# Kodiak Island and Shelikof Strait, Alaska

## Environmentally Sensitive Areas: Winter (November -March)

### PURPOSE

This series of seasonal maps is intended to provide a regional overview of the environmentally sensitive resources of Kodiak Island and Shelikof Strait that would receive priority protection during oil spill planning and response. The resources depicted on the maps were selected on the basis of their high sensitivity and/or vulnerability to spilled oil or their special management status. Kodiak Island and Shelikof Strait are rich in their marine resources, and it is not possible to show all resources that are sensitive to oil. Species with widespread, ubiquitous distributions are not shown. Instead, the maps depict the distribution of sensitive resources when they are most at risk from oil spills using the following criteria: large numbers of individuals concentrated in relatively small areas; early life stages present in restricted areas; where they come ashore for birthing, resting, or molting; areas important to specific life stages or migration patterns; they are threatened or endangered; and where a significant percentage of the population is likely to be exposed to oil during a spill.

Two general types of information appear on the maps: year-round data and seasonal data. Year-round data portray sensitive resources that are present in a given location throughout the year. These resources include sensitive shoreline habitats, such as marshes, tidal flats, and sheltered rocky shores, shellfish beds, anadromous fish streams, and managed lands. For each season, the maps show differing uses of marine habitats by resources according to life stage activity and migration patterns. These seasonal variations in the distribution and abundance of sensitive resources are important considerations in setting protection priorities.

### DEFINITION OF RESOURCES

The categories of sensitive resources depicted on the maps are defined below.

### SENSITIVE SHORELINE HABITATS

*Marshes* – Intertidal habitats that are colonized by perennial vascular plants able to tolerate waterlogged soil conditions. Marshes provide nursery and feeding habitat for many species of fish and wildlife. They are highly susceptible to oil spill impact because they occur at the high-tide line where oil tends to concentrate. They are the most sensitive intertidal habitat because of their high biological utilization and value, difficulty of cleanup, and potential for long-term impacts to both the habitat and the organisms which rely upon them.

*Sheltered tidal flats* – Intertidal habitats that are flat, unvegetated, dominated by soft, muddy substrate, and sheltered from strong tidal currents or wave action. Sheltered tidal flats support large populations of benthic organisms and are important feeding and resting areas for birds and fish. Oil penetration into the muddy, water-saturated sediments will be limited, except where they are highly burrowed. The high biological utilization, soft substrate, and low-energy setting make these habitats highly sensitive to long term oil-spill impacts and almost impossible to clean.

*Sheltered rocky shores* – Bedrock shores sheltered from direct wave attack and highly variable in width, from vertical walls to platforms hundreds of meters wide. They have rich intertidal communities. Oil tends to readily adhere to the rough rocky surface, particularly along the high-tide line. Fractures and tidal pools will be sites of oil accumulation and long-term persistence. Cleanup can be intrusive, usually requiring flushing techniques.

*Exposed tidal flats* – Intertidal habitats that are flat and unvegetated, but the substrate is dominated by sand. Exposure to tidal currents or wave activity is evidenced by the presence of wave-built sand ridges or bars. They support large populations of shellfish which are sought by both humans and wildlife. They are important feeding and resting areas for birds, fish, seals, and sea lions. Oil does not readily adhere to or penetrate the compact, water-saturated sediments; instead, oil is pushed across the surface and accumulates at the high-water line. Exposure to the water-accommodated fraction or smothering can affect infauna. Cleanup is always difficult because of the potential for mixing oil deeper into the sediments.

### SENSITIVE BIOLOGICAL RESOURCES

#### Fish

*Pacific herring spawning areas* – Intertidal and subtidal areas used for spawning by Pacific herring *(Clupea harengus pallasi)* from mid-April through mid-June. Adult herring form large spawning groups and deposit their eggs onto eelgrass, kelp, and other suitable substrate in nearshore areas. Because spawning occurs in shallow water, both adults and eggs are susceptible to exposure to both floating slicks and oil remobilized from adjacent intertidal areas. Herring eggs are susceptible to mortality, reduced hatching success, and an overall decrease in the percent of viable hatch. Herring provide an important item in the diet of marine fishes, mammals, and birds, and are also an important commercial fishery.

*Anadromous fish streams* – Wild stocks of anadromous salmon are major components to the marine ecosystems of Kodiak Island and Shelikof Strait. All five salmon species are present, namely, chinook, coho, chum, pink, and sockeye. The streams shown are only the ones that have been classified by Alaska Department of Fish and Game. During spawning season they may be found in any stream on Kodiak and the surrounding islands. When adult fish return to their natal streams to spawn as early as May (sockeye) to as late as November (coho), they tend to concentrate at the stream mouths prior to moving upstream. Most spawning beds are well upstream, beyond the limit of tidal excursions which could carry oil slicks inland. Juvenile salmon can be present throughout the area and tend to concentrate in shallow, nearshore habitats. They are especially susceptible because of the potential for higher exposures and increased sensitivity to oil when first in seawater.

#### Shellfish

*Razor clam beds* – Intertidal and shallow subtidal areas where major populations of razor clams *(Siliqua patula)* occur. They are an important food item for birds and sea otters, and support subsistence and sport fisheries around Kodiak Island. Because they are sedentary filter-feeders and occur in shallow nearshore areas, they are at risk of being contaminated by spilled oil.

#### Birds

*Marine bird nesting sites* – Locations where marine birds have been documented as nesting, from May through September. This information is derived from the U.S. Fish and Wildlife Service database as of January 1997. The USFWS is constantly updating this database. Birds are in the vicinity of the colony from April through October. See the legend for the list of species included. Two symbols are used to delineate size of the nesting colony in terms of the number of birds present. Nesting sites are of particular concern because of the high concentration of birds in adjacent waters, the potential for contamination of eggs and young by oiled feathers on the adult, and the potential for disturbances to the colony by cleanup activities.

*Bald eagle nests* – Locations of documented bald eagle nests along the shoreline only. There are approximately 1500 nests on the maps. The nesting information is from 1990 survey by Carl Schoch, NPS and Mary Portier, USFWS. The nest sites within the Kodiak NWR are from 1997 surveys by Denny Zwiefelhofer. Although bald eagles are present year-round, the nests are shown only on the spring and summer maps, during the nesting season. Eagles can become oiled when they feed on oiled prey, and eggs can become contaminated from oil carried on the plumage of nesting adults. Nesting can be disturbed by cleanup activities, including aircraft.

*Waterfowl concentration areas* – Coastal areas where migratory waterfowl concentrate in spring (mid-April to mid-May) and fall (mid-August through November). Waterfowl include dabbling ducks, such as pintail, widgeon, green-winged teal, northern shoveler, and mallard; diving ducks, such as scaups, scoters, canvasback, goldeneyes, bufflehead, oldsquaw, harlequin, and mergansers; and geese and swans, including Canada goose, white-fronted goose, snow goose, tundra swan, and trumpeter swan. They are particularly vulnerable during the molting period (late June to mid-August) and the winter season.

#### Marine Mammals

*Harbor seal haulout concentration areas* – Locations where harbor seals *(Phoca vitulina richardsi)* have been documented to concentrate for resting, molting, and pupping. Yellow polygons are used to depict these locations. Harbor seals also concentrate around anadromous fish streams in the summer and herring spawning areas in the spring. Harbor seals are present in the area year-round, however, they are most sensitive when hauled out of water and during pupping which occurs in June and July. Pups are born at the same locations as those used as haulouts at other times of year. Harbor seals rely on blubber to conserve body heat, thus oil impacts are related to ingestion and inhalation. Harbor seal populations have declined precipitously since 1984, making them highly sensitive to additional stress from exposure to oil and disturbances during cleanup activities.

*Steller sea lion haulouts* – Locations where Steller sea lions *(Eumetopias jubatus)* have been documented to use for resting, molting, and pupping. All of the haulouts are shown as yellow points. The four rookeries are depicted with a star, whereas the other haulouts are shown with a dot. Sea lions also concentrate around anadromous fish streams in the summer and herring spawning areas in the spring. Sea lions are present year-round, however, they are most sensitive when hauled out. Sea lions rely on blubber to conserve body heat, thus oil impacts are related to ingestion and inhalation. Their populations have declined precipitously since 1970, with declines as great as 93 percent, making them highly sensitive to additional stress from exposure to oil and disturbances during cleanup activities.

*Sea otter concentration areas* – Areas where sea otters *(Enhydra lutris)* are known to occur in relatively high concentrations. Sea otters are highly sensitive to oil spills, suffering death from hypothermia and severe internal injuries from ingestion of oil during preening and inhalation of oil fumes early in a spill. Sea otter distributions can be variable. Areas not denoted as high concentration areas are likely to have sea otters present throughout the year. This information is from unpublished USFWS 1994 survey data.

*Gray whale migration corridor* – The primary spring and fall migration corridors for the gray whale are shown. These areas would have some of the highest concentrations of whales during migration. These areas may also be used by humpback whales.

### HUMAN USE RESOURCES

The maps include other human-use resources and oceanographic features related to oil spill planning and response.

*Airports* – The airports depicted are all capable of handling small twin engine turboprop airplanes. The Kodiak airport is the only one large enough to accomodate a C-130.

*Bathymetric contours* – Contours to 150 meters are shown. In addition to providing information for dispersent use, the contours also are used as a guide for where benthic fish may concentrate.

*Management areas / parks* – The boundaries of national and state parks, wildlife sanctuaries, refuges, and special management areas are shown. Icons are used to show parks too small to include a boundary. Katmai National Park includes all islands within 5 miles of the shoreline. It is also designated a Wilderness Area, which gives it special management status.

*Marinas* – Boat harbors and marinas are depicted on the map, to assist in management of waterborne resources.

*Salmon hatcheries* – Salmon hatcheries are shown with an aquaculture symbol and the facility name. They are managed by Kodiak Regional Aquaculture Association.

*Set-net sites* – Set-net sites are plotted as a line along the shore.

### RESOURCES NOT SHOWN

Users of these maps should be aware that they include the best available, but still incomplete, depiction of the highly sensitive resources of Kodiak Island and Shelikof Strait. Significant cultural resources were not included on these maps due to their widespread distribution.

Mariculture facilities are also located throughout the area. The areas in the heads of bays are particularly important for both mariculture activities as well as salmon production. Important salmon fishing areas, both commercial and recreational, are found throughout the coastal waters of Kodiak and surrounding islands. Subsistence fishing of both finfish, including salmon and invertebrates is common in all the waters around Kodiak Island.

Whale species are not common in Shelikof Strait, although they may be found throughout the area. Because of the lack of surveys documenting distribution, concentration areas for most of the whales are not shown. Humpback whales are very common off the Barren Islands, East Shuyak, and Northern Afognak in summer. Fin whales concentrate in Shelikof Strait. Dolphins are widely distributed throughout the region. Whales and dolphins are not considered to be highly sensitive to oil spills, but their special management status mandates mitigation of all possible impacts resulting from oil spills and their cleanup.

### DATA SOURCES

Nearly all of the information shown on the maps was provided in digital form from the Alaska Department of Natural Resources, the Kodiak Island Borough, and Alyeska's Graphical Resource Database. These digital data were then synthesized into seasonal distributions and the final map compositions generated used Geographic Information Systems (GIS) software.


### ACKNOWLEDGMENTS

These maps were prepared by Research Planning, Inc. Joseph Holmes was the project cartographer, Jeffrey Dahlin was the project biologist, and William Holton generated the map and digital products. Funding for this project was provided by Alaska Department of Environmental Conservation, Alaska Chadux Corporation, Cook Inlet Regional Citizens Advisory Council, Cook Inlet Spill Prevention and Response, Inc., and Prince William Sound Regional Citizens Advisory Council. The following persons are acknowledged for their valuable participation as providers of data, coordinators, and reviewers: John Whitney and Robert Pavia, National Oceanic and Atmospheric Administration Hazardous Materials Response and Assessment Division; Brad Smith, John Cease, and David Withrow, National Marine Fisheries Service; Claudia Slater, Mark Fink, and Jim McCullough, Alaska Department of Fish and Game; Richard McMahon and Dorothy Mortenson, Alaska Department of Natural Resources; Denny Zwiefelhofer, Angela Doroff, Vivian Mendenhall, John Nichols, and Catherine Berg, U.S. Fish and Wildlife Service; Joel Cusick, Buddy Goatcher, and Bud Rice, National Park Service; Linda Freed and Jim Woitel, Kodiak Island Borough; David O'Brien, EMCON Alaska; Alison Smith, Dames & Moore; and Susan Saupe, Cook Inlet RCAC.


### REFERENCES


Alaska Department of Fish and Game, 1996, Catalog of waters important for spawning, rearing, or migration of anadromous fish: Anchorage, Alaska.

Alaska Department of Fish and Game, 1984, Alaska habitat management guides, southwest region, Volume IV: Habitat Division, Anchorage, Alaska.

Alaska Department of Natural Resources, 1996, *Exxon Valdez* oil spill database summary: Division of Support Services, Anchorage, Alaska.

Alyeska Pipeline Service Company, 1996, Geographical resource database: Anchorage, Alaska.

Erikson, D., 1977, Distribution, abundance, migration, and breeding locations of marine birds, lower Cook Inlet, Alaska, 1976, Vol. VIII: in L.L. Trasky, L.B. Flagg, and D.C. Burbank, Unpubl. report, Alaska Department of Fish and Game, Anchorage, Alaska.

Hayes, M.O. and C. Ruby, 1978, Sensitivity of coastal environments to spilled oil: Kodiak Island, Alaska, University of South Carolina, Columbia, SC.

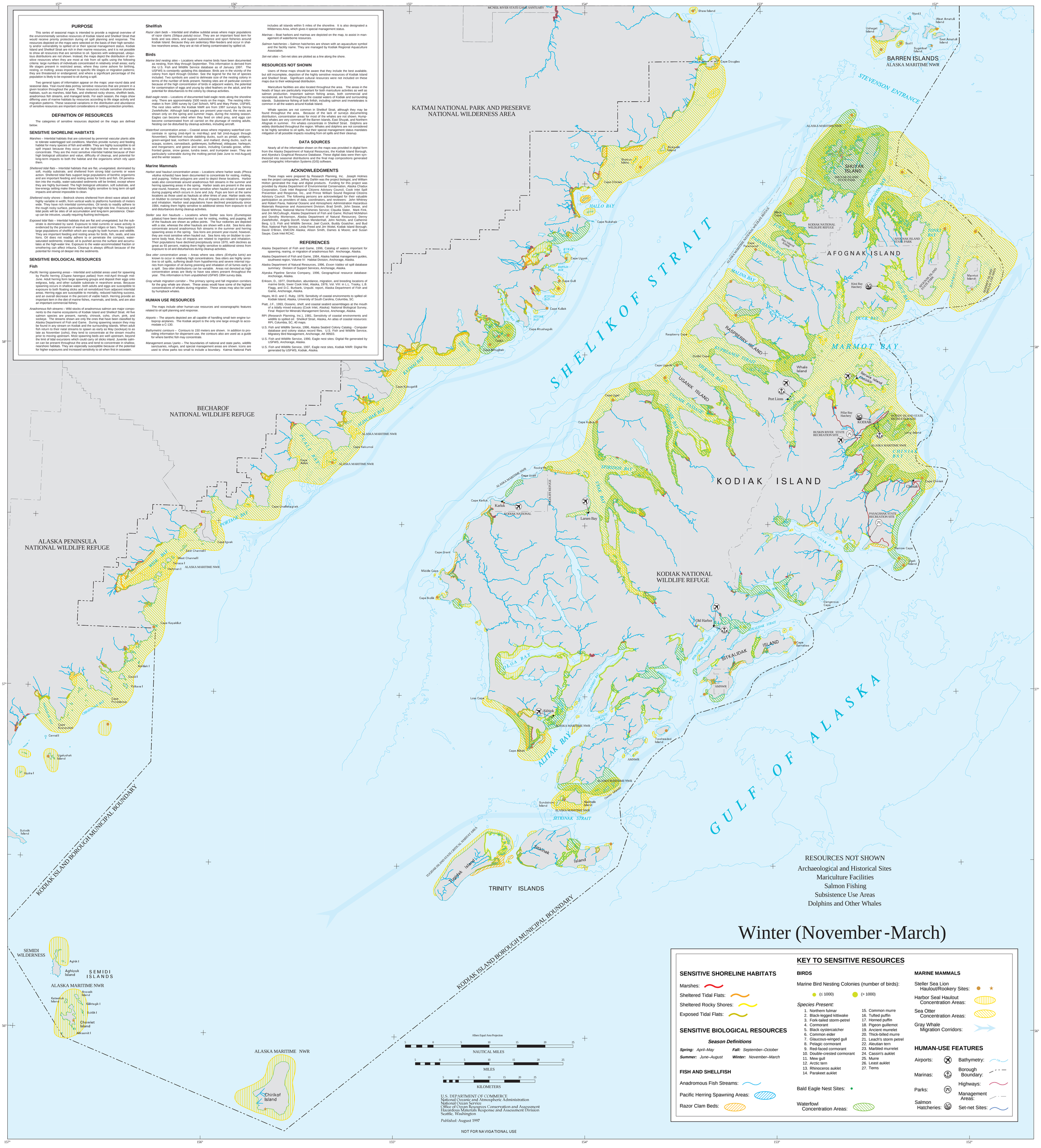
Piatt, J.F., 1993, Oceanic, shelf, and coastal seabird assemblages at the mouth of a tidally mixed estuary (Cook Inlet, Alaska): National Biological Survey, Final Report for Minerals Management Service, Anchorage, Alaska.

RPI (Research Planning, Inc.), 1981, Sensitivity of coastal environments and wildlife to spilled oil: Shelikof Strait, Alaska, An atlas of coastal resources: RPI, Columbia, SC, 40 maps.

U.S. Fish and Wildlife Service, 1996, Alaska Seabird Colony Catalog - Computer database and colony status record files. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK 99503.

U.S. Fish and Wildlife Service, 1990, Eagle nest sites: Digital file generated by USFWS, Anchorage, Alaska.

U.S. Fish and Wildlife Service, 1997, Eagle nest sites, Kodiak NWR: Digital file generated by USFWS, Kodiak, Alaska.


RESOURCES NOT SHOWN

Archaeological and Historical Sites
Mariculture Facilities
Salmon Fishing
Subsistence Use Areas
Dolphins and Other Whales

## Winter (November -March)

### KEY TO SENSITIVE RESOURCES

#### SENSITIVE SHORELINE HABITATS

Marshes:
Sheltered Tidal Flats:
Sheltered Rocky Shores:
Exposed Tidal Flats:

#### SENSITIVE BIOLOGICAL RESOURCES

***Season Definitions***

***Spring:*** *April–May* ***Fall:*** *September–October*
***Summer:*** *June–August* ***Winter:*** *November–March*

#### FISH AND SHELLFISH

Anadromous Fish Streams:
Pacific Herring Spawning Areas:
Razor Clam Beds:

#### BIRDS

Marine Bird Nesting Colonies (number of birds):

(≤ 1000) (> 1000)

*Species Present:*

1. Northern fulmar
2. Black-legged kittiwake
3. Fork-tailed storm-petrel
4. Cormorant
5. Black oystercatcher
6. Common eider
7. Glaucous-winged gull
8. Pelagic cormorant
9. Red-faced cormorant
10. Double-crested cormorant
11. Mew gull
12. Arctic tern
13. Rhinoceros auklet
14. Parakeet auklet
15. Common murre
16. Tufted puffin
17. Horned puffin
18. Pigeon guillemot
19. Ancient murrelet
20. Thick-billed murre
21. Leach's storm petrel
22. Aleutian tern
23. Marbled murrelet
24. Cassin's auklet
25. Murre
26. Least auklet
27. Terns

Bald Eagle Nest Sites:
Waterfowl Concentration Areas:

#### MARINE MAMMALS

Steller Sea Lion Haulout/Rookery Sites:
Harbor Seal Haulout Concentration Areas:
Sea Otter Concentration Areas:
Gray Whale Migration Corridors:

#### HUMAN-USE FEATURES

Airports:
Marinas:
Parks:
Salmon Hatcheries:
Bathymetry:
Borough Boundary:
Highways:
Management Areas:
Set-net Sites:

## Winter (November -March)