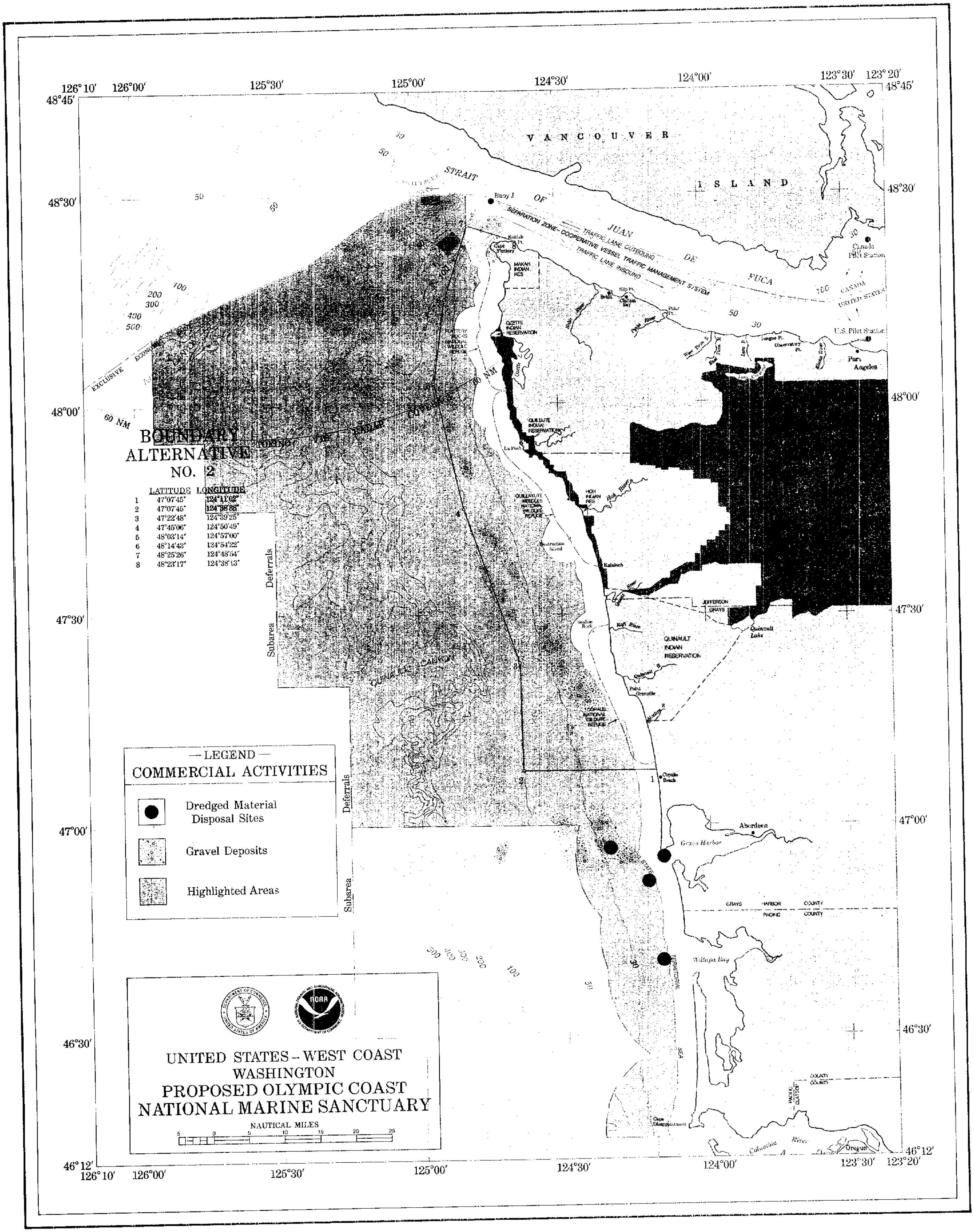


Figure 66. Boundary Alternative 2 in Relation to Vessel Traffic Management Regimes, Dredged Disposal Sites, Oil and Gas Resources and Gravel Deposits.

nearshore foraging areas. However, it still excludes those areas over the Juan de Fuca Canyon seaward from the entrance to the Strait of Juan de Fuca where one is most likely to see the densest concentrations of foraging seabirds. This area was recognized by the most recent and comprehensive seabird study of the West Coast, conducted by MMS, as one of the most significant seabird habitats off the west coast of the contiguous U.S.

From a human-use perspective, this boundary would encompass an increasing aerial extent of the former Lease Sale #132 which adds a greater buffer from impacts of coastal development. This will protect the viewshed off the Sanctuary by maintaining its pristine quality. This boundary alternative also encompasses more of the vessel traffic corridor. Radar coverage from Tofino extends 15 miles into this boundary alternative. Figures 67-70 depict boundary alternative 3 with respect to the areal extent of fisheries, marine mammal haul out sites, kelp distribution, and human uses other than fishing.

E. Boundary Alternative 4

Boundary alternative 4 was the preferred boundary in the DEIS/MP for the Olympic Coast National Marine Sanctuary. Pursuant to comments on the DEIS/MP, NOAA has undertaken an analysis of the resources, uses, and coastal development patterns in the Strait of Juan de Fuca. Boundary alternative 4, as it appeared in the DEIS/MP, includes the area of boundary alternative 3 and the addition of the head of the Juan de Fuca Canyon. The boundary includes the key fishing areas off the Strait, the most significant bird foraging areas, additional ocean pink shrimp, squid, salmon, and groundfish harvesting areas. This is also the area where vessels converge as they enter and exit the Strait of Juan de Fuca. It is a complex area in terms of managing human uses due to the variety of uses, vessel types, cargo and languages spoken by mariners. This complexity was most recently evidenced by the sinking of the Tenyo Maru which resulted in an oil slick along the coast killing numerous pinnipeds, birds and fish.

NOAA's analysis of the resources and uses in the Strait demonstrate that the Strait is ecologically contiguous with the outer coast environment. The Strait of Juan de Fuca is widely recognized as a transition zone between the open ocean characteristics of the outer Washington Coast and the inner sea dynamics of Puget Sound proper. These characteristics include beach profiles, sediment types, bathymetry, salinity, currents, wave force, and biological resources. No study has been identified that specifically defines a boundary between the outer coast ecosystem and that of the inner sea. In any event, such a boundary would hardly exist in nature as a fixed line of demarkation but rather a band or zone where open ocean processes cease to predominate and inner sea processes (hereafter referred

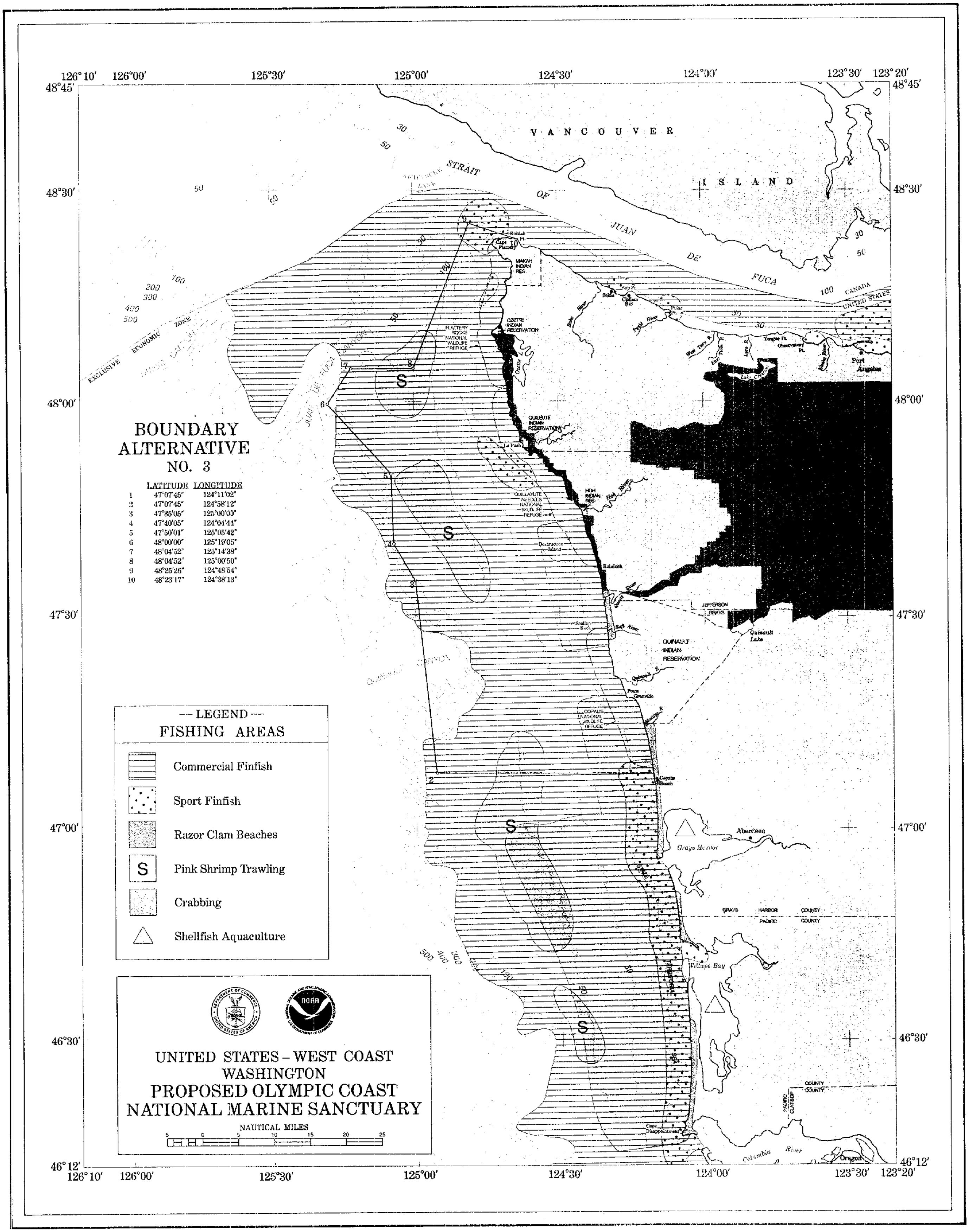


Figure 67. Boundary Alternative 3 with Respect to Fisheries.

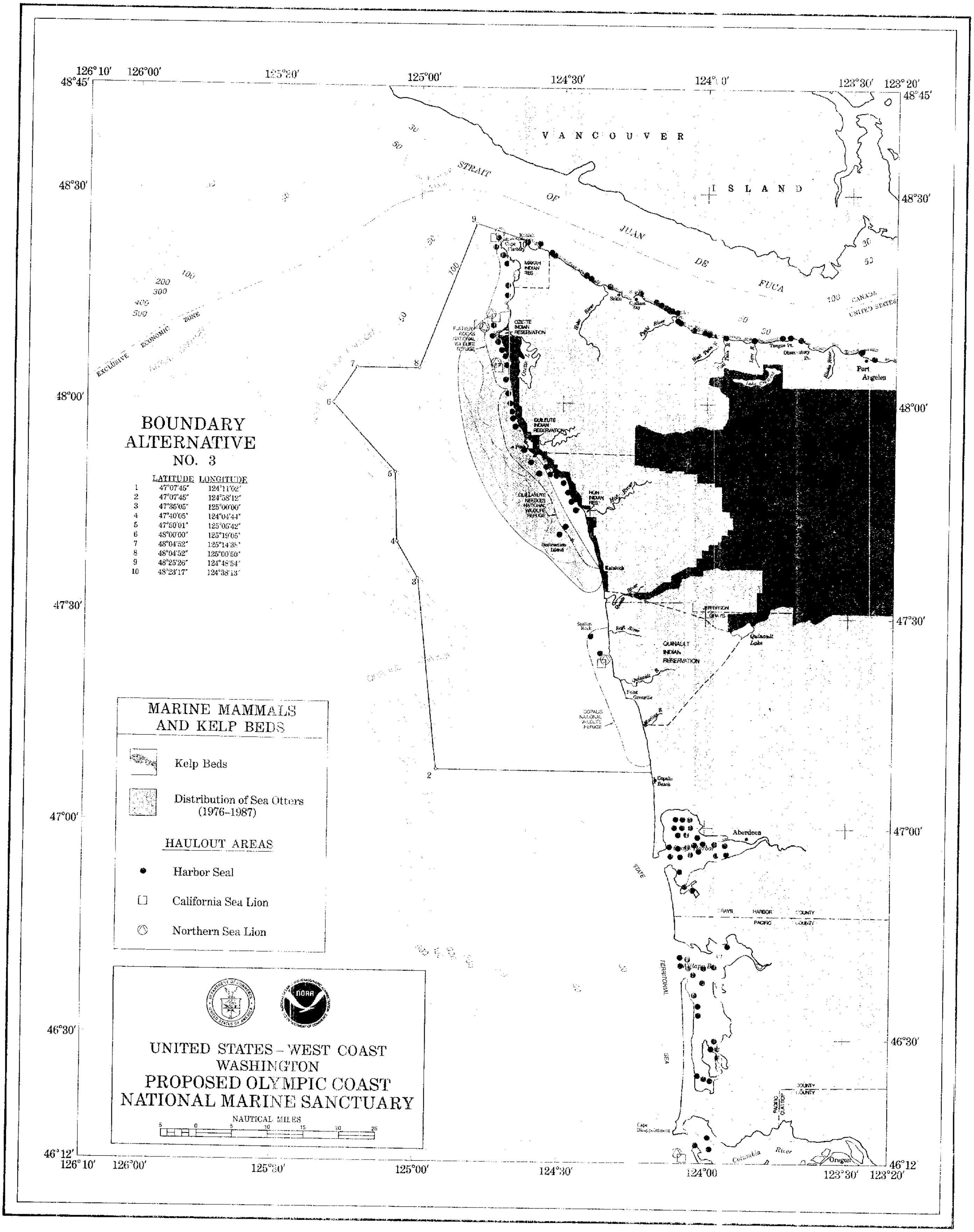


Figure 68. Boundary Alternative 3 with Respect to Marine Mammal Haulout Sites and Kelp Habitat.

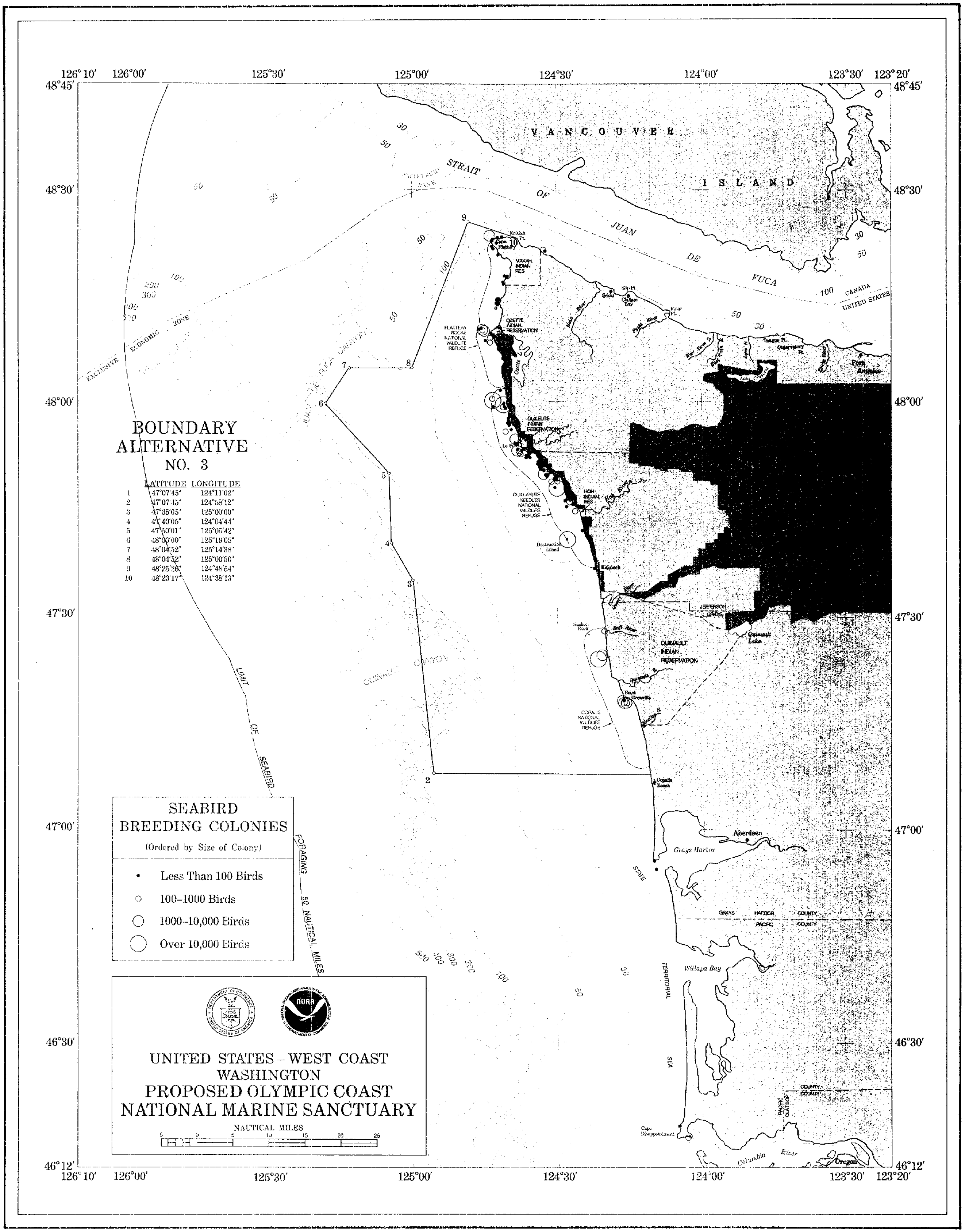


Figure 69. Boundary Alternative 3 with Respect to Seabird Colonies and Seabird Foraging Range.

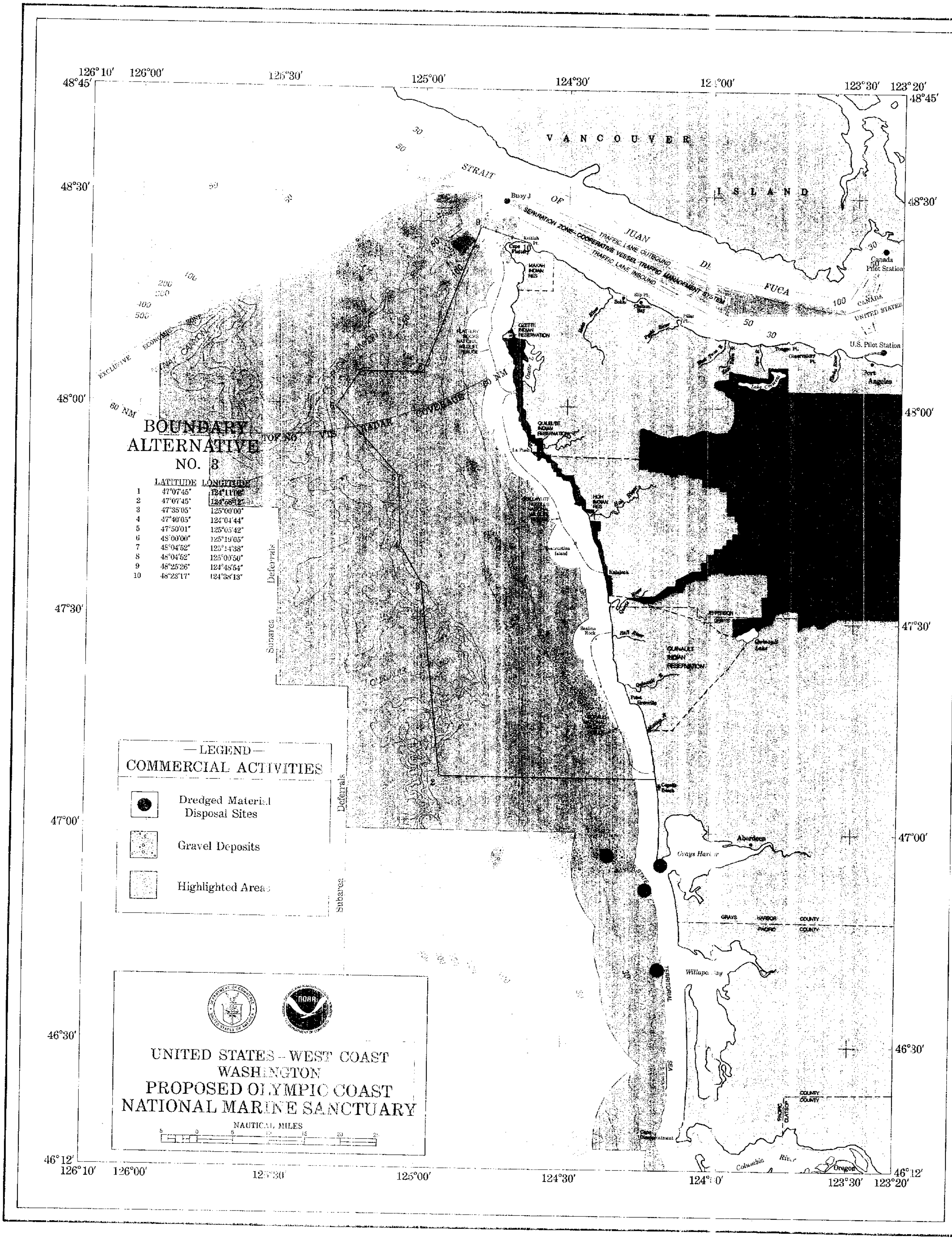


Figure 70. Boundary Alternative 3 in Relation to Vessel Traffic Management Regimes, Dredge Disposal Sites, Oil and Gas Resources and Gravel Deposits.

to as "estuarine") become more common. Once such a zone is identified, a fixed boundary may be drawn that will include the furthest inland approach of oceanic processes in any given season.

The entire Strait of Juan de Fuca east to the San Juan Islands is decidedly marine in character with water salinity approaching that of the Pacific Ocean (29 to 21 ppt). Salinity is often lowest

in the eastern and northern portions of the Strait due to the influence of the Fraser River and other freshwater sources. Surface temperatures range between 8° C and 11° C; the west portion of the Strait of Juan de Fuca is warmest due to the influence of Pacific Ocean Water" (Long, 1983). The water column in the San Juan Island area is more stratified due to a large volume of freshwater inflow from the Fraser River. Water density in the Strait of Juan de Fuca is fairly homogeneous at all depths. The salinity and temperature regime of the Strait does not shift or change in any manner that would distinguish oceanic from estuarine processes (Duxberry, p.c., 1992).

The center channel of the Strait exceeds 100 fathoms from the western entrance to the head of the Juan de Fuca subsea canyon (offshore of the Twin River estuary). The westward limit of the Juan de Fuca Canyon extends several miles off the Washington coast. Though upwelled water travels up the canyon, upwelling occurs across the width of the Strait. However, the distribution and density of upwelled nutrients in the Strait has not been systematically identified (Duxbery, p.c., 1992).

Studies in the late 1970's conclude "that year-round net circulation in the Strait consists of a rigorous two-layer estuarine [current] pattern with seaward flowing near-surface currents of 20-40 cm/S and landward flowing deeper currents of -10 cm/S. The level of no net motion is typically between 40 and 60 m. These studies also have shown that during non-summer months, the near surface (upper 15 m) circulation in the western Strait is dominated by the sub-tidal motions with periods of 5-30 days which induce reversals in the estuarine flow of up to 60 cm/S. Such sub-tidal fluctuations are strongly correlated with local winds, atmospheric pressure, and sea level. During a later winter experiment in the eastern strait, seven such current reversals lasting from 2-6 days with maximum upstrait velocities of 20 cm/s were found to depend upon the direction, strength, and duration of winds associated with coastal cyclonic storms. During current reversals, coastal water, which can be fresher owing to Columbia River discharge and warmer owing to summer heating, has been observed to intrude up to 135 km into the strait (vicinity of Dungeness Spit)" (Frisch et al., 1981). Studies have "also found evidence for the reversals to intrude along the southern half of the western strait first...Details of the flow at the interface between inflow and outflow were mapped with an HF current-mapping radar and reveal complex mixing circulation with diversion to the south" (Frisch et al., 1981). This area of mixing is located between Victoria BC, Dungeness Spit and Port Angeles. In addition to these surface and deep-water current flows, longshore flows between Cape Flattery and Dungeness Spit are not appreciable for the most part, but when existing (usually in pocket beach areas) flow in an easterly direction (Schwartz, 1991).

The coastline west of the Elwha delta is composed predominately of bedrock. It is characterized by rocky exposed shorelines and intertidal areas, small estuaries, short pocket beaches, and high steep backshores. The armored shoreline is stable with a minimum of longshore sediment transport (net shore-drift). The coastline east of the Elwha Delta is primarily composed of eroded and compacted glacial till. It is characterized by sand spits, protected bays, gradually sloped beaches and mudflats (Shipman, 1992).

The geological break at the Elwha Delta between western and eastern features of the Strait coincides with biological distinctions in the same area. West of the Elwha River delta are the most proliferous macrocystis kelp beds in the state (located near the Twin River delta). Macrocystis is described as "strictly an open coast species" (Kyte, 1992) and extends into the Strait eastward to Crescent Rock where it abruptly ends.

The macrocystis beds are accompanied by other organisms endemic to the outer coast. Three species of oceanic sea anemone are found inland to Tongue Point. These are Urticina Lofotensis (White Spotted Tillia), Urticina Piscivora (Fish Eating Tillia), and Anthopleura Xanthogrammica (giant green anemone). Giant green anemone range eastward beyond Tongue Point but only to Observatory Point where their concentrations end. Though some are found sporadically in the San Juan Islands, no significant populations exist east of Observatory Point (Kyte, 1992).

The Purple Urchin (<u>Stronglocentrotus Purpuratus</u>) is a grazer that moves among the rocks in search of kelp. Purple Urchin populations do not extend east of Tongue Point except for scattered numbers in the San Juan Islands.

Two common oceanic invertebrates, California Mussels (<u>Mytilus Californianus</u>) and Gooseneck Barnacles (<u>Pollicipes Polymerus</u>), also share the exposed rocky habitat of the north Olympic Peninsula. These species are commonly found on the outer Washington coast. A cursory survey from the Elwha River to Slip Point identified mixed populations of these species between Observatory Point and Tongue Point in the east and between Pillar Point and Slip Point to the west (Goodwin, 1992). Both species form dense beds in the intertidal zone where wave action is strong. Gooseneck Barnacles are only found on vertical to near-vertical surfaces. Giant green anemones settle into these colonies during their early life stages. As the anemones mature, they move into the lower intertidal and subtidal zones where wave action makes prey available to this passive predator. Giant green anemones may live from 50 to 100 years and grow up to a foot in circumference. Also associated with the mussels and barnacles is the Purple or Ocher Sea Star (Pisaster Ochraceus), a predator to both species.

An important element to any ecosystem is the relationships between the organisms found there. The organisms listed above interact with each other to form one example of biological interdependence along the shores of the Strait of Juan de Fuca. The rocky substrate and strong wave action from the Pacific Ocean create the conditions necessary for the proliferation of the California mussels and gooseneck barnacles. These residents feed on plankton that is washed in by the surf. Another resident, the purple urchin, grazes on the nearby kelp. As the mussels and barnacles colonize into dense beds, the green anemone moves in and waits for urchins and other organisms to be scoured from the rocks by strong waves and delivered into it's tentacles. This set of interactions has been documented by Dr. Robert Paine (Professor of Zoology at the University of Washington). Though some of the species involved may be found individually in areas of the San Juan Islands, these species are never found together as a functioning community east of Observatory Point. Since the community is common to the outer coastal regions of the Pacific Northwest, its presence in the Strait provides an indicator that the coastal ecosystem extends into the Strait as far east as Observatory Point.

Macrocystis, as an individual species, is decidedly an open coast oriented kelp. The fact that rocky habitat extends east of Crescent Rock - Macrocystis does not - indicates that factors beyond mere topography are necessary for its survival beyond that point. Since Macrocystis thrives on the coast, some significant property of the coastal environment must end at Crescent Rock. This indicates a break between the oceanic processes of the outer coast and the estuarine processes of inner Puget Sound. It should be noted that Crescent Rock is within six miles of the point where the community in the previous paragraph ceases to function. Macrocystis also serves as a food source for sea urchin which in turn serve as prey for sea otters (Enhydra Lutris) . Macrocystis beds are a common habitat feature where sea otters are present.

Sea otters have been identified inside the strait as far as First Beach on the eastern side of Neah Bay. "The sea otter is on the list of Washington State Endangered Species. The federal government considers the California sea otter a threatened species, but not the Alaskan sea otter (the source stock of sea otters in Washington)" (Calambokidis et al., 1987). The Strait contains the greatest percentage of Washington shoreline occupied by kelp (Thom and Hallum, 1990). As the Washington Coast sea otter population expands, it is expected that otters will move into these prime habitat areas of the strait (Strickland and Chasan, 1989).

The Strait of Juan de Fuca serves as a transit and migration corridor for marine birds, mammals and ocean organisms entering from the outer coast. Up to 300,000 common murres may enter northern Puget Sound in any given year during the molting season. Since the birds are mostly flightless, they must use the Strait to access the inland waterways (Strickland and Chasan, 1989). Drift studies have identified oceanic species in significant quantities as far east as Dungeness Spit. Curt Ebbesmeyer has been studying currents and drift patterns in the Strait for 15 years and estimates that 1 of every 1000 organisms on the Washington Coast enters the Strait of Juan de Fuca on eastward current flows and migrates along the north shore of the Olympic Peninsula. Such transfers of outer coast resources are indicative of an inland extension of the coastal ecosystem. (Note: The 1/1000 transfer capacity of the currents is also Ebbesmeyer's estimate for the rate at which oil spilled at the Strait entrance would travel inland.)

There is evidence that up to 15 gray whales spend the summer near Cape Flattery. Gray whales have often been sighted well inside the Strait of Juan de Fuca. "Unlike most cetaceans, gray whales feed on bottom animals; in Northwest waters, these prey include amphipod and mysid crustaceans near kelp beds" (Strickland and Chasan, 1989). A 1985-86 survey of gray whale presence between Cape Flattery and Pillar Point tracked a continuous presence of the species from December through the summer. Gray whales were often seen foraging in kelp beds between Koitlah Point and the Sekiu River (Calambokidis et al., 1987).

In the above survey conducted between Cape Flattery and Pillar Point, "two species of small cetaceans were frequently seen...Harbor porpoise were the most abundant cetacean and were seen primarily from 0.5 to 1.5 nm offshore. Sighting frequency of harbor porpoise varied by region with the greatest numbers seen off the Sekiu River and Kyadaka Point. Harbor Porpoise were present in all seasons but were most numerous in fall. Dall's porpoise were seen less often than Harbor Porpoise and tended to occur farther offshore. Dall's porpoise were seen in all seasons" (Calambokidis et al., 1987). A report prepared for the National Marine Mammal Laboratory in April, 1992 estimates harbor porpoise abundance for the Strait of Juan de Fuca and Swiftsure Bank at 2,226 animals. It is the first comprehensive report of harbor porpoise in the Strait. The report also listed direct sightings of 100 Dall's porpoise in the same area (Calambokidis et al., 1992).

California sea lions are present in the Strait and appear in a small concentration at Neah Bay. Harbor seals are the most common marine mammal in the Strait and have many haul-out sites between Cape Flattery and Observatory Point (Calambokidis et al., 1987). Migrations have been observed from the outer coast and eastern Strait of Juan de Fuca into the western Strait (Strickland and Chasan, 1989).

The majority of strictly pelagic birds (e.g., albatrosses, cassin's auklets, shearwaters, storm petrels), however, do not enter and reside inside the Strait for any appreciable length of time or in large numbers. Most only appear at Tatoosh Island and seaward. Swiftsure Bank, at the entrance of the Strait, is a critical feeding area for birds (Wahl, 1992). "Huge feeding flocks estimated to approach one million birds (have been) observed at the entrance to the Strait of Juan de Fuca" where oceanic fronts converge (Strickland and Chasan, 1989). It should be noted however that no comprehensive bird studies have been conducted exclusively for the Strait of Juan de Fuca. Nor has any research been conducted to analyze bird populations within the Strait in the context of ecosystem dynamics.

This analysis suggests that the ecosystem of the outer Washington coast extends into the Strait of Juan de Fuca as far eastward as Observatory Point. Changes in biota, geology, and topography all appear to coalesce between Crescent Rock and Observatory Point. The constant eastward drift and migration of coastal organic matter resupplies the area with new colonists and prey organisms. Coastal water is transported into the Strait by currents that break and mix north of Dungeness Spit. The dense kelp beds are a central factor to the productivity in the Straits and Macrocystis serves as a particularly strong indicator for the inland extent of the coastal environment.

The human uses in the Strait include vessel traffic, commercial, recreational and tribal fishing, recreational boating and SCUBA Diving. The Strait is a heavily used corridor for barges, larger commercial vessels and fishing boats transiting between the outer coast and Puget Sound. There is a carefully coordinated vessel traffic system operated jointly by the U.S and Canadian Coast Guards to manage vessel traffic (see Part II for further discussion). Clallam Bay and Neah Bay are central locations for the charter boat industry and recreational fishing in the Strait is concentrated off Pillar Point, Slip Point and Neah Bay. Although various types of clams are present throughout the Strait, recreational clam digging in the Strait is prohibited from April 1 through October 31 due to Paralytic Shellfish Poisoning. The Strait is a Usual and Accustomed fishing area for some of the Tribes. Gillnets are used by Tribal fishers in the Strait to harvest salmon.

The kelp beds, subtidal communities, and a shipwreck off Tongue Point offer spectacular diving throughout the Strait. Most of the beaches (i.e., tidelands) in the Strait are publicly owned (Figure 71). Access to these beaches is severely restricted because the back beach environment is characterized by steep bluffs in private ownership to the extent of high tide. There are approximately seven access points along the entire Strait between Observatory Point and Neah Bay. Most of the beaches are accessible only by boat, and then under mostly dangerous conditions because of submerged rocks and strong tidal currents. The beaches are predominately sand, gravel, cobble and hardpan and submerged at mean high water. Boat access ramps are limited to Freshwater Bay, Silver King Resort and Pillar Point Recreation Area.

Clallam County has developed county parks at Observatory Pt. (Freshwater Bay Recreation Area) and Tongue Pt. (Salt Creek Recreation Area) which provide boat access ramps, shoreside access for SCUBA Divers, sport fishing, picnic tables and other outdoor recreation. The WDNR has developed a state park at the Lyre River with many of the same accommodations. The Twin River and Pyscht River have undeveloped recreation areas. Clallam Bay has a harbor supporting a popular charter boat industry.

Coastal land ownership patterns in the Strait adjacent to the beaches include reservation lands (the Makah Tribe), private landowners (including timber companies), and county and state protected lands. The towns of Joyce, Clallam Bay, Sekiu, and Neah Bay are the population centers along the Strait. Their economies are influenced by recreational and commercial activities occurring in the Strait of Juan de Fuca.

Boundary alternative 4 with a southern boundary extending to Copalis Beach, and eastward into the Strait to Observatory Point encompasses what can be considered a distinct ecological system with intertidal communities, rookeries and haul out sites, foraging areas, rich fishing grounds and fish concentrations, and proliferous kelp beds continuous throughout this boundary. Vessel traffic, oil and gas exploration, fishing, minerals mining, and overflights, are all uses that can potentially threaten the resources of this still relatively pristine area.

An extension into the Strait to Observatory Point would afford maximum protection and monitoring of the coastal resources within an identifiable ecological system. The Strait is where much of the population and uses are concentrated. Protection and monitoring of the resources would be beneficial. Further, coordination of Sanctuary research and education programs would enhance the efforts of the State, local and tribal initiatives in the Strait. When further opportunity is provided for public comment NOAA will re-consider adding the Strait into the boundaries of the Olympic Coast or the proposed Northwest Straits

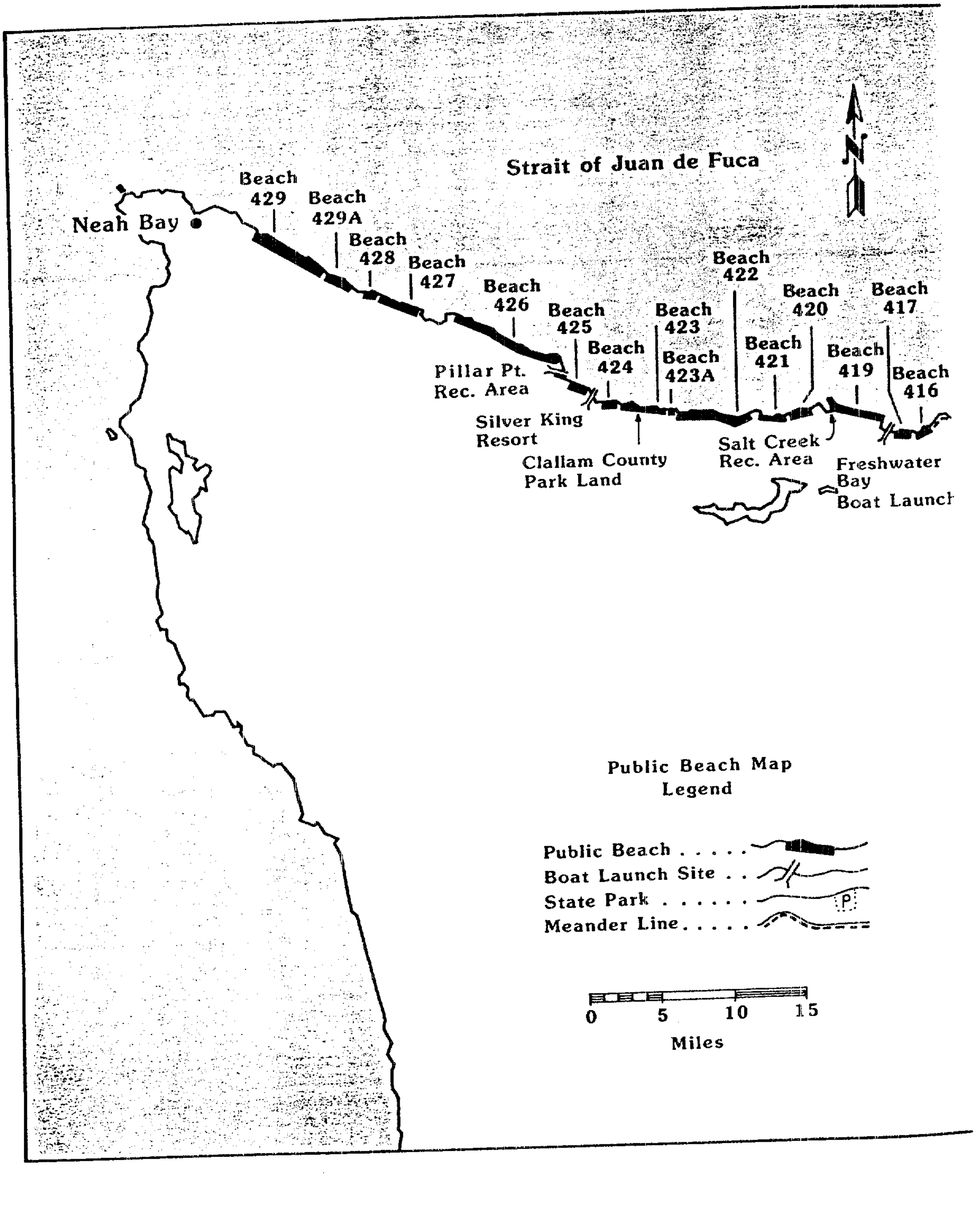


Figure 71. Beaches Along the Strait of Juan de Fuca (WDNR, 1984).

Marine Sanctuaries.

Boundary alternative 4 excluding the Strait, therefore, is NOAA's preferred alternative. The boundary encompasses the most sensitive and vulnerable habitats along the outer coast and, although excludes the transition corridor into the estuarine environment of Puget Sound, includes an ecologically identifiable oceanic ecosystem. The boundary will facilitate close coordination with Tribal, Federal, International, State and local initiatives. Through this coordination, the Sanctuary will afford greater protection to the nearly pristine environment off the Outer Coast. Boundary alternative 4 with Respect to the fisheries, marine mammal haul out sites, kelp distribution, seabird colonies and foraging range, and human uses other than fisheries are depicted in Figures 72-75.

F. Boundary Alternative 5

Boundary alternative 5 encompasses the entire study area from the Washington/Oregon Border to the Canadian Border and into the Strait of Juan de Fuca to Observatory Point. This alternative adds to boundary alternative 4 the sandy beach environments of the southern coast. Many commenters supported inclusion of the estuaries of Grays Harbor and Willapa Bay within the boundaries. However, upon further consideration, NOAA believes that the estuary of Grays Harbor and Willapa Bay are more appropriate candidates for estuarine management regimes such as NOAA's National Estuarine Research Reserve System (NERRS) or EPA's National Estuary Program (NEP) and thus the estuaries are not included in the Sanctuary study area of the Final EIS/MP. Therefore, the coastal boundary of alternative 5 cuts across the mouths of Grays Harbor and Willapa Bay.

Further, the southern portion of the study area abuts more populated areas and encompasses more marine development. The southern portion of the study area is clearly the most developed and populated regions of the Washington outer coast. Major population centers of Grays Harbor, Raymond, and Ocean Shores support fishing and logging industries, pulp and paper mills, port activities, and tourism.

Consequently, a large concentration of uses occur within the southern portion of the study area. This southern boundary encompasses valuable groundfish, salmon, ocean pink shrimp and dungeness crab fishing areas. It is also transited by tankers engaged in coastwise traffic, and tugs and barges entering and exiting the Ports of Grays Harbor, Willapa Bay, and the Columbia River. The tugs and barges transport, among other things, refined petroleum products, chemicals and logs and wood chips. There has been an ongoing $75 million Federal/State/local partnership to diversify the Port of Grays Harbor which has involved the dredging of Grays Harbor channel to enable larger

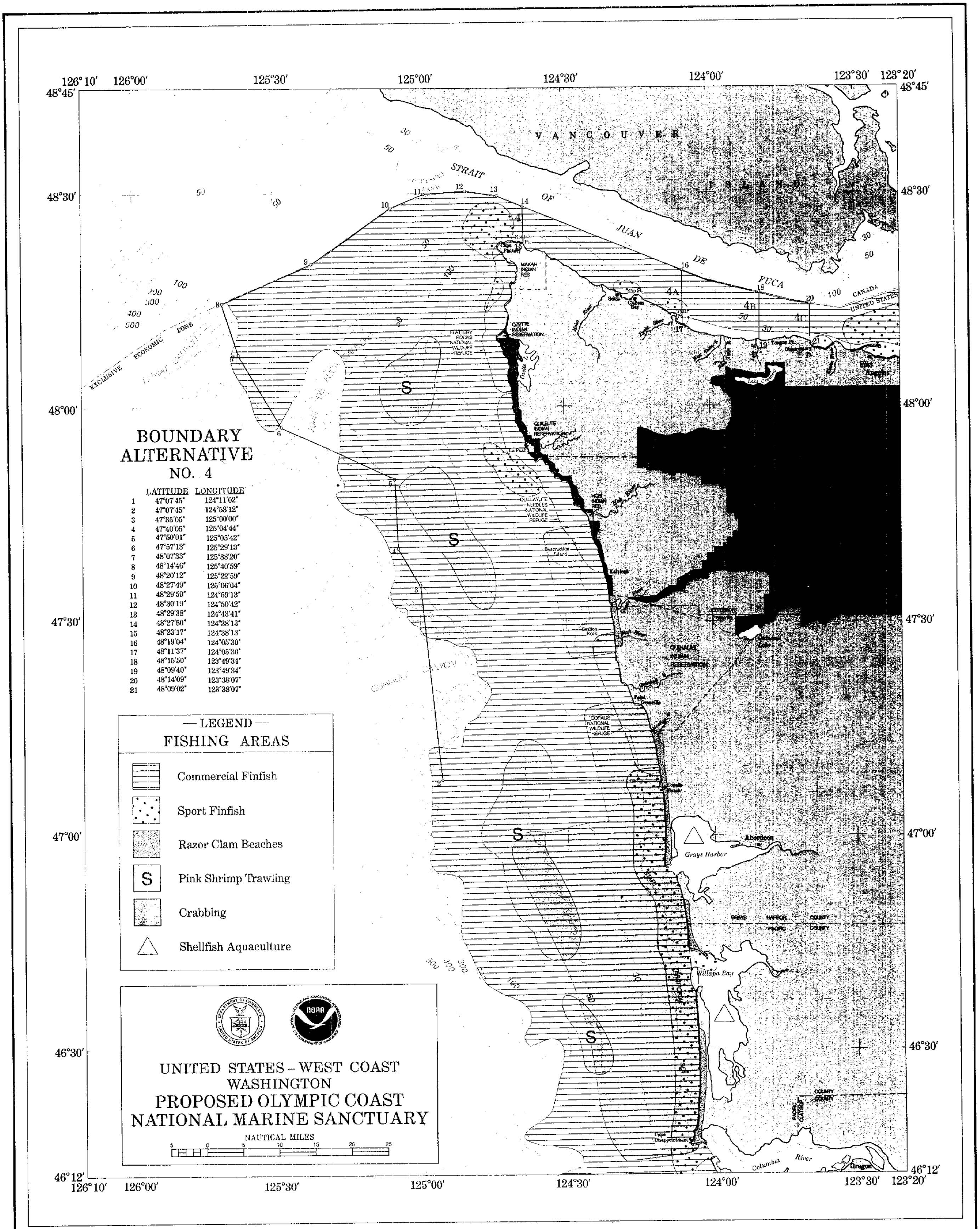


Figure 72. Boundary Alternative 4 with Respect to Fisheries.

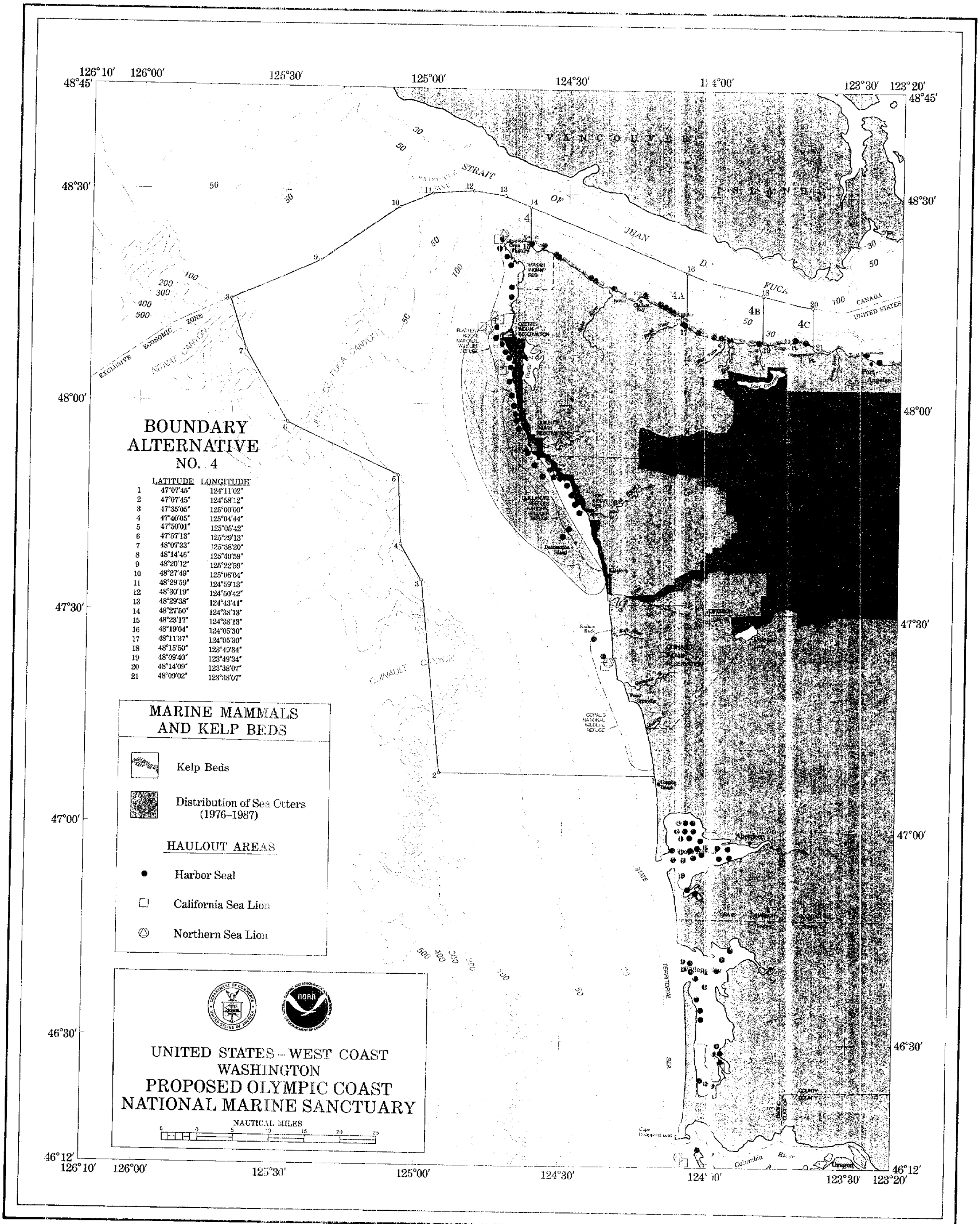


Figure 73. Boundary Alternative 4 with Respect to Marine Mammal Haulout Sites and Kelp Habitat.

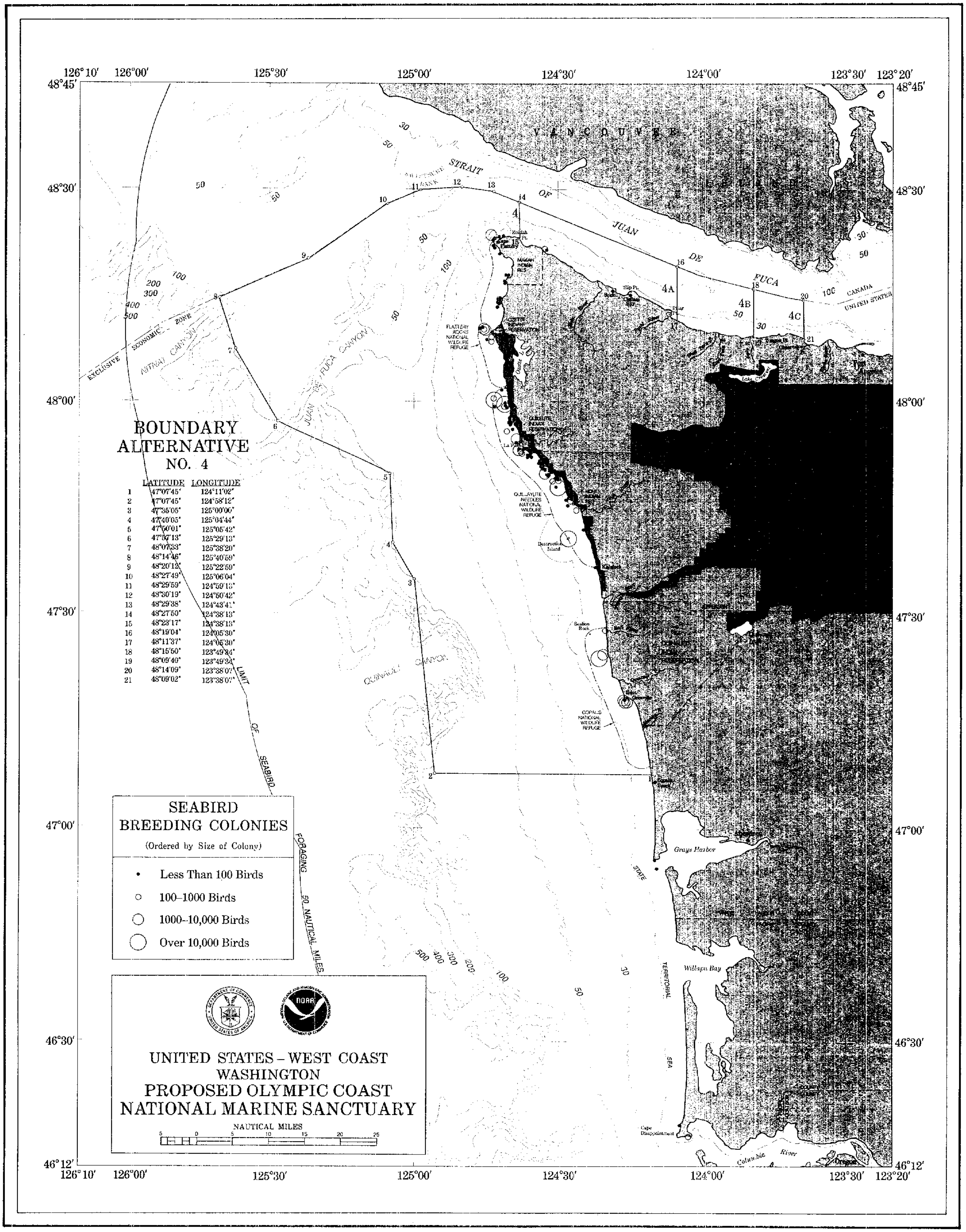


Figure 74. Boundary Alternative 4 with Respect to Seabird Colonies and Seabird Foraging Range.

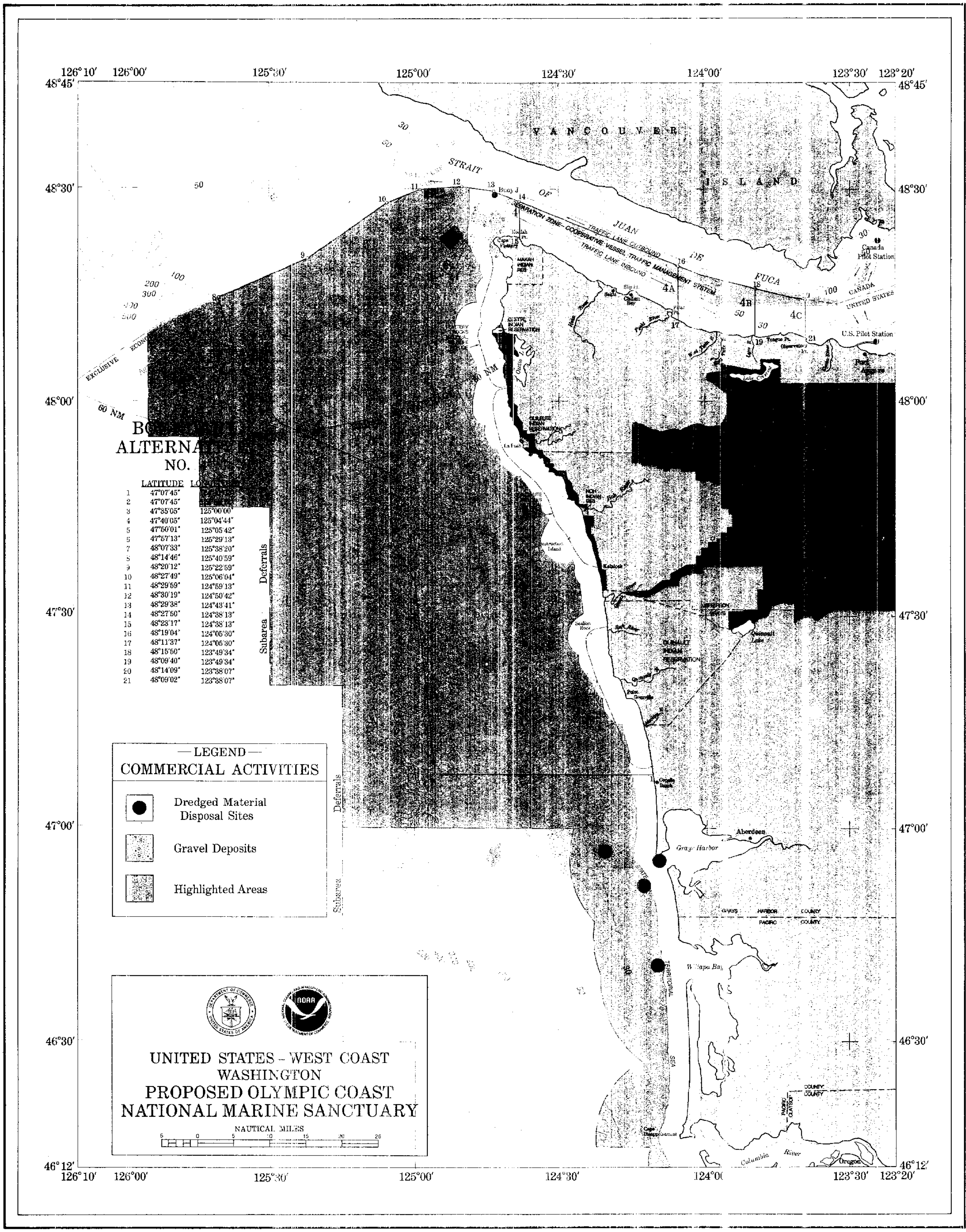


Figure 75. Boundary Alternative 4 in Relation to Vessel Traffic Management Regimes, Dredge Disposal Sites, Oil and Gas Resources and Gravel Deposits.

vessels to enter the port. Clean dredge spoil from the dredging project are dumped at three EPA/COE permitted dumpsites located off the mouth of Grays Harbor. There is also an interim dumpsite off the mouth of Willapa Bay and three others off the Columbia River all receiving dredge spoils from maintenance dredging of the respective ship channels. These dredge disposal sites and port activities would conflict with the Sanctuary regulations prohibiting alteration of, or construction on the seabed, and discharges.

The southern addition adds approximately 46% of the relative density of invertebrates harvested by commercial and recreational fishers in the total study area. The largest significance is attributed to the presence of Pacific oysters in Willapa Bay, and the Dungeness crab and ocean pink shrimp stocks offshore. This is reflected in the tables comparing the relative abundance and importance of selected invertebrates off Washington (Appendix C).

The southern addition also is significant in that it represents approximately 43% of the relative abundance of fish species in the study area. Salmon, steelhead, lingcod and Pacific cod account for the greatest density indexes. The salmon and steelhead accounted for in these areas are migrating through from the Columbia River, Chehalis, tributaries of Willapa Bay, as well as from river and stream systems located in Oregon. The significance of this addition is skewed by the importance of estuaries for marine fish. During the spring when freshwater inflow into the estuaries is greatest, and the predominant currents originate from the north, the Columbia River fresh water plume is kept south of Point Grenville dominating a large area of the marine environment off southern Washington. This essentially extends the Columbia River estuary well offshore. The boundaries of the water masses support rich fishing grounds.

The seaward portion of the southern addition is weighted as being very significant for marine mammals (Appendix C). This is due to the inclusion of the migration corridor for the right, minke, and humpback whales, Dall's porpoise and while-sided dolphins. The migration of these marine mammals are most heavily concentrated at the edge of the continental shelf. Gray whales migrate through the study area within approximately 12 nautical miles from shore. Appendix C reflects that the most seaward portions of the entire study area is significant for marine mammals. Hence, the extension of boundary alternative 5 adds little difference. The tables in Appendix C also reflect the significance of boundary alternative 5 because the estuaries are critical haulout sites for pinnipeds.

The table comparing the estimates of seabird populations within the study area indicates that only 12% of the population was counted in the southern boundary. The largest bird populations in the southern portion of the study are juvenile rhinoceros auklets feeding off the mouth of Grays Harbor, Glaucous-winged gulls and caspian terns. Approximately four small colonies of pigeon guillemots are located in the jettys of Grays Harbor in driftwood debris at the opening of the Colombia River and Willapa Bay (Speich and Wahl, 1989). The estuaries provide valuable habitat for migrating shorebirds whose populations swell in the spring and fall.

While the resources in the southern portion of the study area are significant to the marine ecology of the Pacific Northwest, the analysis of resources and uses indicates that there are two separate but related ecosystems. To the north of Copalis Beach, the marine environment is dominated by rocky intertidal habitats, kelp forest subtidal habitats, and ecologically rich neretic zones all of which are fueled by upwelling from the Juan de Fuca Canyon coupled with the presence of the shallow offshore banks in the photic zone. This portion of the study area provides rich foraging areas and haul out sites for colonial seabirds and marine mammals. Sediments nourishing the benthic environment originate predominately from the Strait of Juan de Fuca. The coastal environment is sparsely populated, with the greatest immediate threats to the resources runoff from timber activities in the adjacent watersheds, and offshore development (vessel traffic, and potential offshore development of oil and gas and gravel deposits). The ability to respond to potential spills from offshore development are hampered by limited coastal access and the high energy marine environment.

By contrast, the sandy environments south of Copalis Beach are much less diverse (with the exception of the estuaries) and are capable of rebounding from an oil spill relatively quickly compared to communities of rocky intertidal habitats. The southern boundary has already experienced heavy development and there are a number of point and non-point source discharges and dumpsites. Consequently, the southern portion of the study area does not have the pristine qualities of the northern areas.

The benthic sediments in the southern portion of the study area originate from the Columbia River Basin reflecting the aerial extent and influence of the Columbia River Plume. The ecosystem that dominates the southern portion of the study area in fact extends well into Oregon and state boundaries present an arbitrary delineation. Thus, while there are significant ecological qualities to both the northern and southern regions of the study area, there are notable differences in their ecology and human-uses that characterize these regions as distinct. Figures 76-79 depict boundary alternative 5 with respect to fisheries, marine mammal haul out sites, kelp distribution, seabird colonies and foraging range, and human uses other than fishing.

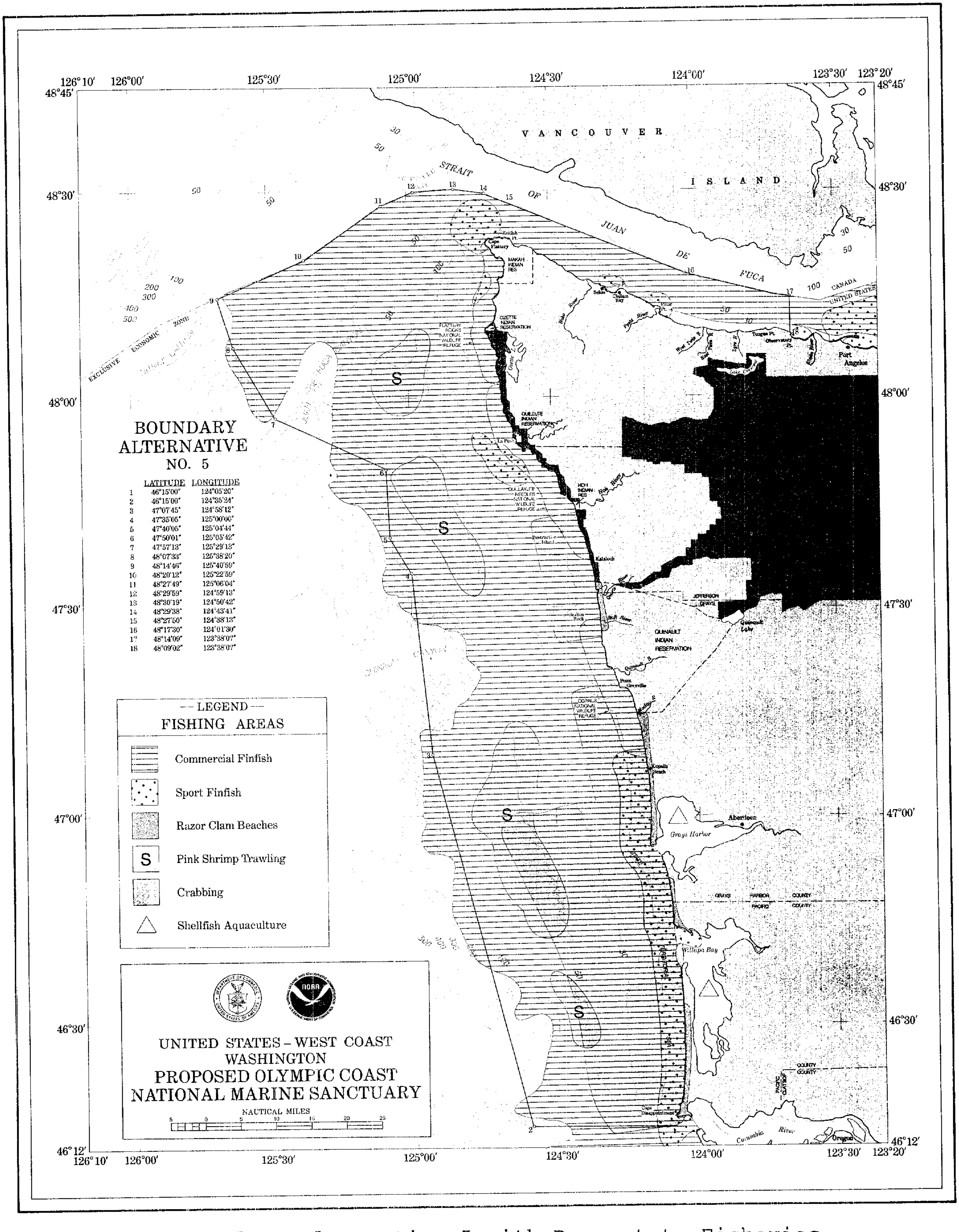


Figure 76. Boundary Alternative 5 with Respect to Fisheries.

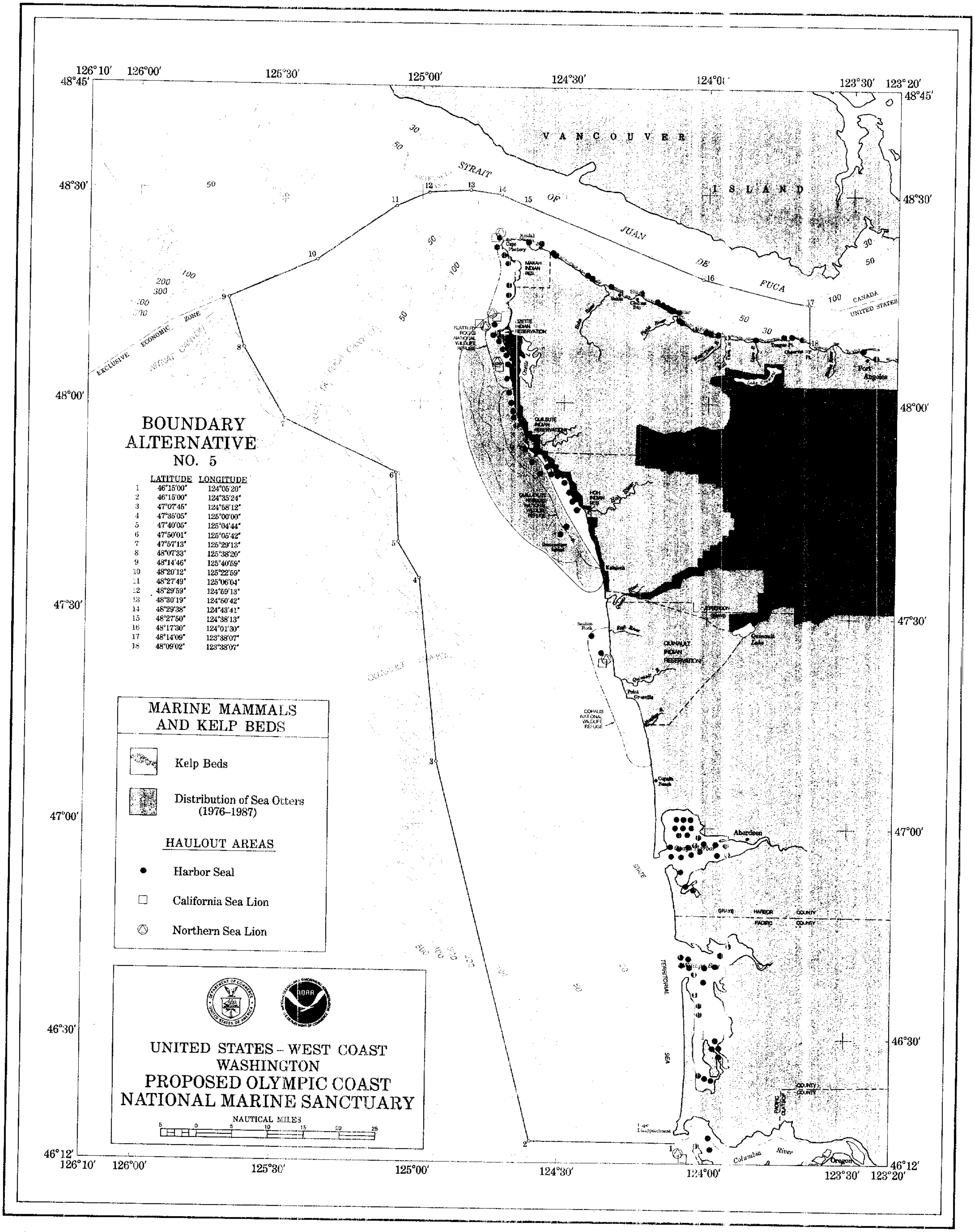


Figure 77. Boundary Alternative 5 with Respect to Marine Mammal Haulout Sites and Kelp Habitat.

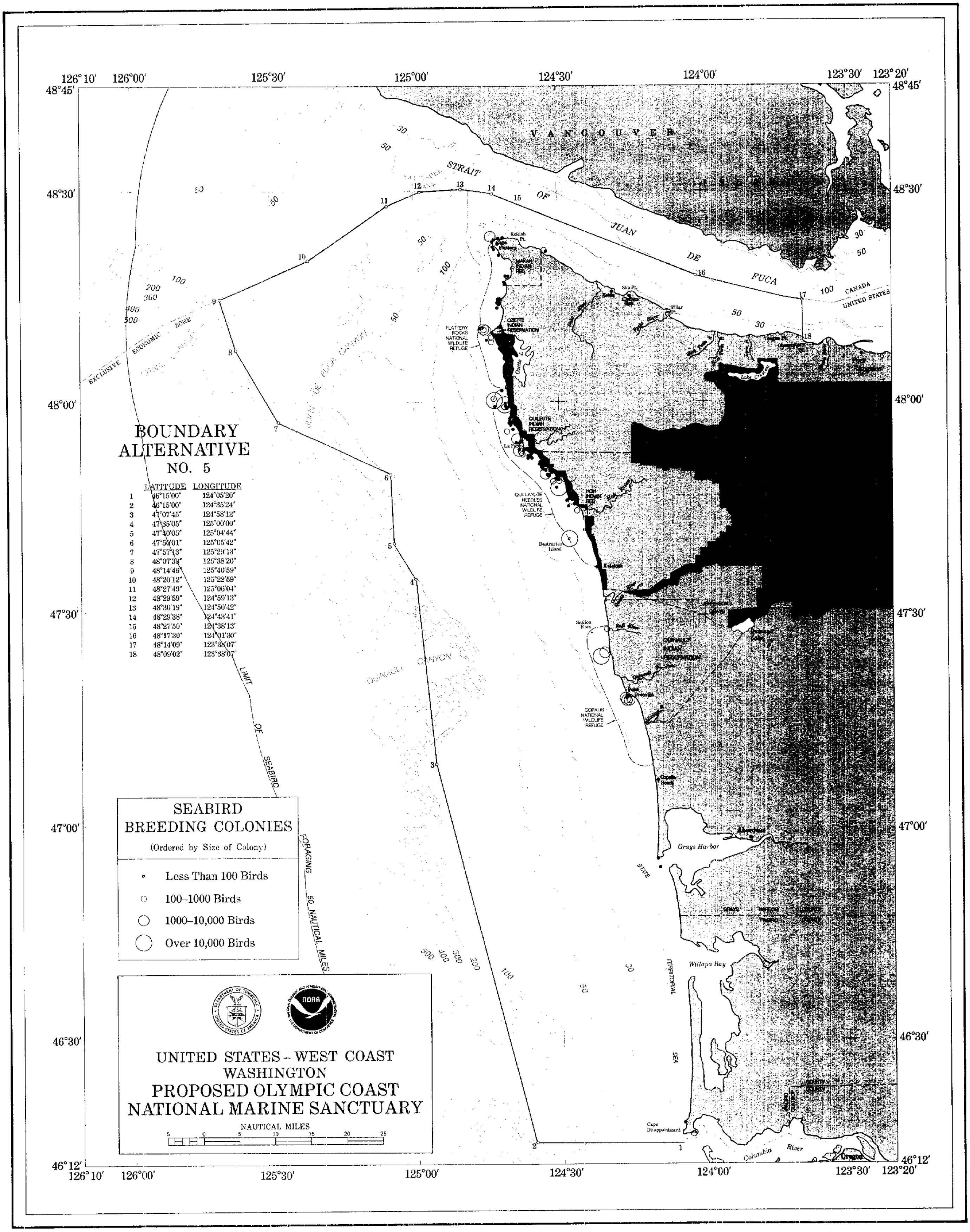


Figure 78. Boundary Alternative 5 with Respect to Seabird Colonies and Seabird Foraging Range.

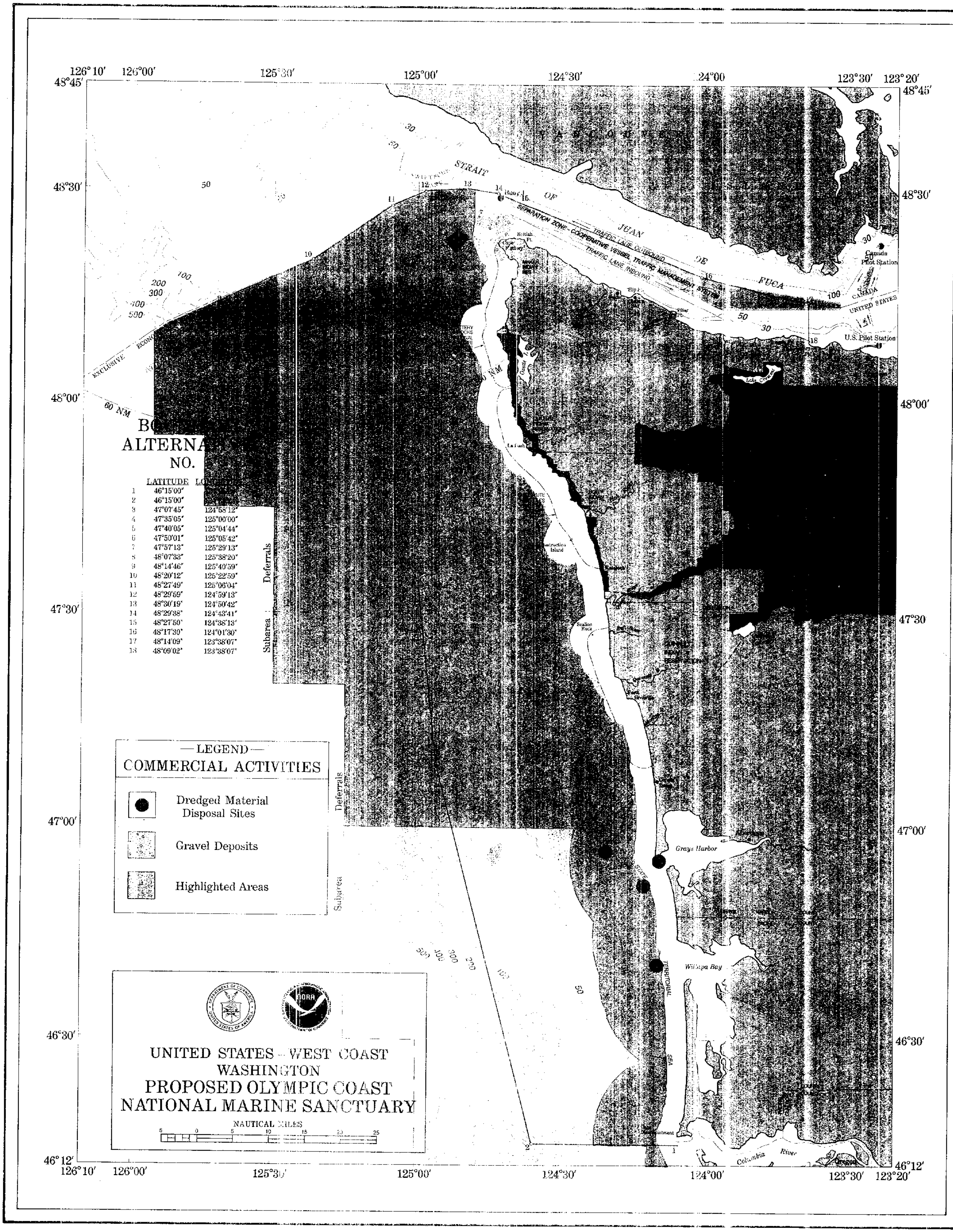


Figure 79. Boundary Alternative 5 in Relation to Vessel Traffic Management Regimes, Dredge Disposal Sites, Oil and Gas Resources and Gravel Deposits.

Section II: Regulatory Alternatives

A. Introduction

This section analyzes the environmental consequences of the eight activities included within the scope of the Sanctuary regulations. For each activity the preferred Sanctuary regulatory action is identified along with an analysis of the impact to natural resources and human uses of both the Sanctuary regulatory alternative and the status quo. There are also two regulations proposed (preferred Sanctuary action) whose purpose is to facilitate enforcement of the other Sanctuary regulations: the regulations prohibiting possession of resources and interference with enforcement.

Overall, the proposed final regulations and designation are intended to: (1) improve resource protection by instituting new regulatory measures and by supplementing present surveillance and enforcement actions; (2) minimize negative impacts to human uses, particularly to those deemed consistent with the purposes of the Sanctuary and; (3) provide for a manageable area including such factors as its size, its ability to be defined as a discrete ecological unit, its accessibility, and its suitability for monitoring and enforcement activities.

It is important to note that in promulgating these regulations, NOAA must work within the constraints of Title III of the MPRSA. Specifically, section 304(c) states that while NOAA cannot terminate valid leases, permits, licenses or rights of subsistence use or access existing as of the date of Sanctuary designation, NOAA can regulate the exercise of such authorizations and rights consistent with the purposes for which the Sanctuary was designated.

B. Oil, Gas and Mineral Activities

1. Status Quo

a. Consequence of Impact to Resources

There is presently no oil and gas development taking place in the study area. Under the most recent Five-Year Plan for OCS oil and gas leasing activities developed by the MMS, an OCS lease sale on the Washington OCS was scheduled for the spring of 1992. However, the reauthorization of the MPRSA (P.L. 102-587) mandates a permanent prohibition on oil and gas pre-leasing or leasing activities within the Sanctuary.

Currently, state law prohibits oil and gas activities in state waters. Also, Washington state has requested that MMS delete from any lease sale the portion of its planning area that lies north of the 47th parallel, and the area within 12 nautical miles of the Grays Harbor, Willapa Bay, and Columbia River estuaries.

Scientific evidence concerning the potential impacts of oil and gas activities on the natural resources of the Olympic Coast is not conclusive, and the studies planned by MMS and the Pacific Northwest OCS Task Force will address several critical questions. A recent National Academy of Sciences study (NAS, 1989) as well as past EPA (1985) and NAS (1985) studies, have examined whether there is adequate information available to determine the effects of oil and gas activities on the marine environment. It has been concluded that many uncertainties still exist, even in marine areas for which there exists far more information than exists for the Olympic Coast. However, it is still possible to evaluate some of the potential risks to the Olympic Coast from OCS oil and gas activities, and the transportation of hydrocarbon products.

Offshore hydrocarbon exploration, development, and production activities, including the transshipment of crude oil to the mainland, may cause unforeseen and potentially substantial discharges of oil, both chronic and catastrophic, into the marine environment. The sensitive marine resources of the Olympic Coast may be threatened by: (1) well "blow-outs" caused by equipment failure or damage, or geologic hazards; (2) oil spills and pipeline leaks; (3) noise and visual disturbances caused by drilling, the presence of drill rigs or platform, work crews, supply boats, and helicopters; (4) pollution associated with aquatic discharges; and (5) short-term pipeline construction upheaval.

Normal hydrocarbon operation can result in unintentional, chronic, or small oil spillage. Since the Olympic Coast area has had little history of hydrocarbon production, direct evidence does not exist to illustrate the effects of exploration, development, and production spills in these waters. Petroleum products are, however, transported along the coast and in and out of the Strait of Juan de Fuca. Two oil spills, the General M.C. Meiggs and the Nestucca, have occurred recently in coastal waters off Washington State. Oil spilled from the barge Nestucca soiled beaches found within the boundary of the Sanctuary. The reports of damages from these incidents, as well as data from spills in other marine waters, serve as examples of the types of impacts that can result from oil related accidents. Known threats to marine organisms that may result from offshore oil and gas exploration, development, and production are presented in Table 6 (page III-19).

Even though OCS oil and gas activities may take place offshore in Federal waters, the activities can negatively effect state territorial waters and coastal environments. In addition to effecting marine organisms, these activities can disrupt human uses of the marine environment and the socioeconomic structure of coastal communities. Potential negative impacts to nearshore and coastal areas include: the presence of processing facilities which also involves the problems of air pollution and the disposal of processing wastes; interference with port operations and stress on existing port facility space and services; conflict with shore-based operations which use the offshore waters (e.g., commercial and recreational fishing, whale-watching operations); and socioeconomic impacts on the affected coastal communities (Mead and Sorenson, 1970; Cican-Sain, 1985; Freeman, 1985; MMS, 1990a).

(a) Sources of Oil Spills and Potential Impacts

Inputs of petroleum into the marine environment come from a variety of sources. Less then 2% (50,000 tons of a total estimated 3.2 million metric tons) of the annual input of oil into the world oceans is from offshore production activities. The largest input, accounting for approximately 45%, is from transportation related incidents including tanker operations, spills at terminals and dry docks, bilge and fuel oil flushing, tanker and other ship or barge accidents. Municipal and industrial wastes, and runoff account for 36.5% of the oil entering the world oceans. Other sources include natural seeps (7.7%), and atmospheric deposition (9.2%) (NRC, 1985; Boesch and Rabalis, 1987). Due to the near absence of industrial and municipal discharges along the Olympic Coast, it is clear that the major threat of oil contamination in this area currently is from tanker and barge operations.

Accidents, natural disasters, and human error can lead to situations which result in the release of oil into the marine environment. Chronic discharges, well blowouts, barge and tanker accidents, pipeline breaks and leaks, and equipment failures cause spills. The large majority of spills involve relatively small amounts of oil, usually less than 1000 gallons (24 barrels) (MMS, 1986; 1987). Small spills, defined by MMS as less than

1,000 barrels, account for almost all spill incidents in U.S. waters, but only 28% of the total volume of spilled oil. One to two barrels, on average, are spilled during routine operation for every million barrels of oil produced from offshore platforms (MMS, 1986). The cumulative long-term impact of many small spills and chronic discharges is not well understood and requires further study.

Well blowouts and tanker accidents can result in large, acute oil spills (greater than 1,000 barrels) that may have severe, long-term impacts on marine environments (MMS, 1984). In addition to blowouts, platform spills can result from leaks and small releases of fuels and lubricants. Offshore production also carries with it the risk of spills from pipelines; 95% of oil and gas produced offshore is transported by pipeline. For both Federal and state waters, the loss of oil from major spills ranges from 0.15-1 barrel of oil spilled for every million barrels produced (MMS, 1986) (note: these figures were calculated prior to the Exxon Valdez spill and other spills occurring in 1987-88).

Blowouts were the cause of sixty-five percent of oil spills associated with drilling and production from 1964 through 1980. During these 17 years, a total of 102,382 barrels were discharged into marine waters as a result of blowouts at offshore wells in the Gulf of Mexico, while about half that amount, 55,213 barrels, was spilled as a result of non-blowout associated incidents (The Futures Group, 1982). Massive spills caused by well blowouts have been highly publicized, but such spills are rare. The OCS spill-rate for platform spills of more than 1,000 barrels is one per billion barrels produced (MMS, 1986).

Most blowouts have been relatively minor, especially in recent years. From 1964 to 1981, 99.5% of the spill volume caused by blowouts in the Gulf of Mexico was spilled in the years 1964 through 1971. After 1971 the volume of blowout-produced spills was negligible, yet there was no reduction in the number of blowout spills (The Futures Group, 1982). The OCS spill-rate for small platform or pipeline spills is 379 spills per billion barrels produced or transported. Ninety-nine percent of these spills are less than 50 barrels, and 89% are less than one barrel (MMS, 1986).

Although the offshore oil industry has been successful in reducing the volume of oil spills, the record indicates that if oil development were to take place in the area of the Olympic coast, spills from blowouts, platform accidents, and transportation of crude oil to shore are likely to occur. MMS (1986) has estimated that during the 35 year life span of lease sale #132 a total hydrocarbon equivalent of 243 million barrels of oil (58 million barrels of oil and 1.043 billion cubic feet of gas) would be retrieved by a single platform drilling 30 wells.

Using a high-case and low-case production scenario, MMS has estimated rates of oil spillage off the Washington/Oregon coast should the lease sale #132 area be developed. Employing the low case scenario (58 million barrels produced) with tanker transhipment, MMS projects that 0.23 large spills would occur, with a 11% probability of a large spill occurring. The high case scenario (180 million barrels produced) estimates are 0.51 large spills projected and 16% probability of one or more large spills occurring. A cumulative scenario, which adds in the effects of oil transhipment along our coast of oil produced elsewhere changes the projected figures to 3.16 spills over the life of the field, with a 96% probability of occurring.

These MMS projections indicate that OCS oil and gas activities would increase the risk of hydrocarbon contamination along the Olympic Coast, but that the major threat is from tanker or barge oil spills. From 1974 to 1981, there were 81 tanker or barge related oil spills of more than 1,000 barrels in U.S. waters. Only six of these were on the West Coast--three in port and three at sea (The Futures Group, 1982). In 1988 and 1989 there were six significant oil spills resulting from tanker or barge accidents. Three of these tanker oil spills occurred on the east coast and three on the west coast.

The largest of the three east coast spills occurred on June 24, 1989 when Uruguayan oil tanker Presidente Rivera ran aground near Philadelphia, releasing 800,000 gallons of oil into the Delaware River. On June 23, 1989, the Greek-registered World Prodigy grounded on Brenton Reef near Newport in Narragansett Bay, Rhode Island dumping 300,000 gallons of oil. Also on June 23, 1989, the tanker Rachel B. collided with a barge resulting in 6,000 gallons of oil spilling into the Houston Ship Channel.

Other spills occurred off the west coast: the tanker Puerto Rican near San Francisco in 1984, the Oil barge Nestucca off Grays Harbor, Washington in 1988, the General M.C. Meiggs off Cape Flattery, Washington, and the Exxon Valdez near Valdez, Alaska in March 1989. The Exxon Valdez ran aground on Bligh Reef off of Valdez, Alaska and spilled 242,000 barrels (over 10,100,0000 gallons) of crude oil onto the shores of Prince William Sound. This was the largest oil spill to date in U.S. waters. The Exxon Valdez disaster has received much publicity and scientific investigations are currently underway investigating the long-term effects of the spill and possible future management measures (CMC, 1989).

The tanker Puerto Rican broke apart approximately eight miles seaward of the Golden Gate Bridge after becoming disabled by on-board explosions. The tanker released 48,000 barrels of hydrocarbons into the ocean and of this amount, only 1,460 barrels were recovered during cleanup operations (USCG, 1985). This spill killed an estimated 2,874 seabirds, and caused additional damage to water quality, fishery resources, marine mammals, and human uses. For comparison, in February, 1986, the tanker barge Apex Houston spilled some 600 barrels of oil along the central California coast killing an estimated 9,817 seabirds within the Gulf of the Farallones National Marine Sanctuary.

The Nestucca and Meiggs spills occurred off the Washington coastline, and the oil spilled affected coastal areas found within the boundaries of the proposed sanctuary. These accidents demonstrate the seriousness of potential hazards to the proposed sanctuary resources and environment from spilled oil, regardless of its source.

On December 22, 1988 the barge Nestucca was struck by its tug the Ocean Service. The barge released 231,000 gallons of NO. 6 fuel oil into Grays Harbor and coastal waters polluting the shoreline from Grays Harbor to Cape Flattery. In addition, oil polluted beaches inside Grays Harbor and along the western shoreline of Vancouver Island, in British Columbia Canada. The resulting oil slick covered over 800 square miles and more than 110 miles of the Washington coastline. Cleanup response was started immediately and actual cleanup efforts were underway by December 23, 1988. As of August 1989, very little visual evidence of the spill remains on the beaches, though long-term impacts to marine biota are not known.

An assessment of damage resulting from the oil spill has not yet been completed, although short-term impacts are known. Over 10,300 oiled waterfowl (mostly murres and grebes) were collected (WDOE, 1989). Although No. 6 fuel is a relatively low toxicity oil, it is highly viscous, maintains large slicks on the water surface, weathers slowly, and kills by physical contact and smothering.

Of the 10,300 birds collected after the Nestucca spill, approximately 9,300 were dead or died at the bird rescue center. It is likely that this number of dead birds represents only a small portion of those birds affected because many oiled birds were not collected because of sinking, predation, hiding, and burying.

Another example of an oil spill accident in the vicinity of the proposed Olympic coast sanctuary is the General M.C. Meiggs. While under tow, the unmanned troopship broke loose and grounded 10 miles south of Cape Flattery in January, 1972 spilling approximately 55,000 barrels of Navy special fuel oil. Prevailing winds blew oil globules onto beaches where the oil became incorporated into the sediment. For the period of a five-year study, oil persisted in the intertidal area of a contaminated cove, causing the intertidal organisms to be continuously exposed to the oil. Some primary observations of the study were that hydrocarbons taken up by mussels persisted in their systems for five years after the spill, and 70% of surviving sea urchins lost their spines (Clark et al., 1978).

These oil spill events demonstrate a number of concerns related to oil spills in general:

1. The size of the spill does not necessarily correlate with the resulting damage to the environment.

2. For many oil spill incidents, exemplified primarily by the two spills in California and the Valdez disaster, the existing capability to contain and clean up the spill is not sufficient. The areas affected are coastal marine waters, and to be effective clean-up equipment requires less turbulent conditions than normally encountered in the waters off the Olympic Coast.

3. Mitigating measures alone may not be sufficient to ensure adequate protection of sanctuary resources.

These oil spill incidents, especially those occurring off the Washington coast, illustrate the vulnerability of the Sanctuary environment and resources to the potential impacts from oil and gas activities and hydrocarbon transportation. Lack of sufficient baseline information collected on the Olympic Coast makes it impossible to determine or predict the full extent of potential impacts. Some research in the Olympic Coast area has, however, shown that negative impacts from oil and gas activities (including seismic surveys and exploratory drilling) on the highly valued fisheries; vulnerable stocks of sea otters, fur seals, and seabirds; and other coastal marine resources are potentially great (Wahl, 1984; EPA, 1985; Felleman, 1985; Battelle, 1987; Bowlby et al., 1988; Grader and Laychack, 1989).

Seasonal sensitivity of certain species to a possible oil spill must also be considered. In the Olympic Coast area certain species of marine mammals and birds are seasonally present in numbers representing an ecologically significant percentage of their entire population (as discussed in Part II Section 2). Potential harm to marine organisms would be magnified if an oil spill were to occur during a period of high density or during a breeding season. The concept of seasonal susceptibility has been highlighted by the U.S. Bureau of Land Management (1979) in regard to the marine resources surrounding the Northern Channel Islands, off Santa Barbara, California.

Consideration of the physical oceanographic dynamics is important in protecting sanctuary resources from possible contaminants transported by currents and eddies. Oil spill trajectory models have not been developed for the Washington coast primarily due to the limited amount of detailed current and wind data that is available. Studies recommended by MMS and the

Pacific Northwest OCS Task Force would allow for the development of trajectory models. Available data for mean wind, wave, and currents, however, indicate that the sanctuary area is vulnerable to spills occurring outside the proposed boundaries. On the average, surface currents over the shelf travel northward and shoreward in the winter months and southward and seaward in the summer, with transitional periods in the spring and fall. Coastal upwelling occurs during the summer months, bringing deep water to the surface, while downwelling occurs in the winter. Prevailing wind direction is northward in the winter, and southward in the summer with a strong shoreward component during all seasons. Wave directions are shoreward over the entire year, and mean flow along the bottom is northward during all seasons.

(b) Effects of Hydrocarbons on Living Marine Organisms

Although most spilled crude oil initially floats, approximately 1% - 5% of the volume of a surface slick will occur in the water column as a result of dissolution, dispersion, sinking, or sedimentation in the vicinity of the spill. Additional oil may be retained in the water as the result of a lesser known mechanism, the formation of a subsurface oil plume. Because the oil in such a plume remains below the surface it may have a different chemistry than the surface slick and be more toxic to marine organisms. In the case of the IXTOC blowout, which occurred in June, 1979 in Mexican waters of the Gulf of Mexico, it was found that a subsurface plume of oil droplets, extending from the wellhead and generally aligned with the surface slick, contained high concentrations of low molecular weight aromatics, alkyl benzenes and naphthalene compounds which are acutely toxic to marine organisms (MMS, 1986).

The toxic effect of oil on organisms can be short-term, long-term, lethal or sublethal. Toxic effects on different organisms vary and depend on a number of factors including: chemical composition of the oil; environmental factors such as temperature, salinity, and viscosity; the level of feeding and reproductive activity by the organism; and differences in susceptibility among species and among life cycle stages within the species. The sublethal effects of hydrocarbons on marine organisms include: the disruption of normal feeding behavior, breeding, and locomotion; interference with thermo-regulation; reduced resistance to stress; and diseases caused by the intake of carcinogenic or potentially metagenic chemicals (MMS, 1986). At the tissue level, lesions may develop on the skin, gills, or intestine (Hawkes, 1977). Some organisms, however, may have the ability to compensate for minor toxic stress and may thus be able to tolerate low concentrations of toxic hydrocarbons.

A large amount of research has been completed showing the sensitivity of commercially important fish, shellfish and non-commercial invertebrates. Effects to these organisms are summarized by Strickland and Chasan (1989).

Sublethal and long-term hydrocarbon impacts on ecosystems are associated with low oil concentrations in marine environments which may result from the evaporation, degradation, and dispersion of hydrocarbons following a large spill or from chronic, low-level, small spills (less than 1,000 barrels). Of the two, chronic small spills may pose a greater hazard to marine ecosystems than isolated large spills. The damage resulting from the Nestucca, Apex Houston and Puerto Rican spills illustrate that even small spills, in the short term, can kill a large number of individual birds or other marine organisms. Oil can directly affect living marine organisms biochemically or physically (see, for instance, Boesch et al, 1973; Michael, 1977; National Research Council, 1985; EPA, 1985; MMS, 1987; Boesch & Rabalais, 1987).

The greatest damage to the marine environment occurs under any of the following circumstances: (1) The oil is spilled into or reaches a confined, shallow body of water, such as an estuary; (2) the oil is refined oil, such as home heating oil or diesel oil; (3) storms or heavy surf cause the oil to be churned into the bottom sediments. In many instances, it does appear that the marine ecosystem can recover from the damage occasioned by oil spills although the rate and completeness of recovery remain subject to dispute.

Petroleum hydrocarbons can also have sublethal or indirect lethal effects on marine organisms through the destruction or alteration of food supply, through chemical interference with reproductive success, synergistic effects which may reduce resistance to disease, and other stresses which alter behavioral patterns such as feeding. The physical damage resulting from the coating of marine organisms (e.g., feathers of marine birds, fur of marine mammals, and respiratory apparatus of fish) with oil is well documented (see, for instance, U.S. Bureau of Land Management, 1979). Below is a summary of the impacts of oil spills on the biological resources and uses of the Olympic coast and offshore waters.

Oil Spill Impact on Pinnipeds and Sea Otters:

Floating oil can foul the fur or skin, and irritate the eyes and membranes of pinnipeds and sea otters, and cause harm when the oil is ingested or inhaled (U.S. Bureau of Land Management, 1980; Geraci and Smith, 1977). Oil contamination can cause loss of buoyancy, and impairment of normal thermal regulation. Of the two, impairment of the body's insulation properties is probably more damaging, particularly for fur seals and sea otters which depend primarily on the fur for insulation (U.S. Bureau of Land Management, 1980).

Although northern fur seals depend only partially on their fur for thermal protection, oiling could depress their thermoregulatory abilities, which could lead to hypothermia and death (Kooyman, et al., 1977). Studies by Kooyman, et al., (1977) indicate that among sea mammals, the most profound effects of oiling may be on the sea otter pup: its thermal conductance increased by 2.1 times after oiling, indicating a significant loss of insulation capacity. The results of Kooyman's later studies confirm that even a light oiling could have marked detrimental effects on the thermoregulatory abilities of otters (Kooyman and Costa, 1979). The limited migratory abilities and lack of a blubber layer make sea otters even more vulnerable to oiling (Strickland and Chasan, 1989).

The sea otters which inhabit the nearshore areas within the proposed sanctuary are a Washington state endangered species and their distribution is localized to a specific stretch of the coastline. The sea otters were reintroduced to the area in the 1970's after being hunted to extinction before 1910. The localized distribution of this sea otter population makes them even more vulnerable to the effects of spilled oil than other more established sea otter populations. One oil spill could eliminate the entire population.

Phocid seals rely on blubber and vascular mechanisms for thermal regulation and are thus more resistant to thermal loss caused by contact with oil (Geraci and St. Aubin, 1980). Phocid seals of the Olympic Coast include the northern elephant seal and harbor seal.

The ingestion of oil by pinnipeds is most likely to occur during feeding or as the animals clean their coats. The impact of such ingestion depends upon the amount ingested, its toxicity, and the physical condition of the pinnipeds. The long-term effects on pinnipeds of various levels of hydrocarbon bioaccumulation are largely unknown. Longer-term effects may result from subtle changes in habitat and intrinsic stressors within the environment rather than direct mortality (Boesch & Rabalais, 1987).

Oil Spill Impacts on Cetaceans:

Effects of oil on cetaceans include: damage to skin or eyes upon contact, the fouling of baleens, and physiological effects of ingestion, and inhalation. Because the skin of cetaceans is smooth and furless, oil is unlikely to adhere to it, although it may adhere to the callosities that occur on right and humpback whales. In a study of bottlenose dolphins to determine the effects of direct skin contact with spilled oil, it was found that exposure to crude oil for periods of up to 45 minutes produced short-term, morphological, and biochemical changes to the skin. Recovery appeared to be rapid following the oil exposure (Geraci and St. Aubin, 1982). Since whales depend on blubber rather than fur for thermal regulation, oil would generally not affect their ability to thermoregulate. How cetaceans react to an oil spill on many variables including the species type, time of year, and severity of the oil spill.

Although the effects of oil on cetaceans have not been carefully investigated, scientists hypothesize that oil could cause short-term and long-term harm. Scientists hypothesize that cetaceans may suffer eye irritation as the result of contact with oil, and that Baleen whales, such as the gray whale which migrate through Olympic coast waters, are subject to baleen fouling as a result of exposure to spilled oil. The southern migration includes pregnant females, and the return migration to arctic waters includes females accompanied by calves. Both pregnant females and calves may be more susceptible to oil pollution than male adults.

The bioaccumulation of oil in both baleen and toothed cetaceans can occur as the result of eating contaminated food supplies. There is little likelihood that oil would be inhaled through the blow-hole, although it is possible the whales might inhale small quantities of toxic fumes (Geraci and St. Aubin, 1980). Although the effects of hydrocarbon accumulation in cetaceans are unknown, one can assume that the longer an animal is exposed to spilled oil, the more likely it is to suffer adverse effects. Prolonged exposure is most apt to occur when feeding grounds are contaminated. For example, because baleen whales are filter feeders, they may ingest oil or oil-tainted substances. Gray whales that migrate through the sanctuary area are susceptible to contamination since they feed on nearshore bottom organisms.

Oil can destroy fish eggs which in turn can upset the delicate balance of the food web, and thereby diminish an important local food source for some species. In addition, oil effects may reduce a mammal's ability to find food, flee from predators, and care adequately for their young. Although bioaccumulation can occur, there currently is no data available showing that accumulation of oil through the food chain will result in a biomagnification effect on cetaceans.

In general, little is known about the ability of cetaceans to avoid oil spills. Humpback whales, however, have been observed feeding in oil-slicks without apparent immediate ill effects (NOAA, 1979). Other cetaceans such as the bottlenose dolphins can detect and will avoid thick oil accumulations, but not thin oil sheens (Geraci and St. Aubin, 1982, 1983). Experiments have also shown that dolphins can detect oil and, under certain circumstances, will avoid oil (Boesch & Rabalais, 1987). The likelihood of prolonged exposure is diminished if the slicks are avoided and even if certain species move through at normal speeds.

Oil Spill Impact on Marine Birds:

Oil spills can seriously harm or kill seabirds, which are one of the most vulnerable animals to oil spills. The impacts on seabirds from the Nestucca spill clearly demonstrated this fact. Over 10,000 seabirds were killed in the days and weeks following the Nestucca spill. The major cause of immediate mortality among seabirds contaminated by oil is fouling of the feathers, which reduces flying and swimming ability and results in a loss of buoyancy and thermal insulation. It is generally assumed that most birds that are oiled as a result of a major spill will die (Hunt in MMS, 1989). The ingestion of toxic hydrocarbons, sometimes by preening contaminated feathers, can produce physiological stress which may eventually result in death. If non-fatal contamination occurs during the breeding season it may lead to reproductive abnormalities and failures. Birds that have ingested toxic elements may produce inviable eggs, and birds whose feathers are contaminated may transfer oil to eggs or chicks, thus reducing hatching or fledgling success. Other laboratory and field studies have shown that the ingestion of petroleum products can cause physiological damage and potential disruption of reproductive function (Hunt 1987; Fry 1987 in MMS, 1989).

A number of factors influence the vulnerability of different species of birds to contact with spilled oil. Species which have a tendency to form large, dense flocks on the water, spend considerable time swimming on the water, or dive when alarmed are extremely vulnerable, as are species which exist in small, isolated populations (U.S. Bureau of Land Management, 1980).

Diving birds and species that spend a considerable amount of time resting on the water are especially vulnerable to contact with spilled oil. The alcid seabirds, which dominate the population of seabirds on the Olympic coast (e.g., compose 86% of the nesting seabird populations), are also vulnerable due to their concentration in dense colonies. Dominant species in this group are Cassin's auklets, common murres, rhinoceros auklets, and tufted puffins. Destruction Island hosts one of the seven major colonies of rhinoceros auklets in the world. The Copalis Rocks Refuge contains 82% of the Brandt's cormorants, 77% of the common murres, and 39% of the rhinoceros auklets breeding in the state of Washington.

Local populations of cormorants and waterfowl are vulnerable because they represent a large portion of the local total population, the populations are low, and they would most likely recover slowly (Strickland and Chasan, 1989). Shearwaters and terns are also vulnerable but less so than diving birds. Marbled murrelets (which are being considered by USFWS for inclusion on the threatened species list) have the highest oil/bird vulnerability index of any seabird because they feed in local concentrations close to shore.

Catastrophic oil spills, like the 1971 Golden Gate spill, generally result in extremely high marine bird mortality. Other major oil spills, such as England's Torrey Canyon incident in 1967, have affected far larger numbers of birds than did the Golden Gate spill and have resulted in very high bird mortality (Holmes and Cronshaw, 1977) Attempts to clean oiled birds often prove unsuccessful and may occasionally cause even more stress than light oiling.

Oil pollution threatens bird populations beyond immediate mortality from ingestion of oil or fouling of feathers. Because of their direct dependence on nearshore food sources, long-term contamination of foraging grounds could cause major alterations in marine reproductive capabilities. As with marine mammals, birds may be adversely affected by the ingestion of oiled invertebrates. The potential long-term, cumulative impacts of nearby oil and gas development on marine bird habitat areas and feeding grounds in the Olympic coast area remain largely unknown.

Oil spill treatment and cleanup operations (including the adverse effects of human intrusion) can also have serious impacts on marine birds and marine mammals. Often the emulsifiers used and the associated human activity during cleanup procedures have been more harmful than the oil (MMS, 1987). Because many new generation dispersants, which are supposed to be no more toxic than oil, have not yet been fully evaluated, their environmental effects remain largely unknown (MMS, 1987). Mechanical cleanup and containment devices, such as booms, pose no toxic threat to marine birds, however, the extensive human activity associated with deployment can cause social disturbances within the marine bird and mammal populations. As with oil spills themselves, the impacts of cleanup operations would be particularly severe at times when marine birds and mammals were highly concentrated, e.g., during breeding or feeding activities.

Oil Spill Impact on Fish, Planktonic and Benthic Biota:

Oil spill impacts on the fish stocks and benthic fauna of the Olympic Coast waters would depend largely upon the type of oil involved (solubility, toxicity, etc.), the timing of the spill with respect to reproduction and larval development, migration patterns, and prevailing weather conditions.

Both lethal and sublethal effects of petrochemical pollution have been noted in fish (Hawkes, 1977; Patten, 1977; Sniderman, 1979, 1982). Observed sublethal effects range from visible physical abnormalities to subcellular defects. Some fish exhibit severe anatomical deformities such as curvature of the spine. At the tissue level, lesions may develop on the skin, gills, or intestine (Hawkes, 1977; Sinderman, 1982). In addition to any possible health hazards from the consumption of contaminated fish by humans, these sublethal effects are aesthetically displeasing and increase the difficulty of marketing fish for human consumption.

Patten (1977) and Sinderman (1978) discuss changes in behavior, metabolism, locomotor and activity patterns, growth, feeding and reproduction. Laboratory research, for example, has demonstrated deleterious effects on the survival and growth of eggs and larvae during spawning conditions due to short, low-level hydrocarbon exposures (Whipple et al., 1978). These laboratory results do not necessarily predict the effects of open ocean exposure to hydrocarbon discharges, where levels of contaminants may differ.

The lethal toxicity of oil ranges from .1 to 100 parts per million of soluble aromatics for adult marine organisms. Larvae are usually 10 to 100 times more sensitive than adults. Sublethal effects have been demonstrated with aromatic compounds in concentrations as low as 10 to 1,000 parts per billion (Johnston, 1979). The impact of a spill is thus apt to depend on the magnitude of egg and larval mortality. Because the early life stages are often pelagic, they are more susceptible to the effects of a surface slick. Heavier hydrocarbon elements are characterized by aromatics of higher molecular weight and lower water solubility. These elements may be avoided by adult finfish, but benthic organisms are highly susceptible to the lethal effects.

Although offshore production in general may be compatible with healthy fisheries in some areas, studies following past oil-tanker spills demonstrate some long-term damage from crude oil in the near shore area. Studies plaice, centered on breeding grounds and estuarine habitat, show 27 months after the spill, recovery of the fishery, although improved, was still not complete (Neff and Haensly, 1982).

A large oil spill in, or close to, valuable fishing areas poses a potentially serious threat to Washington State's valuable sport and commercial fisheries, including aquaculture. Oil spills or chronic exposure can affect fisheries through loss of fishing time or gear, tainting of fish, and direct destruction of the fishery. The most serious long-term effect is lingering tainting of stocks (Michael, 1977). Although direct toxic effects on an entire fishery of finfish whose populations cover large areas are not probable, smaller fishery segments can be seriously harmed. Generally, fisheries are most vulnerable during the reproductive and juvenile stages. Many species concentrate in small geographic areas during these stages increasing the potential for serious ecological consequences as a result of contaminant concentrations.

In the waters of the Olympic coast, salmonids are very important to both the commercial and recreational fishery. They are susceptible to spills which could occur near estuaries and river mouths. Some lethal and sublethal effects of adult salmon exposed to oil in laboratories include tissue damage, narcosis, and reduction in the ability to sense "home" waters. Tainting of the salmon flesh, which can spoil the catch's marketability, poses a serious threat to the commercial fisheries. A large potential risk from spilled oil exists for juvenile salmon during their migration into salt water from rivers and estuaries. Groundfish are also vulnerable to spilled oil at all life cycle stages; the groundfish catch off the Washington coast has exceeded that of salmon (Strickland and Chasan, 1989).

Shellfish, particularly Dungeness crab, pink shrimp, razor clams and oysters are also important fisheries of the Olympic coast region. Crab and shrimp eggs and larvae float in the water and are extremely sensitive to lethal and sublethal effects from hydrocarbon exposure. Razor clams and oysters are particularly susceptible to the effects of oil because they are immobile filter feeders (Strickland and Chasan, 1989). A major oil spill could cause significant long-lasting damage to the production of clams and oysters along the Washington coast.

The effects of oil and gas activities on kelp are serious particularly because kelp is a critical habitat for many species of fish. It is generally believed that the susceptibility of kelp and other plants to oil pollution varies with life stage, and that the adult kelp generation has an outer mucilage covering which appears to protect it against oil toxicity (U.S. Bureau of Land Management, 1979). While there appears to be little evidence to indicate that kelp is harmed by oil, the fish and fauna which live in the kelp may be harmed by ingesting, or coming into contact with, the oil trapped in the fronds.

Drilling and production platforms may form an artificial reef environment which could have short-term benefits for some fishery species. The fishery habitat remains in existence only during the life of the field and disappears once the platform is removed. This limited enhancement must be balanced against threats posed by oil and gas production.

Oil Spill Impacts on Estuaries, Wetlands, and other Critical Coastal Habitats:

The intertidal area is an important breeding, spawning and feeding ground for many marine organisms; the area also provides substrate and suitable habitat for many other species. Oil in the intertidal zone can affect the benthic biota by smothering, fouling, or directly poisoning organisms (Michael, 1977). As a result of the Valdez and Nestucca spills, for example, a significant amount of oil washed up on beaches, rocky shorelines and bays. A tanker collision spill, which occurred at the Golden Gate Bridge in 1971, provides an example of oil contamination in mussel beds located on the high rocks at Duxberry reef. Although comparison of pre-oil and post-oil transects showed a significant short-term decrease in marine life after the oil spill, the visible signs of oil passed rather quickly with no long term damage documented (Chan, 1977). Oil spills, however, pervaded the upper tidepool waters almost a year following the accident and there was selective evidence of marginal organism recruitment.

Wetlands and estuaries are critical coastal habitats for a number of the species discussed in Part II. These areas are highly productive areas that are important in sustaining offshore oceanic biota with nutrient resources as well as habitat for part of their life-cycles. Estuaries are critical rearing areas for juvenile flatfish and other groundfish, salmonids, crab and other significant species.

The estuaries of the Washington coast are poorly flushed soft-bottom embayments which can retain harmful oil residues and delay biological productivity. Once in the sediments of an estuary, oil can remain for years and destroy the entire ecosystem (MMS, 1987). If the substrate is heavily oiled, erosion can increase by 24 times (MMS, 1987) and thereby permanently alter the morphology and physical fluid dynamics of the estuary. Finally, according to MMS (1987) it is extremely difficult to protect estuary mouths by sealing them off if they are larger than 100 m. The openings to both Grays Harbor and Willapa Bay are greater than 100 meters in width and are therefore especially vulnerable to oil spills.

(c) Impacts From Discharges (other than oil) From OCS Activities

A wide variety of pollutant discharges are normally associated with OCS oil and gas development: drill cuttings and muds, sewage and trash, formation (or produced) waters, marine corrosion products, and air pollutants (e.g. petroleum aerosols and exhausts). Hazards to living resources from oil development operations can result from the on-site discharge of drill cuttings and drilling muds. These materials may adversely affect benthic biota as well as fishery resources, seabirds, and marine mammals. Drilling muds consist of naturally occurring minerals such as barite, simple chemicals such as sodium hydroxide and potassium chloride, and complex organic compounds such as lignosulfonates and formaldehydes. Department of the Interior OCS Order Number 7 forbids the discharge of drilling muds containing toxic substances into ocean waters.

In 1983, the Marine Board of the National Research Council conducted a study of drilling discharges. The study found that these discharges present minimal risk to the marine environment. The Marine Board did note, however, that drilling discharges do have an impact on the immediate benthic environment (National Research Council, 1983). However, more recent research (EPA, 1985) has shown significant benthic impacts from platform discharges up to two miles from a drilling site. Rocky reefs and hard-bottom areas off the Washington coast are susceptible to impacts from drilling fluids and muds.

Fluids and the lighter elements in drilling discharges rapidly disperse in the water column. The heavier elements, over 90 percent of the discharged material, settle to the bottom, usually in a plume extending in the direction of prevailing bottom currents. The potential impacts on marine organisms resulting from the discharge of drilling muds and cuttings are: 1) decreased primary production caused by increased turbidity which reduces light levels; 2) interference with filter feeding caused by high particulate loads; 3) burial of benthic communities; and 4) injury resulting from the acute or chronic toxic effects of drilling mud constituents.

Air pollution discharges normally associated with hydrocarbon activities (e.g. nitrogen and sulfur dioxides, carbon monoxide, particles, and organic fumes) can affect and potentially degrade local air quality. The discharged gases originate from a number of activities directly associated with oil and gas development including: flaring of excess gas, motor emissions from the platform, vessel traffic, onshore facilities, and petroleum fume releases from normal operational spills. Impacts on air quality from these gases depends on local meteorology and wind conditions. MMS projects possible impacts to the Puget Sound area, and minor impacts to the coastal area.

(d) Acoustic and Visual Disturbances

Oil and gas platforms, rigs, and related activities create both a visual intrusion on the scenic qualities of the area's seascape, and disturbances from construction activities and the sound and movement of boats and helicopters (U. S. Bureau of Land Management, 1979). Seismic survey equipment can interfere with fishing activities. In December, 1980 more than 1200 crab pots were caught in the airgun array of a vessel conducting a geophysical survey in Federal waters off Washington, causing in excess of $100,000 damage to fishing gear alone. As these pots were rendered irretrievable, they continued to catch crab. The Washington Department of Fisheries estimated a 5% loss of the offshore crab resource and untold opportunity costs as a consequence of this incident alone. The acoustic signals used during surveys have been shown to decrease catches of some rockfish species, kill fish eggs and larvae that are present near the generating apparatus, and alter swimming behavior in gray whales. The continuous human activity associated with oil and gas development and the steady stream of crew and supply boats create visual impacts and noise which may disturb marine birds and marine mammals, particularly during sensitive nesting, pupping, and migration seasons. Pinniped stampeding or sudden flights by nesting birds can occur if these disturbances occur very close to shore (U.S. Bureau of Land Management, 1979). During critical breeding periods, such reactions could result in increased mortality rates in young marine birds and marine mammals (U.S. Bureau of Land Management, 1979). The Washington Department of Ecology is funding an analysis of probable biological impacts from seismic testing to be completed in the summer of 1990.

Due to the undeveloped nature of the Olympic Coast area, the presence of an oil rig offshore would detract from the wilderness experience derived from visiting the beaches along the sanctuary shoreline. MMS (1989) stated that platform construction will create unavoidable adverse impacts to the visual resources, and that these impacts would last the life of the projected OCS activity.

(e) Socioeconomic Impacts

The socioeconomic consequences of prohibiting oil and gas activities within the sanctuary include effects on local communities and industries such as tourism and fishing. Prohibiting oil and gas development within the sanctuary will result in net positive effects on the local communities by reducing threats to the natural resource based economies.

Most of the revenues produced from oil and gas development would flow to the oil industry, while most of the impacts would be borne by the local communities and state government. If oil and gas development were to proceed, local communities might experience the short and long term effects of the boom-bust phenomenon. The local communities along the Olympic coast have traditionally relied on natural resources (e.g., timber, pulp, and fish) for the basis of their economy. The economy of these communities is chronically depressed and unemployment has been higher than the Washington state average. The expected employment benefits for the local communities is minimal. MMS's low case scenario predicts that 1,176 jobs would be created at the development stage. Estimates indicate that at the development stage a platform would employ 105 people per 12 hour shift and 175 people per 7 hour shift. Most of the skilled jobs located on the drilling rigs would be filled by non-local workers. The influx of outside workers could produce some problems in small communities. Past experiences dictate that increased population could increase: housing prices, certain types of crimes, traffic, demand for social services, and need for government spending.

Construction work might be made available to the local residents, although there is no guarantee that the lessee would hire locally. Even though a very small amount of jobs may be created, the minimal employment might have a significant short term benefit to the smaller communities. After the production stage the work force would rapidly decrease and eventually diminish completely.

Offshore oil and gas activities may also significantly affect fishing activities with or without consideration of a major oil spill. The impacts on fish populations following a major spill have already been addressed above. It must also be recognized that OCS oil and gas exploration and development may create spatial conflicts with fishermen, both offshore and at dockside. At the exploration stage, the gear employed during seismic surveys could become entangled with crab pots and other fixed gear, and have in the past off Washington. Placement of a platform could cause similar but more severe space use conflicts since the platforms would remain offshore for the life of the lease. While platforms can serve as artificial reefs, which could enhance the fishing from charter or privately owned fishing boats, commercial trawlers may suffer economic losses by having to avoid the platforms. This, of course, would depend on whether the rig was placed within a popular fishing area. There is also potential for conflicts between supply boats and fishing vessels over harbor space for docking or anchoring. This dockside spatial conflict has occurred in the Gulf of Mexico where oil companies and the fishing industry compete for dockside facilities.

b. Consequences of Impact to Uses

Under the status quo, no oil or gas will be developed within the Sanctuary. This action adds further protection to the coastal resources and fishing and tourist industries from the potential impacts of oil and gas development. This action also maintains the undeveloped viewshed. Further, there will be no social impacts of oil and gas development on coastal communities. The impacts of the industry on coastal communities may be both positive and negative. Development would bring economic development to coastal communities suffering from unemployment and seeking new opportunities for economic growth. The oil and gas industry, however, tends to employ individuals with specialized skills and would likely import labor. The importation of labor to develop oil and gas resources off the coast may result in cultural conflicts with the existing population, and overly stress the existing community infrastructure which is insufficient to handle such growth (MMS, 1990).

2. Sanctuary Alternative (Preferred)

a Consequence of Impact to Resources

NOAA is implementing through Sanctuary regulations the Congressionally mandated prohibition on oil and gas exploration and development within the boundary of the Olympic Coast National Marine Sanctuary. Further, the Sanctuary regulations prohibit all mineral development and exploration within the Sanctuary. This prohibition will protect the significant natural resources and qualities that are especially sensitive to potential impacts from outer continental shelf oil and gas activities. In particular, the sea otters, sea birds, and pinnipeds that use the haul-out sites, kelp forests, and rocks along the Olympic Peninsula and the Sanctuary's high water quality are especially vulnerable to oil and gas activities in the area. MMS rates the Washington/region planning area as the area of the continental U.S. (outside of Alaska) in the current Five Year Leasing Plan that is highest in rank on a broad index of marine productivity and environmental sensitivity. It has a higher environmental productivity and sensitivity ranking, and lower hydrocarbon potential, than the Monterey Bay, California Sanctuary planning area which was recently closed off to OCS oil and gas activities by Presidential Proclamation. A prohibition on oil and gas activities within the Sanctuary boundary will help protect Sanctuary resources and qualities.

This prohibition does not completely protect the Sanctuary from the potential impacts from oil and gas development. Development activities can occur south of the Sanctuary boundary, and if an accident were to occur during the winter months, the spill would be carried by the currents northward into the Sanctuary. NOAA will have some control over any future exploration or development activity through the Sanctuary prohibition on discharges that enter and injure Sanctuary resources from outside Sanctuary boundaries.

b. Consequences of Impact to Uses

NOAA's prohibition on oil and gas exploration and development within the Sanctuary boundary will eliminate the potential for increased noise and human activity in coastal and offshore waters. It will also eliminate the need for additional supply boats to enter the nearshore waters and overflights of helicopters that may incidentally approach nesting or resting marine mammals or birds. This prohibition will eliminate the development pressures on shore to support such activities.

Given the wealth of sensitive renewable natural resources within the proposed Sanctuary, the high tourism and commercial fishery value of the area, and the present indications of low national oil and gas resource potential, it is NOAA's judgement that the net economic effect resulting from a restriction on hydrocarbon operations is most likely positive. The net economic effect of the regulation depends largely on the amount of hydrocarbon reserves foregone, dollar value of the oil, the estimated value of the renewable resources, and the economic value of the tourist industry.

NOAA believes that the regulation will have positive long-term economic impacts by contributing to the preservation and health of renewable sources of income, such as fishing and recreation, due to the long term protection of such activities from potential oil spills, discharges and visual and acoustical disturbance. In addition, the Sanctuary research and education programs would have long term benefits by enabling natural resource managers to make better informed decisions regarding the preservation, enhancement and possible additional economic benefits of the areas's natural resources and uses. This regulation will however eliminate any use of the area by the oil and gas industry.

Boundary alternative 4 encompasses an estimated 5% of the reserves estimated to be in former Lease Sale #132. Since the exploratory activities have been cursory, there is no accurate indication of the amount of oil and gas reserves within this Lease Block. Therefore, it is impossible to determine the exact economic impact of the prohibition on oil and gas development within the Sanctuary.

It is possible that the proposed prohibition would reduce U.S. Treasury income from offshore lease sales and leasing royalties. The total amount of lost revenue estimated by MMS from these conditional resource estimates may be modified by the results of petroleum development pursuant to actual drilling associated with some future Lease Sale, as well as an analysis of economic feasibility and environmental and regulatory constraints. Economic feasibility is determined solely by the oil industry based on lease sale costs at the time of sale, current oil prices, proposed project costs, and environmental reviews and mitigation costs. Oil development costs and expected returns per investment are considered confidential information by the oil industry. Once again, environmental and regulatory constraints are impossible to identify due to the lack of experience of the Washington/Oregon planning area with offshore oil and gas development.

C. Discharges or Deposits

1. Status Quo

a. Consequence of Impact to Resource

With increasing human uses in the ocean and adjacent watersheds, discharges and deposits into the proposed Sanctuary can be predicted to increase, further threatening the resources and qualities of the area, particularly in the coastal zone, and human uses such as fishing and recreation that depend upon high water quality.

Under the status quo, discharges will continue to pressure the resources of the coastal zone. It is believed that the cumulative impacts of point and non-point source pollution has already begun affecting the quality of the kelp beds and benthic communities along the Strait and outer coast. Without a coordinated approach and goal for protecting the coastal resources, the impacts may continue to degrade under the pressure of coastal development.

i. Discharges from Point Sources

The Tribes receive their NPDES permits directly from EPA rather than obtaining them through the WDOE.

The only point source discharges from the U.S. along the outer coast and Strait of Juan de Fuca occur from Tribal treatment plants. The Makah and the Quileute Tribes are the only Tribes that are permitted by EPA to discharge wastewater into the marine environment. The Makah's have an inadequate sewage treatment plant and are in the process of upgrading their treatment system. Under consideration is restoration of an ocean outfall pipe which has not been in use for years, but is permitted by EPA. This ocean outfall would discharge into the Strait of Juan de Fuca sewage having received primary treatment. To rehabilitate the outfall would require a Clean Water Act (Section 301(h)) waiver from EPA. The Makah's are considering building a lagoon to treat their wastes which would achieve the equivalent of secondary treatment during peak season and tertiary treatment during the off season.

The Quileute Tribe have been plagued with costly mechanical failures and erosion of the drainage field which drains their treatment plant. They too are planning to upgrade their treatment plant.

ii. Non-Point Source Discharges

Non-point source discharges result mainly as a consequence of timber practices in the coastal drainage basins. There is anecdotal evidence that the kelp beds have been negatively impacted by increasing sedimentation over the past 20 years. The Pyscht River estuary, supporting the largest saltwater marsh in the Strait of Juan de Fuca, has experienced severe sedimentation which is degrading important juvenile salmonid habitat and is likely representative of other small estuarine environments adjacent to the boundaries of the study area.

iii. Hazardous waste, oil and trash disposal

There is an unknown quantity of pollutants and trash which enters the Olympic Coast area from the open ocean. These discharges and deposits may have been transported far distances by ocean currents or may have come from vessels. In addition to reducing overall water quality and lessening the aesthetic appeal of the area, the discharge of litter may harm marine mammals that sometimes ingest or become entangled in such litter. In areas of the northern Pacific Ocean as many as 8,000 fur seals become entangled in such debris annually (Haley, 1978). The incidence of the mortality associated with this type of mammal disturbance remains unclear.

The MPPRCA of 1987 amends MARPOL, by prohibiting the disposal by ships of plastics, such as fishing lines and bags. This protects marine animals and seabirds from ingesting these wastes while foraging, or becoming entangled in them, possibly leading to illness or death. The MPPRCA regulations also prohibit, for example, the disposal by ships of paper, rags, glass, metal bottles, crockery and similar refuse less than 12 nautical miles from the nearest land; the disposal of dunnage lining and packing materials that float less than 25 nautical miles from the nearest land; and the disposal of victual waste less than 12 nautical miles from land (if ground, 3 nautical miles).

Discharges, such as cooling waters from boat engines and fish wastes, used in, or resulting from, fishing vessels during traditional fishing operations are unlikely to harm the resources of the Sanctuary. Discharges resulting from military activities in the area, such as smoke markers, sonobuoys and ordinance, are slight and do not appear to pose a threat to the resources and qualities of the proposed Sanctuary. In addition, Department of Defense vessels are required to be equipped with oil-water separators. The water effluent from these devises must meet standards of 20 parts per million (ppm) oil within 12 nautical miles from land, or 100 ppm beyond 12 nautical miles from land. The oil portion is retained on board for shore disposal.

iv. Ocean Dumping

Ocean dumping, municipal outfalls, and dredged material disposal can smother benthic biota and introduce substances into the marine environment, which may affect fish, bird, and mammal resources. However, all ocean dumping need not meet the standards established by Title I of the MPRSA.

Currently, the dredge disposal sites in Washington are located off Grays Harbor, Willapa Bay and the Columbia River. No dredge disposal sites are located north of Grays Harbor. There are plans to expand the marina at Neah Bay and dredge disposal is planned to be used for beach nourishment near the marina and disposed at upland sites.

b. Consequence of Impact to Uses

Most regulatory decisions pertaining to dischargers are determined on a case-by-case basis with the primary intent of facilitating the use rather than protecting the environment. The Juan de Fuca Canyon and important benthic habitats would not be given special consideration when deciding upon permits. Therefore from the Sanctuary's perspective, certain gaps remain in the regulatory framework.

2. Sanctuary Alternative (Preferred)

a. Consequence of Impact to Resources

The proposed final regulations prohibiting discharge or deposit of materials or other matter (with certain limited exceptions) without NOAA approval complements the existing regulatory system, and would enhance the area's overall recreational and aesthetic appeal, maintain the present good water quality in the Sanctuary, and help protect Sanctuary resources. By maintaining high water quality off the Olympic Peninsula and regulating discharge and deposit activities from an ecosystem-wide perspective the impact of this regulation is predicted to protect the resources and qualities of the Sanctuary above that of the status quo.

Although the Sanctuary would not be terminating any existing uses that discharge or deposit into the Sanctuary, it is expected that this discharge prohibition would have a positive impact on Sanctuary resources through the restriction and possible prohibition of future discharges that threaten the resources and qualities of the Sanctuary. By serving as the steward for Sanctuary resources, the Sanctuary intends to monitor the status of coastal resources and impacts from point and non-point source discharges. There is currently, no comprehensive protection and monitoring of those resources, despite the fact that they represent some of the most diverse and prolific intertidal and subtidal communities in the Pacific Northwest, and indeed, the world. Protection of these resources from point and non-point source discharges will ensure continued use of the resources for subsistence harvest, recreational diving, and recreational, commercial, and treaty fisheries. The Sanctuary program will coordinate with watershed management initiatives and agencies with management jurisdiction in the coastal watersheds to monitor and protect the coastal resources.

b. Consequence of Impact to Uses

The impact of these regulations is expected to be beneficial to the users of the Sanctuary. The requirement of Sanctuary review of permits for municipal outfall disposal ensures that these potentially harmful activities receive special consideration from the Sanctuary's perspective. The Sanctuary will ensure the continued use from such activities as recreational diving, fishing, tourism, research, aquaculture and others that depend on high water quality.

Another positive effect of the regulations would be that by working within the existing regulatory process NOAA will provide and coordinate data from existing studies that can be used to make better informed management decisions by all agencies including the Sanctuary. For example, there are a few site-specific watershed planning initiatives that are underway on the Peninsula to minimize point source pollution in the coastal watersheds. Yet, because there is little or no monitoring of the coastal resources, it will be difficult to evaluate the effectiveness of watershed plans and the means by which to fine-tune them if necessary. NOAA can facilitate the process by coordinating these initiatives and helping to set standards for discharges that will ensure the future protection of the coastal resources.

Those that discharge into the Sanctuary would not be prohibited from, pursuant to existing permits, conducting their activities following designation. Discharges and deposits are subject to all prohibitions, restrictions and conditions validly imposed by any other authority of competent jurisdiction. NOAA may regulate the exercise of existing permits or other authorizations (but not terminate them) to achieve the purposes for which the Sanctuary was designated.

NOAA will also review applications for new permits and other authorizations. Applicants must provide timely notice of the filing of the applications and any additional information NOAA deems necessary. NOAA will either approve them, approve them with terms and conditions, or disapprove them to ensure Sanctuary resources and qualities are protected.

Activities conducted by Tribes pursuant to an existing treaty shall not be terminated by the Sanctuary program. Tribal activities authorized by an existing Treaty may only be regulated if all other possible alternatives have been exhausted with no resulting benefits to the resources, or in emergency situations.

NOAA intends to consult with scientific institutions and local, State and regional organizations, as well as with the holders of, or applicants for, any authorization or right and the relevant permitting authorities of these activities to determine means of achieving the Sanctuary purposes. If additional conditions are necessary, NOAA will work with the permittees and permitting authorities to determine the necessary level of conditions to provide adequate protection of Sanctuary resources. Procedures to ensure efficient administration of NOAA certification and other processes are explained in the proposed final Sanctuary regulations. In general, NOAA intends to work with existing authorities to formalize the oversight and management role of the Sanctuary and increase Federal, state, tribal and local cooperative efforts to achieve the agencies mutual goals.

For example, the requirement of NOAA certification of existing permits for municipal sewage outfalls will ensure NOAA consideration of potential impacts on Sanctuary resources and qualities. The NOAA certification process will be coordinated with EPA, the state and tribal governments. NOAA approval of future permits for municipal sewage outfalls is necessary to exempt such outfalls from Sanctuary regulatory prohibitions. NOAA participation in the permitting process will ensure protection of Sanctuary resources and qualities.

The requirement for new permits of secondary treatment or greater, as necessary depending on the risk to Sanctuary resources and qualities, is expected to minimally impact the coastal economy. The Quileute Tribe is currently planning improvements to their wastewater treatment facility and the Makah are planning upgrades of their facility as well. Both are currently discharging primary treated effluents; however, their improvements are expected to attain secondary treatment.

In reviewing existing or future permits, licenses, approvals, or other authorizations, NOAA intends to encourage best available management practices to minimize non-point source pollution entering the Sanctuary. Sanctuary review of discharge activities will be done in coordination with EPA, the state and the tribes. No disposal sites may be permitted within the Sanctuary.

D. Historical Resources

1. Status Quo

a. Consequence of Impact to Resources

The most significant cultural resources are tribal areas of cultural and/or historical significance. The tribes have inventoried the sites that are significant. Many are rocks, paths, islands with burial grounds, etc.. that dot the entire Washington Coast. There have also been numerous shipwrecks along the coast, most have been a result of groundings on the offshore rocks. The wave energy, however, has resulted in the disintegration of most of the shipwrecks. There are records of shipwrecks further offshore but none have been excavated due to the low economic value of the cargo transported by these vessels, and the technical difficulty in accessing the shipwrecks. There is one shipwreck in 130 feet of water off Tongue Point in the Strait of Juan de Fuca which is a popular dive spot. The mast of this ship, located in 130 feet of water, reaches to a depth of 80 ft.

A recent MMS study of the geologic makeup of the offshore continental shelf indicates that there were probably human settlements along the submerged continental shelf dating back to the last glaciation. Studies using satellites and radar imagery are needed to locate artifacts submerged in the offshore continental shelf.

The Washington State Office of Archeology in the WDCD is responsible for maintaining an inventory of marine archeological resources in Washington State waters. The tribes are consulted during the permitting process for activities resulting in the excavation or disturbance of tribal archeological resources in state waters. Pursuant to the State Environmental Protection Act, the process for permitting research activities accounts for ecological impacts on the marine environment.

b. Consequence of Impact to Uses

Current activities will continue under the status quo without any special protection to historical sites beyond state waters There would be no special requirements for private sector uses such as treasure salvors and recreational divers or public sector agencies such as the Navy, to consider the historic value and ecological consequences of their uses from a Sanctuary perspective.

2. Sanctuary Alternative (Preferred)

a. Consequence of Impact to Resources

Historical resources are defined as resources possessing historical, cultural, archaeological or paleontological significance, including sites, structures, districts, and objects significantly associated with or representative of earlier people, cultures, human activities and events. Thus any inundated prehistoric aboriginal sites and associated artifacts, as well as shipwrecks would be included in the resource protection regime of the proposed Sanctuary.

This regulation is aimed at protecting historical resources NOAA's policy regarding historical resources is fairly congruent with existing state policy. NOAA intends to extend this policy to Federal waters. The regulations provide for the issuance of a NOAA permit for various reasons, e.g., research or to further salvage or recovery operations in connection with an abandoned shipwreck in the Sanctuary (title to which is held by Washington State).

NOAA will thus be able to ensure that all parties affecting historical resources within the Sanctuary conduct their activities according to recognized archeological procedures. NOAA will also be able to ensure that the activity is conducted consistent with the NHPA and that the proposed user consult with the Washington State Historic Preservation Officer.

As part of the Sanctuary management regime NOAA intends to research the number and type of historical resources within the boundaries of the Sanctuary, building on the research of others in the area, and at other Sanctuary sites along the west coast. This research will further our understanding of human populations, their use of the marine environment, and how to protect these resources so that they are available to future generations.

NOAA will also seek National Register listing of appropriate identified resources located in the Sanctuary under the NHPA. Listing would make available grant and survey funds from the Secretary of the Interior (Heritage Conservation and Recreation Service) to be used to identify resource distributions and assess their significance. Placement on the National Register also ensures careful review of proposed Federal activities which could adversely affect identified resources. However, listing does not prevent removal or damage of the resource by non-Federal entities.

Historical resources in the marine environment are fragile, finite and non-renewable. This prohibition is designed to protect these resources so that they may be researched and information about their contents and type are made available to the public.

b. <u>Consequence of Impact to Uses</u>

The proposed final regulation is not likely to significantly affect existing activities within the Sanctuary. Users such as Navy salvage operations, recreational divers and treasure salvors would have to obtain a Sanctuary permit if their proposed activity would violate the Sanctuary prohibition.

The current management regime for excavating archeological resources allocates up to 10% of the value (economic value or artifacts) of an excavation after having an opportunity to examine all of the resources prior to falling into private ownership. The Sanctuary will require that the sanctuary program has access to all archeological resources for educational purposes, including those ultimately destined for personal possession pursuant to state law.

NOAA can also impose penalties of up to $100,000/violation for infractions of the Sanctuary regulation addressing historic/cultural resources. This regulation does not apply to moving, removing or injury to historical resources resulting incidentally from aquaculture or traditional fishing operations.

E. Alteration of, or Construction on the Seabed

1. Status Quo

a. Consequence of Impact to Resources

Currently, the only activities that involve altering or constructing on the seabed are the placement of hydroacoustic sonobouys and cable by the Navy within a 25 square nautical mile subsurface torpedo range off of Kalaloch. However, commercially valuable sand and gravel deposits off of Cape Flattery and the Quinault River have the potential of being commercially developed. This mining could potentially have severe impacts on the benthic environment disrupting habitat for the valuable crab and groundfish fisheries, and gray whale foraging areas (Table 8).

b. Consequence of Impacts to Uses

The status quo will allow dump sites to be established within the Sanctuary pursuant to EPA and COE permits. Also, gravel deposits will be available for development. These activities will be pursued without protection from a Sanctuary perspective.

2. Sanctuary Alternative (Preferred)

a. Consequence of Impact to Resources

The Sanctuary prohibition on alteration of, or construction on the seabed will ensure the continued integrity of the benthic habitat which is critical to the support the marine fish, mammal and seabird populations. Effects of marine mining include emissions of gaseous or particulate matter to the atmosphere, changes in water quality such as red tides, increased turbidity, and storm induced slides, major geologic impacts in the coastal zone where wave energy is a dominant force, changes in current patterns inducing erosion or deposition, and introduction of new habitats which may cause the loss of feeding areas for marine mammals and other organisms in the food web.

b. Consequence of Impact to Uses

The Sanctuary regulation ensures that the integrity of the entire ecosystem of the Sanctuary does not degrade through the cumulative impacts of development projects. These impacts threaten to diminish the value of the region for fisheries, recreation, wildlife, and spiritual benefits.

Currently, dredging of harbors within the preferred boundary (La Push and Neah Bay) occurs rarely and clean dredge spoils are deposited to renourish beaches and stabilize jetties. These harbor maintenance activities will not be impacted by the Sanctuary since harbors are excluded from sanctuary boundaries. The planned expansion of the marina at Neah Bay will necessitate

Table 8. Summary of Environmental Effects of Marine Mining by Resources Affected (MMS, 1993).

Resource and Environment	Significant Findings	Salient References*
AIR QUALITY	Emissions of gaseous or particulate matter to the atmosphere are of greatest potential concern. Principle emissions are nitrous oxides and residual (reactive) organic compounds. During exploration and test mining, emissions are expected to have little effect on onshore air quality except offshore California where high background pollution already exists. Emissions from marine mining sources are expected to be qualitatively and quantitatively similar to oil and gas related sources. In the deep ocean, some gases might be released from seawater brought to the surface from the seabed via hydraulic dredging; information on this effect is sparse. Noise from non-explosive seismic exploration activity is generally dismissed as insignificant. In terms of global or regional effects of marine mining, there is only limited literature on this subject. Effects are generally examined on a site-specific level. No significant problems or priority areas for research are noted.	USDOI, MMS (1988b) OTEC publications
WATER QUALITY		
Natural Effects	In general, the natural effects of environmental change are easily recognized. Phenomena such as red tides, mega-plumes resulting from seabed hydrothermal activity, and storm- or earthquake-induced slides may result in significant but temporary changes in water quality.	
Induced Effects	Induced effects (e.g., turbidity, nutrient or trace metal enrichment) may result in secondary effects throughout the trophic web.	
Deep Ocean and OCS	Impacts are difficult to assess. The capacity for assimilation of plumes increases in deep water, however other factors (e.g., presence of a thermocline, low velocity benthic currents) may prolong the effects of plumes compared to shallow coastal waters. Effects should be examined on a site-specific basis. Dilution of a discharge to low concentrations is rapid (i.e., reduced to 1,000 ppm within 2 min of discharge; to 10 ppm within 1 h). The affected zone typically extends 1,000 to 2,000 m down current. Field studies of drilling muds and other discharges indicate that pollutants are rapidly reduced to background levels. Long-term, chronic effects of these discharges have not been observed. Mining discharges are subject to the same settling and dilution factors as oil and gas related discharges. Turbidity from resuspended sediments may be detected down current over many km; direct effects and indirect effects (e.g., nutrient or trace metal enrichment, increased biological or chemical oxygen demand) are limited to the immediate area of operations. Petroleum spills from marine mining activities would be limited to fuels (during transfer) and tanker loss.	Aurand and Mamontov (1982) Cruickshank et al. (1987) de Groot (1979b) Drinnan and Bliss (1986) ECOMAR (1983) Evans et al. (1982) Gillie and Kirk (1980) Hirsch et al. (1978) Middleditch (1981) Neff (1981, 1985) U.S. Congress, Office of Technol. Assess. (1987) Zippin (1988)
Coastal and Onshore	Marine mining would affect water circulation and water quality proportionally to the level of activity. Large stockpiles of marine minerals or mining wastes could be usefully maintained or disposed of at convenient sites near to shore; impacts from these activities can only be assessed by analysis of site-specific conditions. The shallow and confined nature of many coastal waters makes them susceptible to perturbation or pollutants. Turbidity is generally not considered a problem (e.g., sand and gravel mining operations are discontinuous; deposits rarely contain large amounts of silt-sized material). Good management practices are critical to eliminate potential impacts. A very low potential exists for release of chemicals normally associated with harbor and channel dredging (e.g., PCBs, trace metals).	U.S. Congress, Office of Technol. Assess. (1987)

Resource and Environment	Significant Findings	Salient References*
Terrestrial Sites	Impacts on water quality at shoreside facilities are attributed to gaseous, liquid, or solid waste emissions. Potentially serious problems include the dumping of mined tailings and processing wastes into adjacent waterways. The nature of the effect will be influenced by the characteristics of the dumped material, the nature of the waterway, and its ecosystem.	Ellis (1987, 1988, 1989) Ellis and Hoover (1990)
GEOLOGICAL RESOURCES	The primary effect is the removal of the ore; additional secondary effects may include alteration of the value of remaining mineral resources (grade depletion) and alteration of the seabed.	
Mineral	Mineral deposits removed by mining result in an irretrievable transfer of the mineral from a resource base to a consumptive use.	
Other	Major geologic impacts of marine mining result from activities in the coastal zone where wave energy is a prime factor. The effects of large excavations or shoaling resulting, for example, from the mining of mineral sands will depend on location. Changes in wave or current patterns induced by altered conditions can cause changes in shoreline equilibrium, causing erosion or deposition. Possible effects from sub-seabed fracturing using conventional or other type explosives are not well discussed in the literature; additional study and observation (i.e., in offshore areas susceptible to slumping, in deep water) was suggested. Coral reef growth may be severely affected by siltation, altering the supply of coral sands to adjacent beaches.	Chansang (1988)
BIOLOGICAL RESOURCES	Most biological impacts are secondary, attributed to some alteration in existing physical, chemical, or trophic equilibria. Impacts in the coastal zone have a greater tendency to be significant because of higher energy levels. Physical changes which may induce biological effects include changes in temperature, current patterns, amount of particulates present, nature of the substrate, and introduction of new habitats. Significant chemical changes include changes in the presence of nutrients, trace elements, or toxics. Trophic changes include removal or alteration of indigenous species. Biological impacts are the major enigma of impact assessment. Criteria upon which significant biological changes are based are typically arbitrary. Generalizations rarely allow meaningful prediction of the effects of specific mining operations. Biological studies should be directed on a case-by-case basis to respond to specific needs. Effects of turbidity, sedimentation, explosives, light, and noise on marine biota have been reviewed. Other data sources were noted from deep seabed mining, OCS oil and gas, and academic research.	Cruickshank et al. (1987)
Birds	Large oil spills which have the potential to kill numerous sea birds and shore birds are not anticipated from marine mining operations. Effects of small spills tend to be localized and short-lived.	USDOI, MMS (1983b, 1991)
Mammals	Effects of operations may include loss of feeding areas, uptake of heavy metals, and noise. Oil spills are not considered significant because of the low risk. Mining activities located away from known migratory pathways and calving or feeding grounds are unlikely to adversely affect marine mammal populations although individual transient animals near mining sites may be startled or show avoidance behavior. Limited research suggests habituation to low-level noise.	Gales (1982) Geraci and St. Aubin (1980) USDOC, NOAA (1981) USDOI, MMS (1983a,b)

Resource and Environment	Significant Findings	Salient References*
Marine and Aquatic Fauna	Both adverse and beneficial impacts have been noted. Beneficial impacts include the attraction of fish to offshore structures; enhancement of substrate habitats by alteration of the texture; enhancement of substrate habitats by the presentation of new surface nutrients by mixing and replacement of the benthos; thermal stimulation of growth; and introduction of nutrients by mixing of water masses and enhancement of phytoplankton growth. Adverse effects include direct lethal toxic effects (e.g., abnormal growth, reduced adult fecundity, behavioral changes, etc.) and disruption of community and ecosystem structure (e.g., changes in diversity and abundance via food web disruption, changes in predator-prey relationships, etc.). Analyses of potential impacts requires a knowledge of the pre-operating populations and their natural cycles, allowing a differentiation between natural fluctuations and impact response. Adequate knowledge of pre-operating conditions (baseline) is debatable. Difficulties arise in the selection of indicator species. Effects of marine mining operations occur from turbidity, smothering, and pollutants (from mined formations). Turbidity effects may not be a concern if dilution rates are high and sensitive communities are not proximal to the mining site. Numerous studies have been conducted regarding the effects of turbidity on indigenous fauna, especially fishes. The exposure of free-floating organisms (e.g., plankton) to high turbidity concentrations will be limited. Turbidity impacts from aggregate dredging operations on sensitive benthic organisms will be far less than placer mining. Smothering of bottom dwelling organisms is due to the settlement of suspended sediments and associated depletion of oxygen in surrounding waters. Coral reefs and seagrass beds are particularly sensitive. Smothering is perceived as being of greatest concern in placer mining operations. Pollutants may affect growth and reproductive rates. The effects of pollutants on the physiology of marine fauna has received only limited study. Effects on marine phytoplankton are observed in response to decreased illumination in the laboratory, but these shading effects are not expected to be a problem in open waters. In the benthos, some species will likely be more affected than others because of feeding mode (filter feeders), life habit (surface dwellers), degree of mobility (tube dwellers), or sensitivity of life stage (larvae). Areas that may not be able to withstand slight increases in sediment deposition include coral reefs and areas used by bottom spawning fish. In cases where a majority of the benthic community has been adversely affected, recolonization will occur from populations outside the disturbed area. Benthic organisms may serve as indicators of pollutants and the structure of the benthic community may be indicative of a stressed or disturbed environment.	Aurand and Mamontov (1982) Bigham et al. (1982) Blaxter (1980) California Department of Fish and Game (1977) Chan and Anderson (1981) Clark (1988) Cressard (1981) Cressard and Augris (1982) Cruickshank (1974a,b; 1987) Dawson (1984) de Groot (1979a,b) Drinnan and Bliss (1986) Ellis and Hoover (1990) Gillie and Kirk (1980) Glasby (1985) Hanson et al. (1982) Hirota (1981) Hu (1981) ICES (1979) Kawamura and Hara (1980) Levin (1984) Lunz et al. (1984) Matsumoto (1984) NRC (1985) Pfitzenmeyer (1970) U.S. Army Engineer District (1974) U.S. Congress, Office of Technol. Assess. (1987) United Nations (1981) USDOC, NOAA (1981) USDOI, MMS (1988b)
Flora	Effects on flora are not regarded as a major concern.	
Sensitive Habitats	In sensitive areas (e.g., Arctic waters), particularly in shallow water, or in the deep seabeds, slow regrowth of affected communities is expected. Areas of hydrothermal venting along mid-ocean ridge crests support unusual benthic colonies. Draft regulations have provided for avoidance of such environments.	Dunton et al. (1982) USDOC, NOAA (1981) USDOI, MMS (1983a)

Resource and Environment	Significant Findings	Salient References[a]
Threatened and Endangered Species	Impacts were discussed under respective biotic resource categories. Impacts are associated with noise (marine mammals, birds), accidental oil or fuel spills, and increased turbidity.	
SOCIAL AND ECONOMIC RESOURCES	Most actions resulting in environmental query are triggered on the basis of some social or economic need. Such aspects are built into the scoping process for respective environmental documents. The literature is voluminous and scattered.	
Human Resources	Effects on human resources include health, employment, and infrastructural needs. For processing plants and mining operations conducted from platforms or seabed mining operations carried out in the hard rock, extended periods of relative isolation create impacts on mining personnel. The social environment is extremely variable and widely described, but not specifically for marine mining. Disturbances must be weighed against benefits. The ranking of multiple uses is potentially highly subjective. From a legal perspective, national laws are not adequate for many minerals and international laws regarding the mining of the seafloor are still not well-defined. In many instances, national and international laws have lagged behind rapid social change. Several aspects have a significant effect on planning and conduct of operations, including the exhaustible nature of mineral resources, resource conservation, and multiple uses of mineralized areas.	USDOI, MMS (1988a,b)
Commercial and Recreational Fisheries	Literature from Europe is more extensive on this subject than in the U.S. Modern European prospecting operations cause little disturbance to the marine environment and do not interfere with other activities at sea; no formal government consultations procedure exists for a prospecting license, however, the permitting process is substantive. As a resource, standing fishery stocks are affected by various factors (e.g., turbidity, pollutant loading, physical disturbance). Direct effects of oil or turbidity are limited due to the mobility of fish. Indirect effects include damage to eggs, larvae, and juveniles; sublethal uptake of hydrocarbons and pollutants; loss of prey; loss of habitat; and reduced reproductive success. Marine mineral activities may interfere with fishing activities and compete for space at sea and in port. Space use conflicts between fishermen and vessel operators have occurred with entanglement or severing of net and trap lines. Coordination efforts between the two industries have helped avoid most vessel conflicts. Recent research interest has included assessment of the potential for marine geophysical surveys to reduce catchability of fish and damage to fish eggs and larvae. Long duration, spatially concentrated use of seismic energy sources can disturb the spatial distribution of fish in the water column and reduce catchability. It is expected that there has been some loss of individual income through lost catch opportunity or gear loss and increased cost of port space.	Nunny and Chillingworth (1986) Pasho (1986) Zippin (1988)
Regional Economies	Impacts from resource disturbance will be measurable on the economy. The extent of the economic impact resulting from a given action is affected by various factors. A determination of a prospect's feasibility must consider the net rate of return on the investment.	Sorensen and Mead (1969)
Local Economies	Local economies are site-specific, driven by many factors.	

Table ES2.2 (Continued)

Resource and Environment	Significant Findings	Salient References*
Cultural Resources	Effects are particularly difficult to quantify because intangible cultural systems are subject to the historical and contemporary changes induced by all human activities. A comparison of alternatives using semi-quantitative methods of factor analysis might be valid. Archeological resources may be significant and should be protected.	Cruickshank (1974a)
Technical Resources	Major impacts on technology appear in the form of disturbances to the system due to materials failure primarily effected by motion, pressure, corrosion, and biological fouling. Impacts on the environment are relatively small.	

* - Salient references indicate key sources; several reference listings (e.g., **Marine and Aquatic Fauna**) have been pared, given tabular space constraints.

the disposal of dredged material outside sanctuary boundaries. Inside the Sanctuary, activities associated with harbor maintenance including the installation of navigation aids are exempted from the Sanctuary regulatory prohibition. The Sanctuary program is supportive of the marina expansion and will work with the Makah Tribe to pursue appropriate disposal alternatives. The Makah Tribe plans to use the dredge spoil for beach nourishment and upland projects.

Commercial mining of sand and gravel deposits off the coast is prohibited within the Sanctuary. This prevents the public from receiving economic benefits from these potential commercial endeavors.

The regulation prohibits placement of any structure or other matter on the seabed, such as, but not limited to, artificial reefs, pipelines and outfalls, unless relevant permits are reviewed and certified or approved by NOAA. The prohibition also includes placement or abandonment of any structure or other matter on the seabed, which includes vessels that run aground. This helps ensure that owners and operators are responsible for the removal of their vessels.

The activities exempted from this regulation would be monitored by the Sanctuary manager, based on information supplied by the EPA, COE and the WDNR. If the data collected demonstrate that a greater degree of Sanctuary oversight is appropriate, amendments to the regulations could be proposed.

F. Taking Marine Mammals, Turtles and Seabirds

1. Status Quo

a. Consequences of Impact to Resources

The current regulatory regime under the U.S. Departments of the Interior and Commerce gives each Department the authority to designate and protect oceanic habitats if found to be "critical" for species listed as "endangered" under the ESA (ESA). The MMPA and the ESA prohibit the "taking" of marine mammals and threatened or endangered species. The MBTA prohibits the taking, killing, possessing, selling and other specified forms of exploitation or migratory birds. The term "taking" is defined broadly under the ESA and MMPA and has been interpreted by the administering agencies, so that the ESA and MMPA provide considerable protection. However, the potential threats to marine mammals and endangered species range from direct injuries to a specific animal or population to indirect or cumulative degradation of their habitats. Neither the MMPA nor the ESA fully prevent such degradation of habitats. Section 7(a) of the ESA does provide protection against actions which jeopardize endangered species or their critical habitats, but this section applies only to activities authorized, funded or carried out by Federal agencies, not to private or state actions. There is no explicit provision for the designation or protection of marine mammal habitats under the MMPA. Thus the MMPA, ESA and MBTA together provide considerable protection to the marine mammals, turtles and seabirds of the Sanctuary by prohibiting the taking of specific species protected under those acts, but fail to focus particular attention on the habitats of the species covered by the Acts.

Further, no Federal authority currently exists to identify and protect localized marine habitats of exceptional importance to non-endangered species. While the MMPA and the MBTA proscribe the hunting and taking of marine mammals and migratory birds, they do not protect their habitats from potentially adverse uses. Such program deficiencies have left certain valuable marine habitats largely unprotected. If current uses intensify and seriously threaten resources, the lack of suitable management authority to intervene could allow undesirable environmental impacts to the seabirds, marine mammals and turtles of the area.

b. Consequence of Impact to Uses

Currently the status quo addresses the taking of marine mammals and seabirds under relevant legislation. Marine mammals (except sea otters) may be taken incidentally to commercial fishing pursuant to 16 U.S.C. 1383a until October 1993, after which rulemaking pursuant to 16 U.S.C. 1371, 1373 and 1374 may be required. Fishing activities that potentially take marine mammals are required to have observers and/or logbooks on board to monitor the extent of takings. Researchers studying marine mammals are required under the MMPA to obtain a permit for their activities.

2. Sanctuary Alternative (Preferred)

a. Consequence of Impact to Resources

The proposed regulation would overlap with the MMPA, MBTA and ESA, extending protection consistent with the intent of the MPRSA to protect the Sanctuary resources on an environmentally holistic basis. The proposed regulation would include all marine mammals, sea turtles and seabirds in or above the Sanctuary. The Sanctuary regulation would also allow for the imposition of greater penalties, i.e., $100,000 per violation.

b. Consequence of Impact to Uses

The regulation would not preclude a number of current activities from continuing. For example, scientific research on marine mammals and seabirds that are Sanctuary resources is encouraged as part of the Sanctuary mandate. To facilitate this research the proposed final regulations allow the issuance of Sanctuary permits for research. If the research is on Federal or state designated endangered species or on marine mammals, the researchers are already required to obtain permits from the relevant management agency and would not have to obtain a Sanctuary permit or other approval under the proposed final regulation.

As another example, NOAA will work with existing fisheries management agencies as well as National and local fishery organizations including the PFMC to ensure that the incidental taking of seabirds, sea turtles and marine mammals in commercial fishing nets is minimized.

Finally, rehabilitation of injured seabirds, and studies on dead seabirds and marine mammals, would be permitted under these Sanctuary regulations in response to an emergency threatening life, property, or the environment or pursuant to a research permit.

G. Overflights

1. Status Quo

a. Consequence of Impact to Resources

There are a few small airports and landing strips along the coastal portions of the Sanctuary including a beach landing strip at Copalis, an unstaffed airport at Quileute, an airport at Sekiu and one at Port Angeles. Most of the airplanes utilizing these airports are recreational aircraft or airtaxis. There is a cargo plane that lands daily at Quileute Monday through Friday. Airtaxis to Sekiu are used largely to taxi sports fishermen to Neah Bay for recreational fishing excursions. A radar tower on the peninsula monitors air traffic above 3000 feet above ground level (AGL). A military operating area extends over the Olympic Peninsula and Sanctuary waters above 1200 feet AGL. When in use, other planes must stay below this altitude.

Over Sanctuary waters, there are no restrictions on aircraft with respect to the altitude they may fly. There is a 2000 ft. advisory over the Olympic National Park and USFWS offshore refuges. Most aircraft are believed to observe these advisories, but compliance is not mandatory.

Low flying aircraft threaten the safety of the seabirds and mammals that use the offshore islands and coastal habitats. The noise startles birds and mammals resulting in egg destruction, vulnerability of chicks to predation by raptors and gulls, and stampedes of pinnipeds causing the crushing of young mammals.

b. Consequence of Impact to Use

Although only a few charter airplanes fly over the Sanctuary, the uses may intensify as tourism increases potentially as a result of the expansion of the Neah Bay marina and the presence of the marine Sanctuary.

2. Sanctuary Alternative (Preferred)

a. Consequence of Impact to Resources

This prohibition is intended to protect marine birds and mammals from the disturbance and harassment of low-flying aircraft and to be consistent with the FAA's 2000 ft. advisory adjacent over protected areas adjacent to the Sanctuary.

b. Consequence of Impact to Uses

This regulation will require aircraft to remain above 2000 feet AGL within one mile seaward of the coastal boundary of the Sanctuary unless responding to an emergency threatening life, property, or the environment or necessary for valid law enforcement purposes. Department of Defense practice bombing of Sealion Rock will be prohibited from March 1 through October 31. Helicopters involved in timbering operations on tribal lands, and transporting researchers and tribal members to tribal lands will be exempted from this prohibition as well to be consistent with treaty-secured rights of access of tribal members to tribal lands.

Aircraft flying below 2000 ft. within the regulated zones for research purposes would need to obtain a Sanctuary research permit. The application would be processed expeditiously to ensure that while Sanctuary resources and qualities are protected, there would only be a minimal administrative burden on the applicant.

H. Vessel Traffic

1. Status Quo (Preferred)

a. Impact to Resources

With the projected increasing number of vessels approaching the Strait of Juan de Fuca (see Part II) it is likely that there will be a vessel related accident. Such an event, either by collision or grounding due to loss of power or steering control or human error would likely result in a spill of hazardous material. The rocky intertidal areas and the productive food chain off the Pacific coast are extremely sensitive to damage from oil or other pollutants. This is an area with little coastal access, and most booms are ineffective during common winter storms.

The implementation of an ATBA will offer significantly increased levels of protection by building in a safety net of time to allow emergency response vessels to respond to an emergency off the outer coast.

b. Impact to Uses

NOAA will rely on the existing management regime to manage vessel traffic rather than promulgate regulations. However, NOAA will work closely with the USCG, the Washington State OMS and the vessel traffic industry on matters relating to vessel traffic through the Sanctuary. Vessel traffic will remain in the scope of the Sanctuary's regulations.

There is a Coordinated Vessel Traffic Management System in the Strait of Juan de Fuca with designated inbound and outbound lanes on the U.S. and Canadian sides of the international border, respectively. No vessel greater than 125,000 dead weight tons may pass east of Port Angeles and all vessels greater than 300 gross tons passing into Puget Sound must be accompanied by a pilot. All tankers must be accompanied by one (and soon to be two) escort tugs.

Outside of the Strait of Juan de Fuca there are voluntary agreements by maritime associations to coordinate the movement of coastwise vessel and barge traffic. Under these agreements, tankers transiting along the coast remain at least 50 nautical miles from shore unless entering a port of call. Barges follow agreed upon lanes within 5 and 10 miles from shore pursuant to the crabber-tugboat agreements negotiated yearly. The future of these agreed upon lanes, however, is uncertain.

There are no tugs specifically dedicated for emergency response in Puget Sound, the Strait of Juan de Fuca or Grays Harbor. There have been a number of near misses when vessels have lost power either off the coast or in the Straits. Likewise, there have been collisions off the Strait of Juan de Fuca (Tenyo Maru in 1991) and barges holed/damaged off the coast (Nestucca, 1988). However, the Strait of Juan de Fuca Emergency Towing Vessel Task Force has been formed and is charged with the mission of establishing, maintaining, and operating an emergency towing vessel in the Strait of Juan de Fuca.

NOAA has worked with the USCG and maritime industries in Washington State to analyze the time it would take for a vessel or barge travelling along the outer coast to ground once power was lost. This analysis was used to recommend preventative measures to minimize the chance of a spill of hazardous material. Following is the analysis upon which NOAA has recommended a strategy for addressing the risks presented by vessel traffic in the Sanctuary.

ANALYSIS OF VESSEL/BARGE BUFFER AREA OFF THE NORTHERN WASHINGTON COAST

The following are three actual incidents that occurred in Washington state waters. Two resulted in spills of contaminants. While the third did not result in a spill, it illustrates that response time is critical in order to avert an accident.

1. On December 22, 1988 the barge Nestucca was struck and punctured by its tug, the Ocean Service while attempting to retrieve the barge following the parting of the towline. The barge released 231,000 gallons of fuel oil into Grays Harbor and the surrounding coastal waters, polluting the coastline from Grays Harbor to as far north as Vancouver Island.

2. In January, 1972 the General M.C. Meigs broke free from its tow during a winter storm and went adrift approximately 9.5 nautical miles (nm) west of Cape Flattery. The tug was unable to retrieve the ship. Eight hours later, the ship grounded near Portage Head, just south of Cape Flattery. The incident resulted in a major oil spill.

3. A recent near-miss was reported by The USCG's Puget Sound Vessel Traffic Service (PSVTS) as follows:

"A 13,946 DWT tanker, loaded with caustic soda and other chemicals, lost all power off Cape Flattery and requested immediate assistance. Within minutes, PSVTS located the nearest lite tugs, and had them underway to the scene at top speed. PSVTS kept local, national, and Canadian interests informed with real time information throughout the incident. The tanker was retrieved and towed safely to anchorage for repairs."

What follows is a hypothetical scenario describing a maritime emergency off the western Washington coast. Its purpose is to assess current emergency response capability to a drifting barge or a disabled and drifting vessel in waters along the western Washington coast.

This scenario was developed by a former commanding officer after consultation with members of the commercial towing community, local meteorologists and weather forecasters, members of the USCG and the United States Navy, and personnel with experience in oil spill trajectory analysis. It graphically depicts the fact that response time is critical in the event of a maritime emergency.

Estimates for times of arrival of assistance tugs were obtained from the Emergency Response subcommittee of the Strait of Juan de Fuca/Northern Puget Sound Regional Marine Safety Committee.

The meteorological conditions described in the scenario could occur at any time during the period October through March. This specific scenario was developed by a veteran forecaster from NOAA's National Weather Service Forecast Office in Seattle, Washington.

The United States Coast Pilot for the Pacific Coast: California, Oregon, Washington, and Hawaii (26th edition) makes the following note about weather in the vicinity of the western Washington coast near La Push, WA: "In the late fall and winter, the low pressure center in the Gulf of Alaska intensifies and is of major importance in controlling weather systems entering the Pacific Northwest. At this season of the year, storm systems crossing the Pacific follow a more S path striking the coast at frequent intervals... Gale force winds are not unusual."

The hypothetical incident involves a tug and petroleum barge on a December transit from a refinery in Anacortes to a port on the Columbia River. During this month, the following average weather can be expected (Director, Naval Oceanography and Meteorology, 1976):

1) Visibility of less than 1 nm along the Washington coast can be expected for approximately 1.7% of the time or 0.5 days.

2) Winds in excess of 34 knots (kts) can be expected for approximately 7.7% of the time or 2.4 days.

3) A westerly wind component with an average speed of 18 kts can be expected for approximately 10% of the time or 3.1 days.

4) Wave heights averaging 10-12 feet can be expected for 11.9% of the time or 3.7 days.

5) A current with an average speed of 1.0 knot setting to the north along shore can also be expected.

These are average conditions. In severe conditions, sustained winds in excess of 40-45 kts can be expected with accompanying seas of over 20-25 feet (U.S. Department of Commerce, 1990).

THE SCENARIO

Wednesday A.M (1000 Local Mean Time (LMT))

The ocean-going, twin-screw tug, North Wind (fictitious name) has just taken in tow a petroleum barge loaded with 30,000 barrels of Marine fuel oil. The tug and tow are bound from Anacortes to a port on the Columbia River. Anticipated speed over ground is 8.0 kts. Estimated time of arrival at the Columbia River bar is approximately 30 hours.

Current weather is moderate. A slight chop covers Puget Sound and the Strait of Juan de Fuca. Visibility is 3-4 nm. The sky is overcast with occasional drizzle. Winds in the Strait are easterly at 10-15 kts. The forecast is for an offshore, deepening 1000 Millibar (Mb) low pressure system to move onto northern Vancouver Island during the next 24 to 36 hours. Winds along the western Washington coast are currently SE at 15-20 kts. Seas are reported 6-8 feet and building due to the approaching storm.

The captain of the tug considers all factors and decides he can clear Cape Flattery and be well southbound before the system comes ashore. Further, he concludes that conditions at the mouth of the Columbia River in 30 hours will be moderate enough to safely cross the bar upon arrival.

The tug and tow clear Anacortes and proceed outbound.

<u>Wednesday P.M. (2200 LMT)</u>

Twelve hours after departure from Anacortes, North Wind and its barge round buoy "J" at the entrance to the Strait of Juan de Fuca. The trip through the Strait has been uneventful. The weather, however, has begun to deteriorate. The barometer is falling. Wind speed is now a steady 20-25 kts SSE with occasional gusts to 30-35 kts. Wave height is increasing rapidly with the increasing wind.

To save time and in an attempt to beat the approaching system, North Wind takes up a southbound course using the published "Towboat-Crabber" traffic lane. This lane is a north/south route passing approximately 7 nm west of Cape Alava.

Although the North Wind's parent company has established a policy of voluntary adherence to a trackline 10-30 nm offshore when towing a loaded petroleum barge, this practice will not be followed today due to unfavorable weather conditions offshore. Further, due to sea state and wind being encountered, North Wind slows to 6 kts to reduce the beating on both tug and tow.

<u>Thursday A.M. (0230 LMT)</u>

North Wind's position is approximately 6-7 nm SW of Cape Alava, in the "Towboat-Crabber Lane," proceeding southbound. NOAA weather radio reports that the low pressure system is still moving toward Vancouver Island but is "rapidly deepening" at a rate of 1 Mb/hour. Pressure at the center of the low is now 980 Mb. Frontal passage is expected shortly. Winds are steady SSE at 30 kts with gusts to 40 kts. Seas are 12-15 and building. The barometer is falling. North Wind slows to 4.0 kts.

<u>Thursday A.M. (0300 LMT)</u>

With the front rapidly approaching the coast, winds accelerate to SSE 50 kts, with gusts to 65 kts. Seas are now 20 feet with some exceeding 30 feet. During a period of exceptionally high sea and swell combinations, the towline parts. The petroleum barge is now adrift. Recognizing the danger, the captain notifies the Coast Guard of the situation and begins attempts to recover the barge.

After frontal passage, the wind begins veering to SW 30 kts with gusts to 50 kts. The result is a confused sea with 20 foot swells from the SSE and building 15 foot waves from the SW. The barge is drifting generally NE at approximately 0.9 kts (USCG, 1991a).

Initial efforts at recovering the barge are thwarted by the fact that the insurance wire (an emergency pick up line) from the barge is fouled and laying along the lee side of the barge.

The tug begins attempts to retrieve the tow by using the emergency barge retrieval system (a second backup retrieval device). During one attempt at retrieval, the tug passes too close to the barge and a collision occurs. The North Wind sustains damage to its hull and begins taking water in its engine room. On further inspection, one rudder is also found to be damaged. No further attempts can be made at retrieving the barge and the crew begins efforts to control the flooding and repair the rudder.

Thursday A.M. (0400 LMT)

North Wind immediately issues a Mayday call and notifies the Coast Guard that she is drifting and taking on water. The captain reports that he will be able to control the flooding and remain afloat. However, the petroleum barge is adrift and North Wind will be unable to regain control of it. In the darkness, with high winds and seas and poor visibility, the tug loses sight of the barge and is no longer able to identify it on the radar screen among the sea and rain clutter. The barge is, in effect, lost.

There are no vessels of opportunity in the area able to respond to the Mayday call. The Coast Guard initiates a search and rescue operation but has no vessels capable of taking either the tug or barge under tow. There are, however, two tugs in Anacortes. The Mayday call has been relayed to them and they have notified the Coast Guard and North Wind that they will respond. A smaller, twin screw tug in Grays Harbor has also heard the call and will respond.

Thursday A.M. (0500 LMT)

The responding tugs from Anacortes were conducting a docking evolution but concluded operations within an hour and were underway at 0500 LMT to render assistance. Estimated time of arrival at buoy "J" is 1300 LMT. Arrival on scene is estimated to be 1500 LMT, Thursday afternoon - 12 hours after the incident.

The tug from Grays Harbor was also underway within an hour but will only be able to make 8-10 kts in the heavy weather. Estimated time of arrival for the Grays Harbor tug is between 1330 - 1400 LMT. The forecast for the scene at time of arrival of the responding tugs is for westerly winds at approximately 20 kts with gusts to 30 kts.

The tug and barge began drifting while approximately 6.5 nm WSW of Cape Alava. The tug is able to maintain steerageway and hold position but is still taking on water. The barge, however, is being affected by the wind (i.e., drift downwind at 3% of the wind speed) and a 1.0 kt (approximate) northerly current (Director, Naval Oceanography and Meteorology, 1976).

Although conditions aboard the North Wind are uncomfortable, the crew is making repairs, staying ahead of the water and the tug is not in danger of foundering. Due to sea state, wind, visibility, and low ceiling, the Coast Guard decides that the safest course of action to preserve human life will be for its rescue vessels to remain on scene and also attempt to locate the drifting barge. Coast Guard helicopters and rescue vessels will, however, react immediately should rescue of the tug's personnel be required.

The petroleum barge continues to drift. The responding tugs are 8.5-10 hours away. Using data obtained from Landry and Hickey (1989) to predict the combined effects of wind and current, personnel from NOAA's Office of Ocean Resources Conservation and Assessment in Seattle estimate that the barge will probably ground in the area of Waatch Point in 6-7 hours (1000 LMT). The barge, however, could go aground near Portage Head in 4 hours (0700 LMT) or near Cape Flattery in 8 hours (1100 LMT) due to local variations in wind and current.

<u>Thursday P.M. (1400-1500 LMT)</u>

Responding tugs arrive on scene. North Wind is taken in tow. The barge is aground and breaking up. Over 30,000 barrels of marine fuel oil are now at risk of being spilled.

SUMMARY AND ANALYSIS

As noted earlier in this FEIS/MP there are now no specifically designated emergency response towing vessels in the Strait of Juan de Fuca, along the western Washington coast, or in Puget Sound. There are several major towing and salvage companies in this area but, in the event of an emergency that requires towing, time of response would be based on both vessel availability and distance from the scene of the incident. Emergency response could be significantly delayed due to prior assignment of response vessels to other towing, docking, or salvage operations, or the remote location of an incident or emergency from available vessels (Knight, 1992). Further, severe weather might prevent an emergency response vessel from leaving the Strait of Juan de Fuca or, if it did, prevent operations from commencing when it arrived on scene.

In a separate scenario developed by members of the Strait of Juan de Fuca/North Puget Sound Regional Marine Safety Committee, vessels responding to an emergency near the entrance of the Strait of Juan de Fuca would depart from Cherry Point, approximately 2.5 nm north of Lummi Bay. From there, they estimated it would take approximately 8 to 9 hours to reach Buoy "J" at the entrance to the Strait of Juan de Fuca.

NOAA has been working closely with the USCG on recommendations to the IMO to designate an area within 25 nautical miles off the outer coast as an ATBA. This 25 nautical mile ATBA will extend from the southern boundary of the Sanctuary north a line directly seaward from the designated lane entering the Strait of Juan de Fuca. This 25 nautical mile ATBA will buy enough time, in the event of an engine failure aboard a vessel, for a tug to intercept the eastwardly drifting vessel during a worst-case storm event before it grounds on the shoreline of the Sanctuary.

The USCG will recommend to the IMO that an ATBA be established off the western Washington coast. ATBA's are areas within defined limits in which either navigation is particularly hazardous or in which it is exceptionally important to avoid casualties, and which should be avoided by all ships, or certain classes of ships (IMO, 1991).

This action would, in effect, create a "buffer zone". This zone would provide sufficient time for responding vessels to arrive on the scene of a maritime emergency. Additionally, creation of such a zone would provide time for emergency teams ashore to be notified, contingency plans to be activated, and should there be a spill, some weathering to occur which would reduce the risk of damage to the shoreline.

The idea of establishing an ATBA is consistent with already existing voluntary vessel management practices. U.S tankers approaching the Strait of Juan de Fuca from the south are now voluntarily remaining 40-50 nm offshore until turning inbound to enter the Strait. Additionally, Canada has instituted a tanker exclusion zone affecting all U.S. tankers engaged in the transportation of crude and processed oil originating from Alaska. Several towing companies based in the Northwest region currently adhere to self-imposed plans requiring their captains to remain anywhere from 10-30 nm offshore while transporting petroleum products.

In the worst case scenario described above, the fictitious tug, North Wind, chose to use the "Towboat-Crabber Lane." As exemplified in the scenario, the distance offshore provided by this lane was insufficient in the face of conditions described to allow sufficient time for response vessels to arrive on scene.

Using the drift rate for wind (3% of wind speed) previously cited, the weather conditions of our scenario, and the abetting 1.0 kt. near shore current, the average direction and speed of a disabled and drifting vessel or barge would be approximately NNE at 1.3-1.8 kts. With this, if tanker free zone limits were set at 10, 15, 20, 25, or 30 nm offshore, times to grounding would be as follows (Time of grounding = Distance offshore/speed of drifting vessel):

Distance Offshore (nm)	Time to Grounding (hrs)
10	5.5-7.7
15	8.3-11.6
20	11.1-15.4
25	13.9-19.2
30	16.6-23.1

Due to the shape of the Washington coastline and the unpredictable variables of weather and current, the calculations shown are approximations. For example, using data from Landry and Hickey (1989) personnel from NOAA's Office of Ocean Resources Conservation and Assessment Group estimate that in the conditions described, if an incident occurred further south, 20 nm west of La Push, it might be 24 hours before the barge or vessel came ashore north of Cape Alava, near Portage Head, WA.

The establishment of a 20-30 nm buffer zone within the sanctuary would alter the most direct route from the Straits of Juan de Fuca to ports such as Grays Harbor or those along the Columbia River. Five tracklines from Buoy "J" at the entrance to the Strait of Juan de Fuca to the entrance of Grays Harbor were examined to determine the extent of these differences. The tracklines were as follows:

1. Direct Route-a nearshore route covering the minimum distance possible between Grays Harbor and the Strait of Juan de Fuca.

2. 10 nm offshore utilizing the existing traffic lanes into and out of the Strait of Juan de Fuca.

3. 20 nm offshore utilizing the existing traffic lanes into and out of the Strait of Juan de Fuca.

4. 30 nm offshore utilizing existing traffic lanes into and out of the Strait of Juan de Fuca.

5. "Towboat-Crabber Lane"-established by agreement.

The following tables illustrate the difference in using these lanes. The variability in distance between the routes to and from Grays harbor is due to the use of the already established traffic lanes at the entrance to the Strait of Juan de Fuca.

Grays Harbor to Buoy "J"

Route	Distance (nm)	Additional nm
Direct Route	102	-----
10 nm Offshore	105	3
Towboat-Crabber	109.5	7.5
20 nm Offshore	114.5	12.5
30 nm Offshore	123.5	21.5

Buoy "J" to Grays Harbor

Direct Route	105.5	-----
10 nm Offshore	110	4.5
Towboat-Crabber	113	7.5
20 nm Offshore	120	14.5
30 nm Offshore	133	27.5

The above tables demonstrate that the establishment of a tanker free zone 20 nm offshore would add 12.5 nm to a transit from Grays Harbor to Buoy "J" and 14.5 nm to a transit from Buoy "J" to Grays Harbor. If the distances travelled by transiting 20 nm offshore are compared to the already existing "Towboat-Crabber Lane", the differences are even smaller, i.e., 5 and 7 nm, respectively. The additional time and distances required by using a 30 nm zone are greater but offer the option of having all petroleum and hazardous material barges remain completely outside of the sanctuary boundaries until taking up a course inbound to the Strait of Juan de Fuca.

It would not be wise to have a traffic lane further out than 30 nm as the conflict with larger and faster tanker traffic would increase the risks of collision between vessels.

From the foregoing analysis, NOAA has requested that the USCG establish a zone requiring vessels or barges transporting petroleum or other hazardous materials to remain a minimum of 20-30 nm offshore and also to begin the process for establishing an ATBA off the western Washington coast.

If the ATBA is adopted by the IMO, the impact to uses will be minimal. The 25 nautical mile zone is fairly consistent with customary barges and vessel traffic routes. According to the analysis above, the proposed ATBA will add approximately 17 nautical miles on a vessel or barge's northbound transit, and approximately 21 nautical miles on the southward transit. The increased protection of coastal resources will benefit the tribes who depend on coastal resources for their subsistence, and the entire local economy which depends largely on tourism.

2. Sanctuary Alternative-Regulation of Vessel Traffic

a. Consequence of Impact to Resources

Regulation of vessel traffic at the present time would undermine existing management initiatives that are well coordinated between the State of Washington, and the U.S. and Canadian Coast Guards. A well coordinated management and regulatory environment for vessels entering and exiting the Strait of Juan de Fuca offers a safer environment for mariners. This minimizes the chance for vessel accidents that can harm the environment. Therefore, NOAA believes that the Sanctuary is best served by working within the existing management framework.

b. Consequence of Impact to Uses

Additional regulation of vessel traffic will create confusion among mariners in a very congested and complex environment. Further, regulations promulgated by NOAA without the approval of IMO will have no effect on foreign vessels. Exclusion of foreign vessels from a vessel traffic management regime does little to minimize the risk of a vessel traffic accident and may result in competitive disadvantage for the domestic shipping industry.

I. Fishing, Kelp Harvesting and Aquaculture

1. Status Quo (Preferred)

a. Consequence of Impact to Resources

What little data exists shows that there are some impacts to the benthic resources from roller trawling depending on the substrate (Loverich, 1990; WDF, 1985). Impacts of trawling on soft bottom include an increase in turbidity within a 24 hour period, a depression in the substrate 2-3 inches deep, and crushing of shellfish beneath the otter boards. When trawling occurs on hard bottom, there are no noticeable impacts on the benthos. The greatest impacts of trawling are noticed when trawling occurs in kelp and eelgrass beds. There is no commercial kelp harvesting occurring within the Sanctuary. A small herring-roe-on-kelp fishery is pursued by the Lummi and S'Klallam Tribes and kelp from near Neah Bay is harvested for this fishery. The Department of Natural Resources is currently working on a kelp harvesting management plan for the Strait of Juan de Fuca.

b. Consequence of Impact to Uses

Fishing activities are predicted to benefit from designation of the Sanctuary. Fishing in general has benefitted from

Sanctuary status at other sanctuaries in the program due to the protection provided to the industry and fish stocks from the impacts of ocean dumping, offshore oil and gas development, seabed mining and water pollution. Fishing in the Sanctuary is heavily regulated by other Federal and State authorities.

NOAA evaluated the possibility of proposing some additional Sanctuary regulation of fishing. However, the existing management authorities, the WDF, WDNR, NMFS, PFMC, and the Tribes have comprehensive management authority of these resources. The management regime is highly complex and well coordinated with Canada and other west coast states through the International Pacific Halibut Convention and the Pacific Salmon Treaty. Sanctuary regulation of fishing would undermine the existing international and regional regime. The species are highly migratory and direct Sanctuary management of fishing would have no foreseeable ecological benefits.

Notwithstanding the above, the absence of specific fishing regulations does not absolve fishermen from obeying not only existing State and Federal regulations but also Sanctuary regulations of general application, which are designed to protect Sanctuary resources and qualities.

NOAA may support research on the Sanctuary's marine finfish, shellfish, and algae resources, and strengthening the present enforcement capabilities of the WDF and other enforcement entities including the NMFS and the USCG.

2. Sanctuary Alternative

a. Consequence of Impact to Resources

Sanctuary regulations at the time of designation would be intended to protect identified resources at risk from the threat of fishing activities. Such regulations would require extensive consultation with affected parties and agencies. Furthermore, no major threat has yet been identified. There does not appear that any major benefit to the environment would arrive with promulgation of Sanctuary regulations on fishing with designation.

b. Consequences of Impact to Uses

Sanctuary regulations would add another set of restrictions on the currently complicated, intricately coordinated and heavily regulated fishing industry. Aquaculture and kelp harvesting remain unregulated by the Sanctuary. Any future action would be done in cooperation with relevant Federal and state agencies, particularly the WDW, the WDNR and the WDOA.

J. Navy Bombing of Sealion Rock

1. Status Quo

a. Consequence of Impact to Resources

Figure 80 compares the Navy's use of Sealion Rock from 1986 through 1992 with the use of offshore rocks and islands by nesting colonial seabirds. It is evident that the Navy's use of Sealion Rock coincides with the particularly sensitive colonial seabird breeding events. Under the status quo, the Navy will not be permitted to use Sealion Rock as a practice bombing target for A6 jets unless the Secretary of the Interior issues a new authorization.

b. Consequence of Impact to Uses

Under the status quo, there will be no impact from Sanctuary regulations on the Navy's use of Sealion Rock.

2. Sanctuary Alternative (Preferred)

a. Consequence of Impact to Resources

By prohibiting practice bombing exercises, NOAA is extending maximum protection under the authority of the MPRSA to seabirds and mammals in the Sanctuary.

b. Consequence of Impact to Uses

This alternative will have no impact on the Navy since the authorization to use Sealion Rock for bombing practice exercises has been rescinded.

III. Section: Management Alternative Consequences

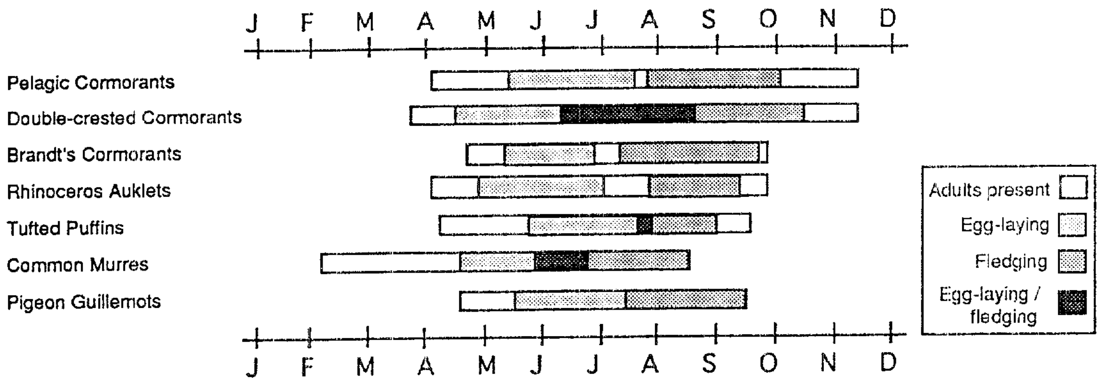
A. Consequences of Status Quo

Under the status quo alternative, protection and management of the proposed Sanctuary area will remain entirely under the existing regime of Federal, state, tribal and local authorities. No single agency will be the steward for the marine resources and ensure that all users and agencies are coordinated to protect the resources of the Sanctuary area.

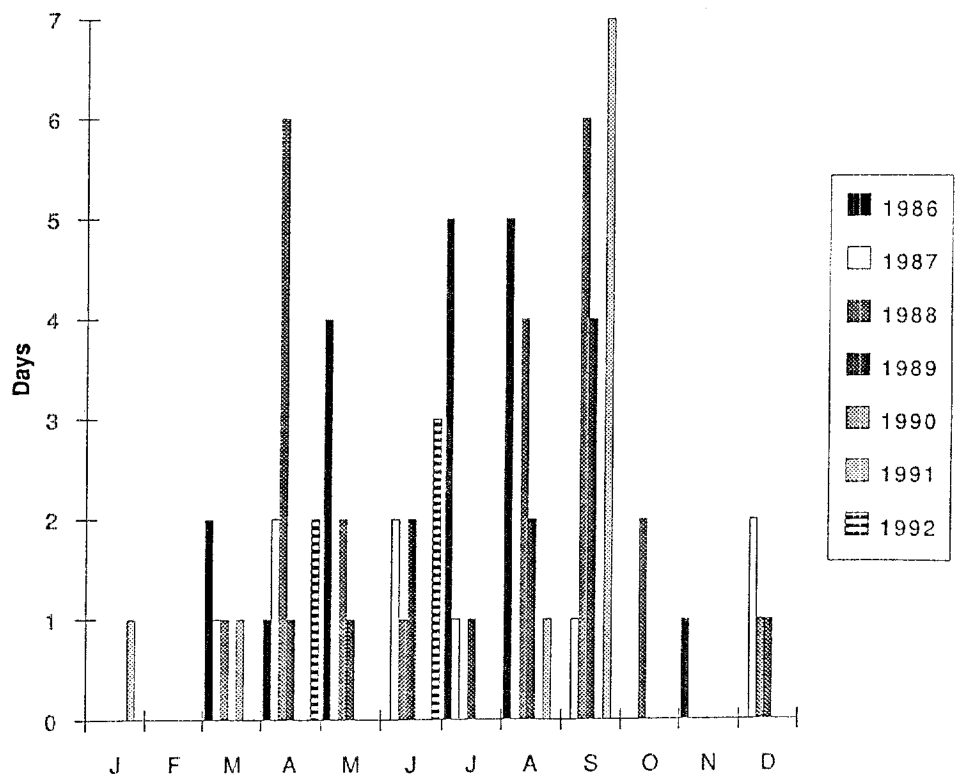
1. Enforcement

A reliable and effective enforcement capability by both the Federal Government, the State of Washington, and the tribes is necessary to ensure that regulations are observed The WDF has a total of 14 officers available to patrol offshore waters, with five actively assigned to the Olympic Coast (Westport-two; Port Angeles-two; and Clallam Bay-one). During the razor clam season, all 14 are likely to be patrolling the Olympic Coast beaches. WDF operates a 55 ft. patrol boat that enforces fishery regulations in state and Federal waters off the Olympic Coast

BREEDING CHRONOLOGY OF COLONIAL SEABIRDS NESTING IN THE MARINE WATERS OF WASHINGTON



NAVY USE OF SEALION ROCK FROM 1986-1992 (DAYS/MONTH)



Source: Whidbey Island Naval Air Station, 1992

Figure 80. Analysis of Navy Overflights and Breeding seabird Activity.

during the commercial fishing season, and is on call during the rest of the year. There is also a 45 ft. patrol boat patrolling the Strait of Juan de Fuca which is available to patrol offshore if the need arises. WDF officers are deputized to enforce NMFS regulations in the exclusive economic zone.

The WDW does not routinely patrol in the area of the proposed Sanctuary; however, six officers are available to assist WDF in emergencies or when no WDF officers are available.

The USCG has primary enforcement and Search and Search and Rescue presence (personnel, boats and aircraft in the area of the Olympic Coast National Marine Sanctuary. Station offices (employing between 25-50 personnel on call to respond to emergencies) are located at Quileute River, Cape Disappointment, Grays Harbor, Neah Bay and Seattle. Group offices (with over 200 personnel offering administrative support services relevant to the area of the proposed Sanctuary) are located in Seattle, Port Angeles and Astoria, Oregon. The district office is located in Seattle, Wa.

The USCG has six large patrol boats, two large buoy tenders, three helicopters and two jets available for search and rescue and law enforcement operations. One medium endurance cutter with helicopter capability is patrolling the waters off the coastlines of Northern California, Oregon and Washington at all times. The locations of the six patrol boats stationed in the vicinity of the proposed National Marine Sanctuary are: 1) Port Angeles (210 ft. and 110 ft.); 2) Astoria (210 ft.); 3) Anacortes (82 ft.); 4) Port Townsend (82 ft.); and 5) Everett (82 ft.). The tow ocean going buoy tenders are located in Seattle (175 ft), and Astoria (180 ft.). There are 14 smaller boats, between 40-45 ft., on call for search and rescue (three at Quileute River, five at Cape Disappointment, four at Grays Harbor and two at neah Bay). These smaller boats proceed at a maximum of 10 knots and have 50 mile offshore capability. There are three helicopters at both Port Angeles and Astoria with over 120 mile offshore capability, and two jets stationed at Astoria.

The Makah, Quileute, Hoh and Quinault Tribes have an enforcement presence within the boundaries of the Olympic Coast National Marine Sanctuary. There are 12 Tribal fishery officers in total (Hoh-1; Quinault-4; Quileute-4; and Makah-3). In addition, the Tribes operate five patrol boats in the area (Quinault-23 ft. patrol boat with radar; Quileute-23 ft. and 19 ft. boat; and Makah-44 ft. and 24 ft. boat).

The NPS employs seven full time employees to patrol the beaches along the Olympic Coast (one at Ozette; tow at Morra; two at Kalaloch; and two assistants from the Hoh Tribe). During the summer, there are five additional rangers patrolling the coastal beaches. The NPS has one zodiac available for search and rescue missions.

The USFWS undertakes aerial surveys approximately five times per year during the spring and summer. In addition, a biologist conducts surveys in a 19 ft. zodiac three or four times per year to gather information and undertake surveillance. The USFWS and the NPS have entered into a cooperative agreement enabling the NPS rangers to provide the USFWS with information concerning violations of USFWS regulations.

The NMFS has no enforcement personnel, boats nor aircraft patrolling waters in the vicinity of the proposed Sanctuary. Enforcement of their regulations have been deputized to the WDF.

Upon consideration of available State, Federal and Tribal enforcement staff it appears that enforcement of Sanctuary regulations can be adequately addressed by the existing enforcement presence.

2. Research and Education

The existing management system contains no mechanism for maximizing the areas research value, e.g., by means of a comprehensive or extended program framework. A variety of organizations conduct significant research in the nearshore waters of the Olympic Coast. The establishment of the Olympic Center linking the terrestrial and marine ecosystems of the Olympic Peninsula has been authorized by the legislature. The National Park, USFWS and the University of Washington continue to conduct resource studies along the coast. To date, however, no coordinating entity exists to identify regional research information needs or to design strategies for filling them.

There are no marine oriented information centers on the outer coast. Thus, tourists, recreational fishermen and nature enthusiasts who visit the area have little or no knowledge of its geology or of the complex communities of biota that inhabit the canyon and surrounding waters and the intertidal habitats. Nor do they realize the value of the oceanic waters to the mammals and birds that feed there or pass through in transit.

B. Consequence of Sanctuary Alternative 1

This alternative slowly phases in the necessary management structure in parallel to the growing presence of the Sanctuary and the demands of its users. Pursuit of this alternative will not capitalize on the present momentum of the local community in support of the Sanctuary. Further, fewer staff will be able to network and coordinate research, education, monitoring and management policies programs.

1. Enforcement

Gradually NOAA would provide an enhanced enforcement regime by providing additional boats, personnel and equipment for on the water surveillance and enforcement. See the Management Plan for possible additional enforcement measures provided by the Sanctuary.

2. Research and Education

Research and education programs would not develop to their fullest potential for many years due to the lack of staff. Therefore, this alternative would not facilitate resource protection and management because the research and education components of resource protection will not be realized.

C. Consequences of Sanctuary Alternative 2 (Preferred)

This alternative supports full time staffing and immediate NOAA presence with siting of an office on the Peninsula. Given the limited NOAA budget in FY93, this would occur at the expense of specific projects. The emphasis of the staff would focus on coordination and planning with other agencies, programs and governments on the peninsula. NOAA believes that a fully staffed Sanctuary would facilitate coordination with other programs in a more rapid manner than if staffing were phased in over time.

1. Enforcement

The impact of enhanced surveillance and enforcement efforts focused on Sanctuary resources would be unnecessary at the present time. Given the extensive Federal, State and Tribal enforcement presence along the coast, and the minimal human uses, added enforcement is not the highest priority within the first year of the Sanctuary's existence.

Eventually, NOAA envisions a State-Federal-Tribal cooperative enforcement system involving the WDF, WDW, the four coastal Tribes, the USCG, the USFWS, the National Park Service and the NMFS. Since the proposed Sanctuary would include both State and Federal waters, and adjacent to Indian Reservations, close coordination between State and Federal authorities would be required.

2. Research and Education

This alternative provides full staffing, including a manager, education coordinator and research coordinator. The manager would oversee the establishment and operations of the Sanctuary Advisory Committee. The research and education coordinators would benefit from the direction provided by the Sanctuary Advisory Committee. Implementation of interpretive and research projects and coordination with the many agencies with programs in the area would commence fairly rapidly. Establishment of a strong and complete infrastructure will provide positive momentum to the program.

IV. Unavoidable Adverse Environmental or Socioeconomic Effects

Specific environmental and socioeconomic effects of each proposed regulation are included throughout the environmental consequences section of the preferred alternative and in Part I of the FEIS/MP. The net environmental and socioeconomic effects of designating the Sanctuary and implementing the Sanctuary Management Plan and regulations are estimated to be positive. While such effects are difficult to quantify, the goals of the Sanctuary in part will be to maintain water quality, fisheries, aesthetics and tourism without causing any adverse effects.

The final Sanctuary regulations would allow all activities to be conducted in the Sanctuary except for a relatively narrow range of prohibited activities (subject to all prohibitions, restrictions and conditions validly imposed by any other authority of competent jurisdiction, and subject to the liability established by Section 312 of the Act). The procedures proposed in these regulations for applying for National Marine Sanctuary permits to conduct otherwise prohibited activities, for requesting certifications for existing licenses, permits, other authorizations or rights authorizing the prohibited activity, and for notifying NOAA of applications for authorizations to conduct a prohibited activity, would impose a cost in time and effort on the part of applicants for such permits or certifications. However, NOAA will keep such costs to a minimum by working closely with State and Federal regulatory and permitting agencies to avoid any duplication of effort and setting guidelines for expeditious review of applications.

The regulations prohibiting discharges and deposits and alteration of or construction on the seabed may require permit holders or applicants for such activities to seek other areas of disposal or apply higher levels of treatment. All measures, terms and conditions applied to existing activities will be done in consultation with the affected party and the appropriate management agency.

Estimates of revenue foregone by the prohibition of oil, gas and mineral activities within the Sanctuary boundary has been presented in detail under the socioeconomic consequences for this proposed final regulation. Balancing the foregone revenue would be the adverse environmental and socioeconomic effects avoided by the proposed prohibition. For example, the proposed prohibition may alleviate or remove matters ranging from costs to local communities for developing on-shore facilities to political and legal action resulting from public controversy and apprehension concerning proposed oil and gas activities.

It is not possible to quantify the positive socioeconomic effects of prohibiting OCS oil and gas activities. The recent NAS study (1989) on the Adequacy of Environmental Information For Outer Continental Shelf Oil and Gas Decisions: Florida and California found that "few data have been collected by MMS or anyone else to address the social and economic impacts of OCS activities."

V. Section: Relationship Between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

Sanctuary designation emphasizes the importance of the natural and historical resources on the Olympic Coast area. The marine waters off the Olympic Coast is relatively pristine and the healthy and diverse natural ecosystem is relatively unaltered. Designation will enhance public awareness of the area and provide long-term assurance that its resources will be available for future generations. Implementation of the preferred alternative ensures that changes in use patterns evolve in a manner that protects the quality of the natural environment.

The education, research, and resource protection programs will provide information, management and protection that develops a foundation for wise public use of the area and results in long-term productivity. Similarly, information collected in the research program will assist marine resource managers in making better management decisions that will result in mitigation of use conflicts and adverse effects of human activities.

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Section I: Introduction

The Marine Protection, Research, and Sanctuaries Act of 1972, as amended, and its implementing regulations (15 CFR Part 922) require that a management plan be prepared for each proposed Sanctuary. Once the Sanctuary is designated, the plan will be implemented. The management plan focuses on Sanctuary goals and objectives, management responsibilities and guidelines for the resource protection, research, education and administration programs.

The plan establishes an administrative framework which addresses the need for cooperation and coordination to ensure effective management. The Sanctuaries and Reserves Division (SRD), National Oceanic and Atmospheric Administration (NOAA), is responsible for management of the site. Variable funding for staff and program development over the next several years may affect specific aspects of Sanctuary management described in this plan. Modifications to the scope and scale of the programs may have to be made because of such unforeseeable changes in the level of funding. The goals and objectives of the plan will, however, remain unchanged.

Sanctuary goals and objectives provide the framework for developing the management strategies. The goals and objectives direct Sanctuary activities towards the dual purposes of resource protection and compatible public use and are consistent with the intent of the National program. No actions taken by NOAA in administering the sanctuary shall infringe upon Native American treaty rights unless the action is absolutely necessary to protect the resources from extinction and no other protective measures are available.

The management strategies planned for the proposed Olympic Coast National Marine Sanctuary (OCNMS) are directed to the goals and objectives outlined below. The management plan is designed to address the first five years following sanctuary designation, after which time it will be revised. Although the plan offers guidelines for the sanctuary manager, there are four important tasks identified as having high priority immediately following designation which, when completed, will set in motion progress towards fulfilling the objectives of the plan. These four tasks are:

(1) Establish liaisons with the appropriate agencies to ensure the Sanctuary mandate can be carried out through a cooperative management strategy. Sanctuary staff will meet with other agencies and institutions operating in the area to familiarize them with the Sanctuary mandate and staff, and determine appropriate working relationships and mutual agendas. These meetings will include, among others, the Washington Departments of Ecology, Natural Resources,

Fisheries, Agriculture, and Wildlife, the U.S. Coast Guard, Canadian Coast Guard, U.S. Fish and Wildlife Service, National Park Service, the four coastal Tribes, local businesses, towns, counties, timber and fishing representatives, and research and education institutions.

(2) Create an Olympic Coast National Marine Sanctuary Advisory Committee (SAC) which will be proactive and reactive in its service to the sanctuary manager. It is intended that the SAC will: a) create subcommittees to assist in developing programs in research, education, resource protection and administration for the Sanctuary; and b) advise the manager on policy issues. Thus the SAC will play a key role in advising on what the management priorities should be, and coordinating Sanctuary actions with those of other agencies. The SAC will consist of appointed representatives of government agencies, research and education groups, and commercial and environmental interests.

(3) Coordinate with the U.S. Coast Guard to Conduct an emergency response drill to assess the state of preparedness to respond to an emergency within, or in close proximity to the sanctuary, and generate a plan to address inadequacies.

(4) If the IMO reject's the U.S. Coast Guard's request for an Area To Be Avoided, the sanctuary manager should work with the Canadian and U.S. Coast Guards to generate a vessel traffic management plan for the sanctuary.

Besides the four priority tasks which should be revisited with every management plan revision, the management plan calls for on-going resource management, research, and education initiatives. The manager will review development or management proposals that will impact upon the marine resources, provide policy advice to other agencies working in the proposed Sanctuary area, and make presentations to appropriate levels of government.

The sanctuary will support management-related research and monitoring through funding, staffing, and other means that may be available and appropriate. It is the highest priority of the research agenda to complete a site profile within the first five years following designation. Completion of the site profile will be critical to refining the sanctuary contingency plan.

The education program calls for coordination with, and support of, existing interpretive and education programs, such as those of the National Park Service and the Seattle Aquarium. The general public and interested organizations on the Olympic Peninsula and in Washington State, will play important roles in attaining resource protection goals in the Sanctuary. Interpretive programs fostering public understanding and, hence, support for management objectives, are inherent in the plan's concept. High priority communication tools will include publications, exhibits, school curriculum, and special events that convey the significance of the Sanctuary's resources to both the in-state and out-of-state public. The management plan will highlight the linkages between the health of the Sanctuary resources and upland uses and habitats.

Information exchange, sharing of facilities and staff, and the coordination of policies and procedures for resource protection will be features of all programs, including research and education. The sanctuary management plan is designed to guide management of the proposed Sanctuary for the first five years after implementation. During this period, management initiatives will generally fall into four basic programs: (1) Resource Protection; (2) Research; (3) Education; and (4) Administration. The remainder of this section describes goals, guidelines and initiatives for each program.

II. Resource Protection

A. Introduction

The Sanctuary resource and quality protection program includes: (1) a statement of Sanctuary resource and quality protection goals; (2) Sanctuary regulations, including procedures for working with existing regulatory authorities in cases of overlapping jurisdiction; (3) contingency and emergency response plans; (4) encouragement of compatible use in the Sanctuary; and (5) identification of surveillance and enforcement plans.

B. Goals

The highest priority management goal for the Sanctuary is the protection of the marine environment, resources and qualities of the Sanctuary. Sanctuary goals are therefore designed to:

1. Reduce threats to Sanctuary resource and qualities;

2. Ensure that the water quality of the Sanctuary is maintained at a level consonant with Sanctuary designation;

3. Promote public awareness of, and voluntary compliance with, Sanctuary regulations and objectives, through education and interpretive programs stressing resource sensitivity and wise use;

4. Encourage participation by interested agencies, tribes, and organizations in the development of procedures to address specific management concerns (*e.g.*, monitoring and emergency-response programs);

5. Ensure that research results and scientific data are made available to management agencies to improve resource protection strategies;

6. coordinate activities of management and regulatory agencies to resolve conflicting or duplicative regulations, policies and enforcement procedures.

C Sanctuary Regulations

Existing regulations and proposed Sanctuary regulations are presented in Part III of this document. The proposed Designation Document (Appendix __) includes the consolidated Sanctuary regulations and activities subject to regulation now or in the future.

To ensure protection of Sanctuary resources and qualities and conservation of its valuable habitat, NOAA proposes seven regulations that govern: (1) oil, gas and mineral activities; (2) discharges and deposits from within Sanctuary boundaries; (3) discharges and deposits from outside Sanctuary boundaries; (4) uses that may injure historical resources; (5) alteration of or construction on the seabed; (6) uses that may injure marine mammals, sea turtles and seabirds; and (7) overflights. Two additional regulations are proposed to aid facilitate enforcement of Sanctuary regulations: 1) a prohibition on possession of Sanctuary resources not exempted by pre-existing treaties; and 2) a prohibition on interference with enforcement operations. Vessel traffic may be regulated in the future if consultation between SRD and the U.S. Coast Guard reveal a significant threat to Sanctuary resources from current vessel traffic conditions. SRD and the U.S. Coast Guard are working toward the establishment of an Area to Be Avoided (ATBA) off the northern Olympic Peninsula, extending 25 nautical miles from the shoreline, for all vessels transporting hazardous materials. Implementation of this ATBA is pending IMO approval. For details on the proposed ATBA, see Part III of the FEIS.

Kelp harvesting has also been included within the scope of possible future regulation. While very little kelp harvesting is occurring at the present time, inclusion of kelp harvesting within the scope of future regulation is necessary to preclude overharvesting of kelp in the future. Overharvesting of kelp could threaten the integrity of the kelp habitat so important to the entire coastal ecosystem.

D. Contingency Plans

The resources of the Sanctuary are susceptible to natural and human-related changes. Many of these changes are gradual and can be detected only through long-term monitoring of environmental and biological indicators. However, certain sudden and catastrophic changes in conditions (due to an accidental oil spill or vessel grounding, for example) could seriously damage resources and present severe health and safety hazards.

1. Existing Capabilities

In 1991, the State Legislature passed Washington ESHB 1027, pursuant to the recommendations of the BC/States Task Force, which identified the response parties for marine spill prevention and response at the state level. The 1991 and subsequent legislation has established a network of agencies for marine spill prevention and response that includes the Washington Department of Ecology (WDOE), newly created Office of Marine Safety (OMS), Maritime Commission, Regional Marine Safety Committees, Board of Pilotage Commissioners, University of Washington Sea Grant, Marine Oversight Board, and existing State agencies including Washington Parks and Recreation Commission, Department of Natural Resources, Department of Wildlife, Department of Fisheries, and Department of Revenue.

The Coast Guard (the federal on-scene coordinator in coastal and tidal waters) has ultimate authority to coordinate and direct all federal, state and private cleanup operations when discharges into the marine environment pose a substantial threat to the public health or welfare.

WDOE is the state agency with primary responsibility for oil and hazardous substance spill response and clean-up on land and water. However, the agency is more familiar with land-based spills. The OMS has responsibility for vessel response plans, barge cable standards, bunkering and lightering operations, and review of federal vessel inspection programs. The OMS has established three regional marine safety committees including one for the North Puget Sound/Strait of Juan de Fuca and one for the Outer Coast. The committees will prepare regional plans governing vessel traffic, including consideration of tug escort requirements, speed limits, navigation aids, vessel conflicts, environmentally sensitive areas, and the Coast Guard VTS.

The OMS will review the plans and implement those recommendations over which the state has authority. By the end of 1993, the OMS plans to implement an extensive Tanker Prevention Plan and Commercial Vessel Screening Requirements. The plan will require tankers and barges transiting Washington waters to file a spill prevention plan verifying that they pose no risk to State waters. The prevention plan will address issues related to vessel quality, procedures and crew training standards. Commercial Vessel Screening Plans, will require all cargo vessels over 300 gross tons and commercial passenger vessels to give OMS advanced notification of their vessel characteristics and cargo prior to arrival in state waters. The OMS is mandated to establish an emergency response system for the

Strait of Juan de Fuca based on recommendations from the regional marine safety committees. The OMS is currently reviewing the recommendations submitted by the committees.

The Maritime Commission, established by the Legislature in 1990, is charged with: 1) developing first response oil spill contingency plans for covered vessels; 2) providing emergency oil spill response services for up to 24 hours following an oil spill incident; and 3) providing a 24-hour communication network for spill response notifications. The latter two of these functions have been contracted to private companies-the former to Foss Environmental and the latter to the Marine Exchange of Puget Sound. The Commission develops vessel contingency plans and maintains a database of vessel accidents.

Numerous State agencies provide spill response assistance and planning information related to resources that may be impacted by a spill. Education and outreach efforts are provided by the University of Washington Sea Grant and Washington Parks and Recreation Commission. The Department of Revenue is charged with studying tax incentives for spill risk reduction through coordination with WDOE and the Department of Trade and Economic Development. The Marine Oversight Board is an independent citizen review of Federal, State and industry actions. The Board is comprised of five gubernatorial appointees, who, acting in an advisory role report to the Governor, and make recommendations to agencies and the State legislature.

A detailed description concerning equipment and procedures for emergency response can be found in Part II of the FEIS.

2. Sanctuary Action

One of the first management actions of the Sanctuary will be to conduct an emergency response exercise for an oil spill in the Sanctuary boundary. The intent of this exercise will be not only to test the adequacy of existing plans and the availability and effectiveness of the equipment allocated but also to provide an opportunity for existing emergency response agencies and personnel to work with the Sanctuary and to define roles and responsibilities.

The Sanctuary program is preparing a National Plan with additional site specific plans, such as for the Olympic Coast, that will address needs for Sanctuary staff training, appropriate equipment necessary to respond to a large-scale emergency requiring long-term response and clean-up capabilities, and NOAA policies regarding use of dispersants.

To provide further protection to the Sanctuary resources and qualities, the Sanctuary staff will assess the state of preparedness of the relevant parts of the contingency plans as they relate to the Sanctuary. This action will entail exchanging information with government and industry response teams and seeking their support in assessing detection and clean-up capabilities that can be used to protect Sanctuary resources. In addition, and consistent with the National Marine Sanctuary Program Regulations (15 CFR Part 22), NOAA will provide the necessary resources and impetus to develop and implement a site-specific contingency and emergency-response plan designed to protect the Olympic Peninsula's offshore resources. The plan shall contain alert procedures and actions to be taken in the event of an emergency such as a shipwreck or an oil spill. The plan will specify the role of the Sanctuary and the action items with which the Sanctuary has lead responsibility versus providing assistance when requested by another lead agency.

An SRD-level contingency and emergency-response plan has been prepared for the Channel Islands and Key Largo National Marine Sanctuaries. A similar plan for the proposed Olympic Coast National Marine Sanctuary will be created that will:

* Describe emergency-response procedures and coordination requirements for SRD and Sanctuary staff;

* Define SRD policy regarding use of dispersants;

* Provide a geographic information system depicting resources at risk which will build upon the GIS developed by the State Department of Natural Resources;

* Outline procedures for emergency research; and

* Provide damage assessment guidelines.

In conjunction with this plan, agreements may be formulated to improve spill detection programs and augment containment capabilities (i.e., with additional equipment, staff, and deployment plans).

E. Compatible Use of the Sanctuary

An important aspect of the resource program is to encourage the private and public uses of the Sanctuary, not prohibited pursuant to other authorities, in ways that are compatible with the primary objective of resource protection. Thus the Sanctuary will:

1. Develop educational materials and programs aimed at enhancing public awareness of the Sanctuary's resources and characteristics and their need for protection.

2. Provide relevant information about Sanctuary

regulations and use policies;

3. Collaborate with public and private organizations in promoting compatible use of the Sanctuary;

4. Monitor and assess the levels of use to identify and control potential degradation of resources and minimize potential user conflicts; and

5. Consult with other agencies on policies and proposals for the management of activities which may affect protection of Sanctuary resources and qualities;

Monitoring and information exchange programs are discussed under research (Section III). The development of materials is discussed under education (Section IV).

F. Surveillance and Enforcement

1. Sanctuary Action and Coordination with Existing Agencies

A primary feature of the resource protection program is the surveillance of sanctuary waters and enforcement of applicable regulations. Although a detailed enforcement plan has not been developed, NOAA currently envisions a State-Federal-Tribal cooperative enforcement system involving the State of Washington, U.S. Coast Guard, U.S. Fish and Wildlife Service, National Marine Fisheries Service, National Park Service, and coastal American Indian Tribes. Because the proposed sanctuary includes tribal, state, and federal waters, close coordination between tribal, state, and federal authorities is required.

Cooperative agreements between state and federal authorities exist at other sanctuary sites. For example, under a cooperative agreement with SRD, the California Department of Fish and Game (and other federal agencies including NPS, NMFS, and USFWS) enforces living marine resource regulations within the Gulf of the Farallones Sanctuary and state enforcement officers are deputized to enforce sanctuary regulations. As discussed below, the Washington Department of Fisheries (WDF), through an agreement with National Marine Fisheries Service (NMFS), enforces fishing related laws and regulations in state and federal waters off the coast of Washington State. Opportunities exist to coordinate enforcement efforts between SRD and WDF. The current regime for enforcing relevant laws and regulations within the boundaries of the proposed sanctuary is summarized below.

The USCG has broad responsibility for enforcing all federal laws in navigable waters under U.S. jurisdiction. Where these laws regulate fishing harvests, the USCG works closely with the NMFS and WDF.

Sanctuary designation would have the effect of broadening USCG enforcement responsibilities to include the enforcement of sanctuary regulations. Neither NOAA nor the USCG has the fiscal resources to conduct systematic surveillance and enforcement operations to ensure compliance with sanctuary regulations. However, both the USCG and the state conduct operations in the area. The USCG would provide limited surveillance in conjunction with multi-mission, surface, or aerial operations.

WDF is the state agency with primary enforcement capabilities in the area of the proposed sanctuary. With the exception of traffic laws, WDF fisheries patrol officers have full police power permitting them to enforce all criminal laws of the state of Washington. There are currently nine Fisheries Patrol Officers who could be available for sanctuary enforcement (a sergeant at Montesano; two officers at Westport; two officers at Ocean Shores; one officer at Forks; one sergeant and one officer at Port Angeles; and one officer at Clallam Bay). WDF officers are cross-deputized with NMFS, and enforce Washington fishing regulations in state territorial waters (0-3 miles offshore), and federal fishing regulations in the Exclusive Economic Zone (3-200 miles offshore). WDF conducts no enforcement patrols on the sixty miles of shoreline in Olympic National Park between Queets and Neah Bay.

Five permanent NPS law enforcement rangers with full federal commissions are stationed along the coastal strip of the Olympic National Park year around: 2 at Kalaloch, 2 at Mora, and 1 at Ozette. During the summer, 5 more seasonal law enforcement rangers are stationed on the coast. In addition, 18 full time, commissioned rangers are stationed in other parts of the Park with 13 more commissioned seasonal rangers on duty in summer. These numbers fluctuate somewhat from year to year. Enforcement of federal regulations within the portion of the sanctuary that overlaps the Park can be performed by these rangers. Authority for law enforcement in other portions of the sanctuary would have to be specifically granted to the Park by NOAA.

USFWS staff make occasional visits to the Refuges along the coast for biological surveys. Enforcement authority is limited to the islands. Incidental observation can be made of the surrounding waters.

Each of the four coastal tribes is an independent, self-governing, sovereign entity, with administrative and management authority over their own lands. In addition, as federally recognized co-managers of the fishery resources tribal enforcement authority extends out into the adjacent waters of the north coast region. In aggregate, the four coastal tribes and North West Indian Fisheries Commission employ more natural resource management personnel to work on environmental protection, habitat enhancement, and fishery management issues in the north coast area than do the corresponding state or federal agencies.

NOAA plans to rely on such observers from other agencies and cooperating organizations, including excursion and service boat operators, to provide the surveillance information needed for the enforcement program. Suspected violations will be reported to the sanctuary manager, who will investigate the reports and take appropriate action. The enforcement program is expected to be sufficiently strong to deter widespread violation of sanctuary regulations.

In the event that analyses of use patterns after sanctuary designation indicate that additional surveillance is required, NOAA will provide for more intensive enforcement to protect sanctuary resources. The effectiveness of sanctuary enforcement operations will be evaluated two years after sanctuary designation, and annually thereafter.

2. Public Education and Information

An emphasis will also be placed on public education efforts to preclude the need for a large-scale enforcement program. Interpretation and education programs will therefore be important for gaining voluntary compliance with sanctuary regulations. Because the most effective enforcement is prevention, the sanctuary interpretive program will make every effort to inform people about wise sanctuary use and enjoyment. It is essential that all users of the sanctuary be provided with easily understood materials which explain the regulations, their rationale, and the shared government responsibility for their enforcement.

Some first step actions directed toward this effort include: (1) developing and distributing brochures explaining sanctuary regulations and their intent; (2) posting sanctuary regulations at appropriate locations (e.g., marinas, sailing clubs, public docks, waterfront recreation sites and restaurants); and (3) establishing contact with industry, and recreational and commercial groups (e.g., fishing and shipping industry) to present and explain the regulations. Discussions with various groups will help determine appropriate educational materials for promoting compatible use of the sanctuary.

3. Planning and Modifying Enforcement Program

Information obtained from the research program and from surveillance-enforcement activities on Sanctuary visitor use patterns, frequently occurring violations, and potentially sensitive resources, will be reviewed in periodic meetings between the Sanctuary Manager, the Sanctuary Advisory Committee and enforcement agency personnel to determine the adequacy of surveillance levels and methods.

Section III: Research

A. Introduction

Effective management of the Olympic Coast National Marine Sanctuary requires the development of a coordinated and focused research program. Research conducted within marine sanctuaries is designed to improve knowledge of the sanctuary's environment and resources and provide data and information that is most useful to the sanctuary manager and decision-makers. The research conducted within sanctuaries contributes to the general body of scientific knowledge, and the management-specific focus of the research provides useful information for application in other marine and coastal areas. Sanctuary researchers, managers and education directors should coordinate their efforts to ensure a strong link between management/education needs and research projects. The research agenda should also be coordinated with the research agendas of the other marine sanctuary's on the west coast to maximize the benefits of research results.

Research conducted within the sanctuary will focus specifically on those management issues that relate to the protection of significant sanctuary resources. The highest priority for research is generation of a "site profile" which will form the foundation for the contingency plan, regulatory regime, and education and research programs on natural resource abundance, characteristics, and processes for the area. Past resource data will be utilized as well as ongoing monitoring and research results. The monitoring program should be both species specific as well as examine questions involving communities and the entire local ecosystem. Management directed research will address practical, use-oriented or "cause-and effect" studies. Long-term monitoring and the resultant data base will provide the foundation for interpreting or predicting natural or human-induced events in the sanctuary and adjacent areas. General directions and priorities for additional research are provided in this section as a guide for identifying and selecting future appropriate research projects.

The sanctuary will work cooperatively with other institutions whenever possible in conducting research. Federal, tribal, state, and local agencies, and universities in Washington State, have important capabilities that could aid in meeting sanctuary objectives. In particular, the Washington legislature established a new Olympic Natural Resources Center, to be located on the western side of the Olympic Peninsula, to conduct research and education in forestry and ocean management. This new Center, a unit of the University of Washington, would be an ideal partner to work with sanctuary staff on ocean issues and educational programs.

B. Goals

The purpose of Sanctuary research activities is to improve understanding of the resources and characteristics of the marine environment off the Olympic Peninsula to resolve specific management problems, and to coordinate and facilitate information flow between the various research institutions, agencies and organizations. A major emphasis of the research program will be to encourage studies that investigate the natural processes at the land-sea interface. Research results will be used in education programs for visitors and others interested in the Sanctuary, as well as for resource protection. The strategies to be employed in the research program are to:

* Establish a framework and procedures for administering research to ensure that research projects are responsive to management concerns and that results contribute to improved management of the Sanctuary;

* Incorporate research results into the interpretive/education program in a format useful for the general public;

* Focus and coordinate data collection efforts on the physical, chemical, geological and biological oceanography of the Sanctuary;

* Encourage research that examines biodiversity within the habitats of the Sanctuary;

* Encourage studies that integrate nearshore and open ocean research findings for a more complete understanding of processes affecting both zones;

* Initiate a monitoring program to assess environmental changes as they occur due to natural and human processes;

* Identify the range of effects on the environment that would result from predicted changes in human activity or natural phenomena;

* Assure that research activities do not harm or diminish Sanctuary resources;

* Encourage information exchange among all the organizations and agencies undertaking management-related research in the Sanctuary to promote more informed management.

* Evaluate the effectiveness and efficiency of the research program and its integration with resource protection and education objectives.

C. Framework for Research

Research projects will be directed to three basic management questions.

* Baseline studies to determine the features and processes of the natural environment; the abundance, distribution, and interaction of the living resources; the distribution and status of historical resources and the pattern of human activity in the Sanctuary from prehistoric times to the future;

* Monitoring to document changes in environmental quality, in ecology, and in human activity; and

* Predictive studies to assess the causes and effects of environmental and ecological changes.

Each of these categories is described in more detail below.

(a) Baseline Studies

Baseline studies will be designed to obtain a better understanding of the physical oceanography and ecology of the Sanctuary. They generally refer to studies of abundance, distribution, and movement of species, and selected chemical, physical, and geological parameters. In the area of the proposed Olympic Coast sanctuary, the basic characteristics of many important species populations and habitats are not known. However, there is an indication that there has been a loss of habitat and species in recent years. Inventories of selected species, particularly threatened or vulnerable species within these populations, represent an important direction for research. Some baseline studies will focus on the inventory and description of sanctuary habitats. Over the long term, there may be a need for a detailed inventory of the intertidal and subtidal habitats of the sanctuary that build on previously conducted surveys, and personal observations.

Since there are barges and vessels carrying hazardous substances through and near the Sanctuary, the Sanctuary manager will need sound information on water circulation. This information would be used to improve understanding of the dispersion pattern of possible oil spills and land-source and ocean-source discharges in the waters within or adjacent to the Sanctuary, and as part of the Sanctuary's contingency planning efforts.

Basic physical oceanographic studies should focus on local circulation patterns offshore and in the Strait of Juan de Fuca, upwelling processes, and the interchange of water masses such as the Columbia River Plume and more saline open ocean water masses.

To accomplish this goal of understanding regional circulation the Sanctuary could assist with the development and dissemination of information from existing monitoring stations such as NOAA tide gauges, current meters, thermistor chains and satellites (i.e., the NOAA polar orbiting satellites with Advanced Very High Resolution Radiometer instruments that can image sea surface temperature). Process oriented studies can use resident, indicator species to identify local water mass movement and elucidate key productivity areas or areas of high diversity. Results can then be incorporated into an understanding of food web relationships and predator-prey foraging dynamics.

Comprehensive knowledge of the distribution of organisms and their dependence on environmental factors is needed for interpretation as well as for resource protection. At representative depths and locations, the environment should be characterized by the collection of additional baseline data on water temperature and salinity, light penetration, upwelling circulation and nutrient-load. This information should be correlated with data on the abundance and distribution, by depth zone and location of species populations living within and transiting the Sanctuary. Data of this type have been collected at particular points along the shoreline by the numerous research institutions in Washington State, but due to the remoteness of the area and limited access points, there are many gaps in our knowledge of the marine ecology off the Olympic Peninsula, particularly land-sea interactions.

The interaction of physical oceanography with biological studies will assist in developing an understanding of the ecology of the region and the general health and productivity of the Sanctuary. The research and education programs in general will emphasize a multi-disciplinary approach to basic and applied scientific issues. The geographic location of the proposed Sanctuary provides an excellent opportunity to integrate research on the effects that human uses in the watershed and in the marine environment have on marine resources. This data would be invaluable in estimating the effects, if any, of present and future land-use practices on the marine environment.

Additionally, a historical context study, including a general literature search building on existing work, will be conducted to identify probable historical sites (including cultural, archeological and paleontological sites) within the Sanctuary. This research will be followed by a field reconnaissance-type remote sensing survey and archeological assessment to locate and evaluate the extent to which historical resources are based in the Sanctuary. These baseline historical resource studies will provide the fundamental information necessary for developing a historical resource management strategy and education/interpretation program for the Sanctuary.

The recently developed Maritime History Museum will provide a new maritime museum in Seattle. Coordination with facilities adjacent to the Sanctuary and in larger population centers will enhance public awareness of Sanctuary efforts to protect and research important historical resources.

2. Monitoring

Effective management requires an understanding of long-term changes to the status of the resources and human uses effecting those resources. Monitoring activities provide for the planned systematic collection of data on selected parameters to detect trends in ecosystem populations, communities, habitats, and processes. A well designed monitoring program can help detect natural cycles and trends, as well as unusual changes, and then relate them to one or more sources of probable disturbance. A monitoring program may help to distinguish between trends related to natural and human-induced activities. Over the long term, a monitoring program should indicate the health of the sanctuary ecosystem and its important resources.

Marine resource monitoring programs can be costly and complex. For these reasons, the selection of parameters to monitor is an important scientific and management question. SRD will continue to seek advice from and coordinate with other agencies and scientists who conduct marine monitoring, and provide technical and other support where possible. Additional programs may also be initiated for important species or habitats of special concern not covered by existing programs. The research subcommittee of the SAC will be instrumental in directing the monitoring program.

Overall, the monitoring program will assist in our understanding of the general health of the Olympic Coast and surrounding waters. The program could help discover sources of pollutants and assist in the establishment of cause and effect relationships as part of long-term toxicological evaluations. Monitoring could also elucidate any problems or changing patterns that had not been previously identified. Ultimately, the monitoring program will address the application of the findings to basic science as well as applied management purposes.

Sanctuary staff will also monitor vessel traffic in coordination with the U.S. Coast Guard to assess the needs of additional preventative strategies.

3. Analytical/Predictive Studies

In addition to baseline research and monitoring, the Sanctuary research program will continue studies, as needed, to analyze the causes and consequences of ecosystem changes and predict their effects on new and more intense human activity in the area. Unlike the monitoring program these predictive studies are envisioned to be more short-term and directly targeted to an immediate management issue. Studies could be made to determine the effects on marine mammals of possible increases in boating activity if heightened interest in whale watching and fishing excursions results from Sanctuary establishment. A knowledge of these effects would enable management to provide information to Sanctuary users to avoid disturbing these animals unnecessarily.

Other studies of whales, pinnipeds and seabirds in the Sanctuary could be initiated to determine their range, their migration patterns, and their dependance on the food resources of the Sanctuary. One such study, for example, might be an investigation to determine (1) whether the decrease in Stellar sea lions can be attributed to a decline in prey availability and compare the results to a similar study on the relatively stable Stellar sea lion population on Ano Nuevo; and (2) the importance of the fish stocks in sustaining the Stellar sea lion population and (3) the interaction of fishing on pinniped, mammal, and seabird populations and vice-versa.

D. Selection and Management of Research Projects

Projects considered for funding by the SRD should be directed to the resolution of sanctuary management issues and concerns. The sanctuary manager, Sanctuary Advisory Committee, and SRD will follow procedures developed by SRD to ensure that each sanctuary's research program is consistent with the national program policies and directions. These procedures include preparing an annual Sanctuary Research Plan (SRP), and monitoring the progress of research in the sanctuary.

1. Preparing an Annual Operating Plan (AOP)

Each year the sanctuary manager will prepare a Sanctuary Research Plan (SRP) with support by the SAC. The AOP is a brief description of the goals for each fiscal year and a justification of how these goals fit into the guidelines of the approved management plan. SRD will then incorporate the SRP into a national plan that includes annual plans for each sanctuary. Steps involved in the annual planning process include:

* Identifying management concerns for the sanctuary with supporting evidence or rationales.

* The sanctuary manager, in cooperation with the SAC and SRD, establishes research priorities based on the identification of management concerns. The most important factors to be considered in establishing annual research priorities will be:

(1) Immediate or evolving management issues that may be

resolved through directed research projects;

(2) The prospects of research already in progress; and

(3) The availability of funds, equipment, and instruments for research support.

* Research workshops are held on an occasional basis to facilitate the identification of research problems. After the management issues and research priorities are developed, a draft SRP is prepared.

* An SRP is prepared that includes documentation of how each project meets the national selection criteria. The final SRP is then incorporated by the research coordinator at program headquarters into a National Sanctuary Research Plan. The highest ranking research projects are selected from the national plan and a procurement schedule is prepared.

* A research announcement and request for proposals (RFP) is prepared. The announcement discusses management concerns and summarizes past and on-going research. Its purpose is to solicit proposals from the scientific community that satisfy the criteria specified in the SRP.

Occasionally, research proposals may include activities that are prohibited by sanctuary regulations (e.g., taking of marine mammals). In such cases NOAA may review the proposal and issue a permit allowing the activity to proceed. The permit review process for research is outlined in Appendix ___). NOAA may also determine that all or part of the research should be conducted outside of sanctuary boundaries. Research focusing on protected or endangered species may require additional research permits from other agencies.

2. Monitoring Progress

The sanctuary manager will monitor the performance of research projects and keep records of ongoing research, equipment being used on site, frequency of researchers' visits, and project progress. In order to ensure conformance to schedules outlined under the terms of the research contract, the researchers must prepare progress reports and final reports for review by SRD and the sanctuary manager. Scientists and resource managers may review final reports before approval by SRD. Additionally, SRD will publish outstanding project reports in its Technical Report Series.

3. Information Exchange

Direct SRD funding for research is limited. To augment directly funded research, SRD will encourage other funding sources to support research that complements sanctuary management goals. In the process of soliciting research projects from other agencies and private institutions, SRD will make available current sanctuary resource data obtained from past and ongoing projects.

Section IV. Education

A. Introduction

The interpretive program for the Olympic Coast National Marine Sanctuary will focus on improving public awareness of the sanctuary program and providing information about the Olympic Coast sanctuary resources, ecological linkages with terrestrial habitats, and regulations. The program will target, among others, local governments, businesses, citizen groups, the tribes, the timber industry, fishermen, tourists and educational institutions. The program is designed to promote understanding of the natural and human resource values of the Olympic Coast sanctuary, to enhance the stewardship responsibilities of the users in the coastal watersheds. Where possible, these programs will be coordinated with already existing programs and facilities, such as the local school systems in the watersheds bordering the sanctuary.

B. Goals

The education program will be directed at improving public awareness and understanding of the significance of the Sanctuary and the need to protect its resources and attributes. The management objectives designed to meet this goal are to:

* Provide the public with information on the Sanctuary and its goals and objectives, with an emphasis on the need to use these resources wisely to ensure their long-term viability;

* Broaden support for the Sanctuary and Sanctuary management by offering programs suited to visitors with a range of diverse interests;

* Provide for public involvement by encouraging feedback on the effectiveness of education programs and collaborate with other organizations to provide interpretive services, including extension and outreach programs and other volunteer projects complementary to the Sanctuary program;

* Establish extension and outreach services through collaborative efforts with school and volunteer programs;

* Incorporate research results into the interpretive/education program in a format useful for the general public

* Use research opportunities as an educational tool by establishing research assistantship and citizens monitoring programs; and

* Create public awareness of the entire Nation-wide Sanctuary Program, its purposes and intent and the role of the Olympic Coast NMS as part of a regional and national system.

C. Educational Opportunities

Opportunities for interpreting the Olympic Coast NMS fall into two broad categories; 1) education for local residents and visitors, and potential users of the Sanctuary, including schools, fishermen, hikers, campers, nature viewers , etc., as well as visitors at local information centers and at the Sanctuary headquarters; and 2) interested groups not visiting the site but who desire to learn more about the Sanctuary's resources and unique characteristics. Below is a description of the educational programs that the Sanctuary will develop to maximize these opportunities.

1. Site Visitor Programs

The Olympic Coast includes intertidal areas that can be readily observed from land. At Kalaloch, Highway 101 parallels the shoreline for approximately 10 miles allowing access to the coastline and enabling disabled or less active visitors to view the sanctuary area from scenic overlooks. Access by road also exists at La Push, Mora Campground, a point south of Neah Bay, and at Lake Ozette where a three mile trail leads to the coast. The unique wilderness setting and the diversity of habitats along the Olympic shoreline present excellent opportunities for school field trips, field seminars, local community programs (e.g. beach clean ups, whale and bird watching), and university level research projects. Visitors and users of the offshore area include kayakers, fishermen and viewers on whale-watching boats. Brochures and interpretive materials will be available to provide information about sanctuary regulations, wildlife, and the sanctuary environment.

The proximity of the proposed sanctuary to the shoreline enables visitors to have a field experience either by walking along the shoreline or by going out on the water. The intertidal areas of the proposed sanctuary are also part of the Olympic National Park and are managed by the National Park Service (NPS). NPS conducts beach walks, sponsors nature seminars, and maintains interpretive signs at beach overlooks. SRD plans to establish a cooperative program with the Park Service to reach those visitors who go to the coastal area of the marine sanctuary. The beach overlooks are also excellent locations to establish signs and displays describing the proposed sanctuary. These interpretive signs will provide visitors, residents, and users of the sanctuary with a brief description of the sanctuary's resources and uses. On-site educational materials will consist largely of written and visual materials describing the sanctuary and explaining its regulations. This information will be available to the wide variety of recreational users and tourists that visit the area.

2. Information Center Programs

Many people who would not normally walk the beaches or go for an open-water cruise will be able to visit sanctuary headquarters and other visitor and information centers in the state. The educational exhibits and brochures available at the centers enable visitors to learn about the Olympic Coast area, and gain a greater appreciation of the marine environment. There are a number of other educational/interpretive centers around the Peninsula and in western Washington cities that may be willing to host sanctuary exhibits and coordinate educational programs. These include:

Olympic National Park: The Olympic National Park recently obtained Congressional approval to build a Visitor Center at Kalaloch, but construction is not expected to begin for several years. The Olympic Park Superintendent has offered the National Marine Sanctuary Program exhibit space in the new facility. Since Kalaloch is located on the coastline, visitors can combine an on-site beach walk with an educational experience at the visitors center. The Olympic Park operates a number of ranger/informational centers on the Olympic Peninsula. An agreement may be reached by which SRD can distribute brochures and other interpretive information at these locations. The Park also hosts "Olympic Field Seminars" sponsored by the Olympic Park Institute. Arrangements can be made to hold a seminar on the sanctuary environment and resources. The Olympic National Park also organizes programs for schools and community groups. Designation of a marine sanctuary provides the opportunity to organize cooperative programs with the Park, schools, local community groups, and coastal tribes.

U.S. Fish and Wildlife Headquarters, Olympia: USFWS distributes a brochure on the Refuges, has created visual panels on the coast in conjunction with the NPS, and is interested in developing additional cooperative projects with NOAA and NPS.

Arthur D. Feiro Marine Laboratory, Port Angeles: Owned by the City of Port Angeles and located on the City Pier, the lab is operated by Peninsula College both as a center for marine interpretation (largely for tourists) and as a center for teaching and research.

Olympic Natural Resources Center (ONRC), University of Washington: The 1989 Washington legislature established the Center as a unit of the University of Washington with a broad mandate for research and education regarding forestry and ocean resources. A development plan is now being written and will be submitted to the legislature in 1991. The ONRC will be based at U.W. in Seattle but the law requires that a facility be built on the western side of the Olympic Peninsula; planning for that facility is now underway.

Sea Grant Extension Offices, Montesano: There is a Sea Grant Extension Office at Montesano, Washington. Informational brochures and other materials about the sanctuary may be distributed from this office.

Seattle Aquarium, Seattle: It is anticipated that several cooperative projects involving exhibits and field excursions will be developed with the Education and Exhibits division of the Aquarium.

New Maritime Center, Seattle: A maritime center combining features of an interpretive center, science and technology museum, and cultural institution is being proposed for Seattle's central waterfront on Elliott Bay. It is estimated that the Center will not be completed for at least seven years.

Grays Harbor Historical Seaport Authority, Aberdeen: Written materials concerning sanctuary resources could be made available at the Seaport, and cooperative efforts to develop exhibits may be appropriate.

Makah Museum, Neah Bay: The Makah Museum, home to 500-year-old Ozette artifacts, is managed by the Makah Cultural and Research Center which has become a focal point for Makah tribal culture since it was founded in 1979. It contains the world's single-largest collection of Northwest coast artifacts dating back to before the times of the non-Indian explorers.

Aside from Port Angeles, the major population centers on the Peninsula (Aberdeen, Forks) do not operate marine oriented information centers. These communities, which are suffering from a declining economy, may benefit from sanctuary designation. Establishment of a sanctuary may increase tourist traffic to the region and thereby benefit the local economy through direct expenditures within the tourist related industries.

3. Outreach Programs

The OCNMS educational/interpretation program will try to reach persons who are unable to visit the Olympic Coast area, as well as those living in the watershed. Outreach programs may benefit groups with a specific interest in the coastal region and groups that are not aware of the importance of the marine environment. The outreach agenda will identify and contact specific groups and school systems and target the needs for marine education and outreach programs. Efforts will then focus on providing educational materials, curriculum and programs about the sanctuary and the marine environment. If interest is strong enough, a slide presentation, mobile exhibit, documentaries and other media may be developed for use with schools and private groups.

Section V. Administration

A. Administrative Framework

This section of the management plan describes the administrative roles of the agencies that will be involved in Sanctuary management, proposes strategies to coordinate their activities, and provides for periodic evaluation of the effectiveness of the management plan. Administration oversees all other functions of sanctuary management including resource protection, research, and education, and establishes the roles of the relevant players in implementing specific programs. The administrative framework ensures that all management activities are coordinated.

The Sanctuary and Reserves Division (SRD) is responsible for the overall management of the proposed Sanctuary. The SRD will coordinate on-site activities through cooperative agreements with the State of Washington, NPS, USFWS, USCG, EPA, and NMFS.

1. Sanctuaries and Reserves Division

The National Marine Sanctuary Program is managed by SRD. SRD prepares a site-specific management plan for each sanctuary to ensure that on-site activities in resource protection, research, and education/interpretation are coordinated and consistent with sanctuary goals and objectives. SRD is responsible for implementing this plan through interagency agreements and funding of on-site operations.

SRD, in collaboration with the sanctuary manager, develops a general budget projecting expenditures for program development, operations, and staffing. Funding priorities will be reviewed and adjusted annually to reflect evolving conditions in SRD's budget, the sanctuary, and the priorities and requirements of the National Marine Sanctuary Program. SRD also establishes policies and procedures in response to specific issues in each sanctuary. Detailed SRD responsibilities are listed under the resource protection, research, and education sections which follow.

The Sanctuary manager serves as the primary spokesperson for the OCNMS, and reports directly to, and represents, the SRD. The manager's headquarters will preferably be located on the west side of the Olympic Peninsula, in close proximity to the sanctuary site. The final decision regarding the location of headquarters and satellite offices will be made after consultation with the SAC.

2. Sanctuary Advisory Committee

A Sanctuary Advisory Committee (SAC) will be established to enable agencies, interested groups, and individuals to actively contribute to the management of the OCNMS. The SAC will consist of representatives of those groups affected by sanctuary designation, and include federal, state, local, and tribal government authorities, users of the area such as vessel operators and fishermen, and local community, and tribal members. These groups will be consulted to ensure that their ideas and concerns are made available to and considered by the sanctuary manager.

The SAC will serve in both a proactive and reactive manner. It will be instrumental in producing annual operating plans by identifying education/outreach, research, and resource protection priorities. The SAC will keep the manager informed about issues of concern, offer suggestions on solutions to conflicts, and assist the manager in achieving the goals of the sanctuary program. The SAC will also be solicited to comment on ideas and approaches to issues that the sanctuary manager raises.

The structure, composition, and role of the SAC will be determined by SRD in conjunction with representatives of the State of Washington. In addition, SRD will appoint members to the committee and define the roles between the manager, the SAC, and SRD headquarters. A broad based constituency will be sought to ensure that a range of views and expertise are made available to the sanctuary manager. The experience and expertise of the SAC will be available to the manager on an ad hoc basis and during regularly scheduled meetings. In order to function efficiently in an advisory capacity it may be beneficial to subdivide the SAC into subcommittees that correspond to the resource protection, research, education and general administration issues. Detailed SAC responsibilities are listed under the resource protection, research, education and general administration sections which follow.

3. Federal Agencies

A. United States Coast Guard (USCG)

The USCG is responsible for enforcing Federal laws in waters under U.S. jurisdiction. This mission includes the enforcement of sanctuary regulations promulgated for the sanctuary. The USCG also manages operations for the control or removal of oil and hazardous substances resulting from offshore spills. In addition to enforcing fishing and vessel discharge regulations, the USCG is also responsible for regulating vessel traffic maintaining boater safety, and coordinating search and rescue operations.

B. United States Fish and Wildlife Service (USFWS)

The USFWS maintains enforcement jurisdiction over the Flattery Rocks, Quillayute Needles, and Copalis National Wildlife Refuges. Because the boundary of these three island refuges is from mean high water landward, there is no overlapping jurisdiction between the USFWS and SRD. The refuges do, however, lie within the waters of the proposed sanctuary. It is anticipated that an interagency agreement will be developed to establish a method for joint management of the resources.

C. National Park Service (NPS)

The NPS is responsible for managing the Olympic National Park. Sixty miles of coastline and the offshore rocks and islands (including the intertidal zones) are included within the boundary of the Olympic National Park. The landward boundary of the proposed marine sanctuary extends to mean high water, cutting across the mouths of streams and rivers, except along Indian reservations where the boundary extends to the lower low water mark. NPS and SRD share jurisdiction over the intertidal zone in those areas where the landward boundary of the proposed Sanctuary extends to mean high water, and around the offshore rocks and islands. Existing National Park Service standards and policies cannot be diminished or diluted by any "shared" jurisdiction with SRD. For example, the large majority of the intertidal area of the park is Congressionally designated Wilderness and must be managed to that standard. SRD and NPS will develop an interagency cooperative agreement to ensure the most efficient use of program funding and manpower in achieving the goals of the sanctuary and park.

D. Environmental Protection Agency (EPA)

The EPA has regulatory responsibilities with regard to sewage outfalls, ocean dumping, and non-point source pollution. While EPA has delegated permitting authority to the State government, the tribes receive their permits directly from EPA.

E. Corps of Engineers (COE)

The COE grant permits that are based on EPA guidelines for the discharge of dredged materials into State waters and the waters beyond. The Corps also issues permits for construction, excavation or fill in any navigable waters of the United States.

F. Department of the Navy

The Department of the Navy conducts military training and surveillance activities in the proposed Sanctuary area.

4. International, Tribal, State, and local agencies

A large portion of Washington State waters is included within the boundary of the proposed sanctuary. The Washington State Departments of Ecology, Natural Resources, Fisheries, and Wildlife have management responsibilities within state waters off the Olympic Peninsula. Ecology also administers the Washington State Coastal Zone Management Program. The state has an efficient infrastructure for coastal resource management and enforcement.

It is NOAA's intent to work closely with the state to ensure full federal-state cooperation, and to coordinate the sanctuary program with the existing local, state and regional management framework. This cooperation will involve the establishment of Cooperative Agreements, Memoranda of Understanding and deputization of officials for enforcement purposes.

NOAA will work closely with the Makah, Quileute, Hoh and Quinault tribes and the other tribes with treaty rights within the sanctuary, Clallam and Jefferson Counties, the City of Forks, and Canadian authorities such as the Canadian Coast Guard and Canadian Park Service to coordinate research, education, monitoring and resource protection initiatives.

To facilitate the administrative procedures regarding certification/approval of leases, licenses, permits, approvals, rights or other authorizations (as described above, Part II, Section III, B.2. Designation Document and Regulations), NOAA will work closely with the owners or holders of, or applicants for, leases, licenses, permits, approvals, rights or agencies.

B. Resource Protection: Roles and Responsibilities

1. Sanctuaries and Reserves Division

(a) Approves priorities for funding for resource protection;

(b) Monitors the effectiveness of interagency agreements for surveillance and enforcement and negotiates changes where required;

(c) Develops contingency and emergency-response plans and, based on these plans, negotiates applicable interagency agreements;

(d) Monitors the effectiveness of existing sanctuary regulations, and manages the process to implement changes in regulations where necessary; and

(e) Coordinates efforts to protect and manage sanctuary resources with other federal agencies, tribal governments, and other public and private organizations.

2. Sanctuary Manager

(a) Recommends to SRD priorities for allocating funds annually for resource protection;

(b) Assists in the coordination of surveillance and enforcement activities by providing liaison with the USCG and other agencies;

(c) Reports regularly to SRD on surveillance and enforcement activities, violations, and emergencies;

(d) Provides information for use in training sanctuary enforcement officials;

(e) Monitors and evaluates the adequacy of emergency-response plans and procedures in the sanctuary;

(f) Maintains a record of emergency events e.g., oil spills) in and around the sanctuary;

(g) Evaluates overall progress toward the resource protection objectives of the sanctuary program, and prepares semi-annual and bi-monthly progress reports highlighting activities for SRD; and

(h) Establishes the Sanctuary Advisory Committee.

3. U.S. Coast Guard

(a) Holds broad responsibility for enforcing all federal laws throughout the sanctuary waters;

(b) Ensures enforcement of sanctuary regulations; and

(c) Provides on-scene coordination and Regional Response Center facilities under the National Contingency Plan for the removal of oil and hazardous substances in the event of a spill that threatens the sanctuary.

4. State of Washington

(a) Owns and manages aquatic lands, manages living resources, and enforces state laws and regulations within state waters of the sanctuary;

(b) State enforcement personnel may be deputized to enforce specific federal laws throughout the sanctuary (e.g., the Endangered Species Act);

(c) Evaluates progress towards management objectives for resource protection, and adjusts annual priorities accordingly;

(d) Monitors the effectiveness of state regulations within the sanctuary and considers recommended changes to state regulations through the State Legislature and Governor's Office;

(e) Monitoring and surveillance of fisheries resources;

(f) Provides on-scene coordination of state clean-up response in the event of an accidental spill of oil or hazardous materials, which threaten the state's fish and wildlife resources.

(g) Regulates recreational and commercial fishing activities in state waters.

C. Research: Roles and Responsibilities

1. Sanctuaries and Reserves Division

(a) Prepares annual Sanctuary Research Plans (SRP's) for each sanctuary;

(b) Prepares an annual National Research Plan (NRP) and budget, based on the SRP's of individual sanctuaries and in accordance with priorities determined at the national level;

(c) Sets dates for procurement based on the NRP;

(d) Administers interagency agreements and contracts for research;

(e) Reviews all interim and final research reports submitted by the sanctuary manager; and

(f) Reviews permits for research activities, considering the recommendations of the sanctuary manager, to ensure consistency with sanctuary regulations and provide additional technical review where necessary.

2. Sanctuary Manager

(a) Recommends broad areas of research to resolve management issues;

(b) Develops the Sanctuary Research Plan;

(c) Reviews research documents and progress reports submitted by contractors;

(d) Prepares assessments of research needs and priorities based on management requirements and research continuity;

(e) Prepares recommendations for SRP's;

(f) Implements the SRP's;

(g) Coordinates research and monitoring activities with other federal, state, tribal, and local agencies in the sanctuary in consultation with SRD, the Sanctuary Advisory Committee and other interested parties; and

(h) Coordinates an on-site process for reviewing and evaluating research proposals and permit requests, considering the views of SRD, the Sanctuary Advisory Committee, concerned individuals and interest groups.

3. Sanctuary Advisory Committee

(a) Provides advice to the sanctuary manager on review of research proposals, interim, and final reports;

(b) Provides advice to the sanctuary manager on approval of proposals for research in the sanctuary; and

(c) Provides advice to the research coordinator and the sanctuary manager on priority research needs.

D. <u>Education/Interpretation: Roles and Responsibilities</u>

1. Sanctuaries and Reserves Division

(a) Reviews and approves the list of annual priorities for education and the annual education budget prepared by the sanctuary manager;

(b) Reviews and approves design proposals for all educational facilities; and

(c) Evaluates progress toward accomplishing objectives for education and adjusts long-term priorities accordingly.

2. Sanctuary Manager

(a) Recommends annually to SRD a list of priorities and an annual budget for education;

(b) Prepares and circulates as required Request for Proposals (RFP's) for educational projects;

(c) Supervises the design and production of educational materials and facilities for the sanctuary;

(d) Provides training for staff assigned to the sanctuary;

(e) Encourages local and regional organizations to participate in sanctuary education;

(f) Disseminates information about the National Marine Sanctuary Program and the OCNMS; and

(g) Oversees the development of any education facilities constructed for the sanctuary, reviews site analyses and design specifications, awards construction and maintenance contracts.

3. Sanctuary Advisory Committee

(a) Provides advice to the sanctuary manager and education coordinator on raising public awareness of the sanctuary and advises on the development of a local constituency by means of brochures, presentations, structured events articles for publication, and other activities consistent with the management plan.

E. <u>General Administration: Roles and Responsibilities</u>

1. Sanctuaries and Reserves Division

(a) Ensures that the sanctuary is operated in a manner consistent with established national program policies and with applicable national and international laws and provides guidance to the sanctuary manager;

(b) Identifies, analyzes, and resolves sanctuary management problems and issues;

(c) Formulates comprehensive, long-term management plans for the sanctuary and revises the management plan as necessary;

(d) Directs and assists the sanctuary manager in the implementation of the management plan;

(e) Coordinates sanctuary management with other federal and state agencies, tribal governments, and private organizations;

(f) Evaluates the effectiveness of sanctuary management and regulatory measures;

(g) Prepares a program budget for the sanctuary; and

(h) Provides funding for overall sanctuary management and administration.

2. Sanctuary Manager

(a) Coordinates on-site efforts of all parties involved in sanctuary activities;

(b) Reviews the management plan periodically and recommends changes to SRD as needed;

(c) Assists SRD in preparing the annual budget for the sanctuary;

(d) Oversees day-to-day operation of the sanctuary, including administrative functions such as bookkeeping, purchasing and keeping records of visitor activities;

(e) Supervises sanctuary staff and other personnel, including enforcement and interpretive employees assigned to the sanctuary; and

(f) Represents the sanctuary viewpoint on local issues and at public forums.

3. State of Washington

(a) Assists in the preparation and implementation of a comprehensive, long-term management plan for the sanctuary; and

(b) Assists in the periodic review of the management plan.

4. Sanctuary Advisory Committee

(a) Provides advice on the specific plans for sanctuary developments;

(b) Provides advice on all proposals for activities within the sanctuary;

(c) Provides advice to the appropriate federal, state, tribal, or local government on proposed actions, plans and projects in areas adjacent to, or affecting the sanctuary;

(d) Enhances communication and cooperation among all interests involved in the sanctuary;

(e) Advises on rules and conditions for all forms of public recreation; and

(f) Advises on an overall plan for the use, development and maintenance of sanctuary lands and buildings.

F. Staffing Levels

Due to limited funding, the sanctuary will begin with a NOAA manager, and an operations coordinator. The sanctuary staff will work closely with the USCG, NPS, FWS, and other state, tribal, and federal agencies in providing enforcement and surveillance in the area of the sanctuary. The SAC will be established during the first year and planning will begin to identify research, education, resource management and administrative priorities for the first five years following designation. The priorities for further staffing will be determined as a result of the planning initiative.

G. Headquarters and Visitor Center Facilities

Sanctuary headquarters and administrative offices will be established at a suitable location on the Olympic Peninsula. NOAA has undertaken a preliminary assessment of alternatives for a main office and satellite offices. However, the final decisions on the siting of administrative offices will be made during the sanctuary planning initiative when the priorities for the first five years after designation for education, research, and resource management are clarified. This will also allow time for the mission and programs of the Olympic Center and the soon to be established Willapa Science Center to be identified. Siting considerations will be contingent upon available funding.

NOAA explored options for siting of offices in Port Angeles, Forks, Neah Bay and La Push. Following is an analysis of locations identifying some of the advantages and disadvantages of each alternative.

1. Port Angeles

The advantages of locating an office in Port Angeles are that: 1) it is the center of communications and transportation on the Olympic Peninsula where regional offices of the Coast Guard, National Park Service and other federal and state offices are located; and 2) should the Northwest Straits National Marine Sanctuary become designated, this location would be convenient in coordinating the operations of both sanctuaries.

The main disadvantage of siting the administrative office in Port Angeles is that it is removed from the population centers on the Olympic Peninsula and it may promote the perception and/or reality that the program is out of touch with the needs and interests of the population living adjacent to the Sanctuary.

2. Neah Bay

Neah Bay offers many opportunities with respect to facilities, research, and education. It is located adjacent to both the Strait of Juan de Fuca and the Olympic Peninsula, and as such, is centrally located adjacent to the entire sanctuary. Facilities exist to support a research vessel and tug. The Coast Guard station has a 600 foot dock with lift and launch capability, and is planning to upgrade the dock and its facilities which is expected to be completed by 1995-96. This may present an opportunity for cooperative funding by NOAA to provide fixed, permanent space for SRD vessels. The station would be a natural place to store a vessel ashore because there is a heavy lift crane which can lift vessels of up to twenty tons from the water. There is also an enclosed maintenance shed which may be available to SRD as well. Both security and maintenance would be much simpler if SRD were able to use the Coast Guard facility.

From the standpoint of research, much research has been occurring at Tatoosh Island by the University of Washington's Friday Harbor Lab. The presence of the Sanctuary in Neah Bay can support and augment this research.

From the standpoint of education/outreach, and research on cultural and historic resources, Neah Bay offers the Makah Archeological Museum and draws a large number of tourists which can be targeted by the Sanctuary program. The Makah Tribe is making long-range plans to improve the harbor at Neah Bay, add on to the museum, construct a marina and convention center and build an adjacent shopping center. In addition, because it is located on a tribal reservation, the education program can become more directly involved with the education needs of the coastal tribes.

3. La Push

There is a small port at La Push which supports the fishing fleet of the Quileute Tribe. However, there is a bar that must be negotiated at the entrance and in heavy weather is dangerous and, at times, impassible. Therefore from the perspective of facilities such as access to the sanctuary by vessels, this is an undesirable location. However because of its coastal location, it is a site where the Sanctuary would ensure that there is adequate contingency planning equipment, and bird and mammal rescue facilities. There is a Coast Guard station at La Push.

There is also a small village that supports a tribal school and recreational opportunities in the summer. Siting an office in this location will enable the sanctuary program to become integrated in the educational program of the tribe and research linkages between upland uses and the health of the coastal environment.

4. Forks

Forks is the center of the timber industry and the commercial center for the Olympic Peninsula. It is located approximately 12 miles from the coast. It will be the location of the Olympic Center which will offer an opportunity to coordinate research focusing on the linkages between upland uses and the coastal ecosystem. The location offers access to tourists and upland users of the watershed and a central location for the entire population on the Olympic Peninsula. A main office of the National Forest Service and an office of the state Department of Natural Resources are also located in the Forks area.

PART VI: List of Preparers and Acknowledgements

PART VI: LIST OF PREPARERS AND ACKNOWLEDGEMENTS

Mr. Joseph Flanagan - Environmental Protection Specialist, Ocean Minerals and Energy Division, NOAA. Mr. Flanagan contributed to the synthesis of information and narrative for Part II which describes the resources and uses of the Olympic Coast area. His academic background includes a Bachelors Degree in Geology and Chemistry from the University of Miami, Florida; and a Master's Degree in Environmental Systems Management from American University, Washington D.C.

Ms. Nina Garfield - Program Specialist, Sanctuaries and Reserves Division, NOAA. Ms. Garfield was responsible for assisting in the final data analysis, writing, editing, and preparation of the draft EIS/MP, and the overall supervision and preparation of the Final EIS/MP and regulations. Her academic background includes a Bachelors Degree in Sociology and Psychology from Kalamazoo College in Kalamazoo, MI; a Masters Degree in Marine Affairs at the University of Rhode Island; course work in Chemistry and Physics at the University of Pittsburgh and Mariculture at the Marine Biological Laboratory in Woods Hole, Ma.

Ms. Karen Holtz - Sea Grant Fellow serving as a Program Specialist for the Sanctuaries and Reserves Division, NOAA. Ms. Holtz was responsible for collecting information and making many of the Federal, tribal, state, and other individual contacts necessary for the preparation of this document. Ms. Holtz wrote the first complete draft of the DEIS/MP and developed the initial regulatory alternatives for this project. Her academic background includes a Bachelor's Degree from Colby College, Maine, and a Masters Degree in Marine Policy from the Institute for Marine Studies, University of Washington, Seattle, WA.

Mr. Scott Kathey - Graduate Intern, Sanctuaries and Reserves Division, NOAA. Mr. Kathey has significantly modified the natural resources section for Part II of the FEIS, contributed to preparation of response to comments, and prepared Appendix F and J of the FEIS/MP. Mr. Kathey is a senior graduate student at the Graduate School of Marine Affairs of the University of Washington in Seattle. He received a Bachelors Degree in International Affairs from the George Washington University, Washington, D.C.

Mr. Rafael Lopez - Pacific Regional Manager, Sanctuaries and Reserves Division, NOAA. Mr. Lopez was responsible for overseeing the Sanctuary designation process following the release of the DEIS/MP. Mr. Lopez received his Bachelors of Science Degree in Physical Oceanography from the Florida Institute of Technology in Melbourne, Florida.

Ms. Linda Maxson - On-site Liaison for the Sanctuaries and Reserves Division, NOAA. Ms. Maxson has served as the SRD contact person for the Olympic Coast project, offered policy guidance on the project, contributed to the preparation of the response to comments and management plan, and edited the FEIS/MP. Ms. Maxson received a Bachelors Degree from the University of California, Davis and a Masters of Science Degree from the University of New Hampshire in Education.

Mr. Chris Ostrom - Senior Project Manager, Sanctuaries and Reserves Division, NOAA. Mr. Ostrom was responsible for the preparation of the DEIS/MP and regulations. His academic background includes a Bachelor's Degree from the University of California at Santa Barbara, and a Master's Degree in Biological Oceanography from the Florida State University Graduate School of Oceanography, Tallahassee, Florida.

CDR. Larry Simoneaux - NOAA Corps Officer, Sanctuaries and Reserves Division, NOAA. CDR. Simoneaux spearheaded the development of the analysis for NOAA's proposal to the Coast Guard of an Area to be Avoided in Part V of the FEIS/MP. In addition, CDR. Simoneaux served in a liaison capacity with the vessel traffic industry and Washington State in matters related to vessel traffic, and contributed to preparation of response to comments. CDR Simoneaux received a Bachelors of Science Degree from the United States Naval Academy and a Masters of Science Degree in Fisheries Biology and Statistics from Louisiana State University in Baton Rouge, LA.

Mr. Glen Tallia - Legal Counsel, General Counsel, Office of Coastal Resource Management, NOAA. Mr. Tallia provided legal guidance and support throughout the development of the DEIS/MP and FEIS/MP. Mr. Tallia received a Bachelors of

Acknowledgements

The preparers would like to offer special thanks to the Office of Oceanography and Marine Assessment (now called the Strategic Environmental Assessments Division, ORCA/NOS/NOAA), headed by Mr. Daniel Basta and directed by Eric Slaughter (Ron Wolitera, Peter Wiley, Anthony Pait, Dan Farrow, Samuel Orlando, Diane Bowen, Elizabeth Archer, Marilyn King, Tom LaPointe, Tim Goodspeed, Tom Culliton and Tracey Gill) for preparing Appendix 2 of the DEIS/MP: "A Proposal for the Olympic Coast National Marine Sanctuary: Site Evaluation Report."

In addition the preparers would like to thank Paul Crawford (National Park Service) Bill Hesselbart (U.S. Fish and Wildlife Service), Craig Bowhay (Northwest Indian Fisheries Commission), and Dave McCraney, Terry Swanson, and Pam Miller (Governor's Ocean Policy Work Group), Bill Simmons, Shari Schaftlein, and Christian Penn for providing invaluable input into the development of the sanctuary proposal and preparation of this document. Rob McMahon, Ocean Issues Coordinator for the Washington State Coastal Counties, kept us in touch with local concerns. Tom Peeling, Ben West, Lt. Kirby Nelson, Elsie Munsell, and Chris Nelson of the Navy provided information on Naval activities for the FEIS/MP. Special thanks is extended to Margie Hegy of the U.S. Coast Guard, Margie Smitch of the Washington State Office of Marine Safety, CDR. Stan Norman of the U.S Coast Guard and CDR. Ken Lilly of the NOAA Corps (retired), and Dick Lauer of Sause Brothers Marine, Inc. for their support in the analysis for the proposal of the Area to be Avoided to the Coast Guard. Our gratitude is also offered to Fred Felleman and Rick Malsed for enthusiastically supporting our efforts.

Further acknowledgement is extended to George Galasso for his research on industrial dumpsites; Enid, Tina, Jennifer and Lauren Berger, and Brady Phillips for their editorial and secretarial support.

PART VII: List of Agencies, Organizations, and Persons Receiving Copies

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Federal Agencies

Advisory Council on Historic Preservation
Department of Agriculture
Department of Commerce
Department of Defense
Department of Energy
Department of Health and Human Services
Department of the Interior
Department of Justice
Department of Labor
Department of Transportation - U.S. Coast Guard
Environmental Protection Agency
Federal Energy Regulatory Commission
Marine Mammal Commission
Nuclear Regulatory Commission
Pacific Fishery Management Council

Congressional

Members of the U.S. House Committee on Merchant Marine and Fisheries
Members of the U.S. Senate Committee on Commerce, Science and Transportation
Honorable Slade Gorton, United States Senate
Honorable Patty Murray, United States Senate
Honorable Maria Cantwell, U.S. House of Representatives
Honorable Norman D. Dicks, U.S. House of Representatives
Honorable Thomas S. Foley, U.S. House of Representatives
Honorable Jay Inslee, U.S. House of Representatives
Honorable Mike Kreidler, U.S. House of Representatives
Honorable James A. McDermott, U.S. House of Representatives
Honorable Al Swift, U.S. House of Representatives
Honorable Jolene Unsoeld, U.S. House of Representatives
Honorable Jennifer Dunn, U.S. House of Representatives

Washington State Government and Agencies

Clallam County Commissioners
City of Aberdeen
City of Hoquiam
City of Ocean Shores
Department of Agriculture
Department of Ecology
Department of Fisheries
Department of Community Development, Office of Archeology and Historic Preservation
Department of Natural Resources
Parks and Recreation
Department of Treasury
Department of Trade and Economic Development

Department of Wildlife
Energy Office
Grays Harbor County Commissioners
Island County Commissioners
Jefferson County Commissioners
Pacific County Commissioners
Parks and Recreation Commission
Puget Sound Water Quality Authority
San Juan County Planning Department
Washington Coast Chamber of Commerce
Whatcom County Planning Department

<u>Tribal Governments and Agencies</u>
Quinault Indian Nation
Hoh Indian Nation
Quileute Indian Nation
Makah Indian Nation
Point No Point Treaty Council
Northwest Indian Fisheries Commission

<u>National, Regional and Local Interests</u>
Admiralty Audubon
American Association of University Women
American Bureau of Shipping
American Cetacean Society
American Fisheries Society
American Gas Association
American Littoral Society
American Petroleum Institute
American Oceans Campaign
Amoco Production Company
Arthur Farrell Marine Lab
Atlantic Richfield Company
Bay Watchers
Black Hills Audubon Society
Boating Industry Association
BP Oil Company
Bullet Foundation
Cascadia Research Collective
Coastal Washington Marine Research
Center for Law and Social Policy
Center for Marine Conservation
Chevron U.S.A., Inc.
Citizens Against Litter
Citizen's Organized Rally Against Leasing (CORAL)
Clean Air Now
Clean Water Action
Coalition of Washington Ocean Fishermen
Coast Alliance
Columbia-Pacific Resource Conservation Development Council
Columbia River Crab Fisherman's Association
Conservation Foundation

Continental Oil Company
The Cousteau Society
CZM Newsletter
Defenders of Wildlife

East Lake Washington Audubon Society
Edison Electric Institute
El Paso Natural Gas Company
Elma Chamber of Commerce
Environmental Policy Center
Environmental Defense Fund, Inc.
Environmental Law Institute
Exxon Company, U.S.A.
Fisherman's Marketing Association
Friends of the Coast
Friends of the Earth
Friends of the San Juans
Friends of the Sea Otter
Grays Harbor Chamber of Commerce
Grays Harbor Economic Development Council
Grays Harbor Regional Planning Commission
Greater Seattle Chamber of Commerce
Greenpeace, U.S.A.
Gulf Oil Company
The Human Race
Inland Waters Coalition
Inverness Association
Kitsap Audubon Society
Lake Sammish Community Association
Lakewood Junior Women's Club
Marine Technology Society
The Marine Wilderness Society
Mayr Bros. Logging Co., Inc.
Mobil Oil Corporation
Mountaineers
National Association of Counties
National Audubon Society
National Campers and Hikers Association
National Coalition for Marine Conservation, Inc.
National Federation of Fishermen
National Fisheries Institute
National Ocean Industries Association
National Recreation and Park Association
National Research Council
National Wildlife Federation
Natural Resources Defense Council
Natural Resources Law Institute
No Oilport!
North Pacific Fishing Vessel Owner's Association
North River Protection Association
North Sound Sea Kayaking Association
Ocean Park Chamber of Commerce

Olympic Environmental Council
Olympic Park Associates
Olympic Peninsula Economic Research Association
Olympic Waters
Pacific Coast Federation of Fisherman's Associations, Inc.
Pacific Conservation District
Pacific States Marine Fisheries Commission
Pacific Salmon Sportfishing Commission
People for Puget Sound
Port of Grays Harbor
Port of Ilwaco
Port of Port Angeles
Port of South Bend
Port of Raymond
Port of Tacoma
Port of Port Townsend
Port of Willapa Harbor
Port Townsend Marine Science Center
Protect the Peninsula's Future
Puget Sound Alliance
Puget Sound Steamship Operators Association, Inc.
San Juan Marina
Seattle Audubon Society
Sierra Club-Cascade Chapter
Sierra Club-Willapa Bay Chapter
Soundwatch
Southwest Washington Anglers
Sport Fishing Institute
Tahoma Audubon
TESC/Environmental Resource Center
Texaco USA
To Protect the Peninsula's Future
Trout Unlimited
Union Oil Company
United States Naval Institute
University of Washington Law Society
Vancouver Audubon
Washington Contract Loggers Association
Washington Dungeness Crab Fishermen's Association
Washington Environmental Council
Washington Public Ports
Washington Trollers Association
Washington Wilderness Coalition
Water Pollution Control Federation
Westport Charters, Inc.
The Whale Museum
Whatcom County Planning Department
The Wilderness Society
Willapa Bay Water Resources Coordination Council
World Wildlife Fund-U.S.
Yakima Audubon

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