Cook Inlet and Kenai Peninsula, Alaska

Environmentally Sensitive Areas: Fall (September - November)

PURPOSE

This series of seasonal maps is intended to provide a regional overview of the environmentally sensitive resources of Cook Inlet and the Kenai Peninsula 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. Cook Inlet and the Kenai Peninsula are rich in their marine resources, and it was 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 are concentrated in relatively small areas; early life stages are present in restricted areas; individuals come ashore for birthing, resting, or molting; areas that are important to specific life stages or migration patterns; species are threatened or endangered; and a significant percentage of the population is likely to be exposed to oil during spills.

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 and tidal flats, 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 various categories of sensitive resources depicted on the maps are defined below.

SENSITIVE SHORELINE HABITATS

Marshes — Intertidal habitats colonized by perennial vascular plants able to tolerate waterlogged soil conditions. Marshes provide nursery and feeding habitat for many species of fish and wildlife. Marshes 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 it.

Sheltered tidal flats — Intertidal habitats that are flat, unvegetated, sheltered from strong tidal currents or wave action, and dominated by soft, muddy substrate. 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 these sediments are highly burrowed. The high biological utilization, soft substrate, and low-energy setting make these habitats highly sensitive to 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 adhere readily to the rough rocky surface, particularly along the high-tide line. Fractures will be sites of pooling and long-term persistence of oil. Cleanup can be intrusive, usually requiring flushing techniques.

Exposed tidal flats — Intertidal habitats that also are flat and unvegetated; however, the substrate is dominated by sand, and exposure to tidal currents or wave activity is evidenced by the presence of wave-built sand ridges or bars. In middle and lower Cook Inlet, 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 smoothering 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 May 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 stranded on adjacent intertidal areas. Herring eggs are susceptible to mortality, reduced hatching success, and an overall decrease in the percentage 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 Cook Inlet and the Kenai Peninsula. All five salmon species are present; namely, chinook, coho, chum, pink, and sockeye. 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 in Cook Inlet. Because they are sedentary filter-feeders and occur in nearshore areas, they are at risk of contamination by spilled oil.

Birds

Marine bird nesting sites — Locations where marine birds have been documented as nesting from May through September. 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 disturbances to the colony by cleanup activities.

Bald eagle nests — Locations of documented bald eagle nests along the shoreline only. There are 309 nests on the maps. 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 with oil carried on the plumage of nesting adults.

Seabird concentration areas — Locations where seabirds concentrate for feeding during the summer and winter, and for staging during the fall.

Waterfowl concentration areas — Coastal areas where large concentrations of migratory waterfowl occur 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. Areas along the western coast (Susitna Flats, Trading Bay, and Redoubt Bay), as well as Kenai River, Kasilof River, and Chickaloon Bay, are especially important as spring migration areas. Steller's eider is listed as Threatened under the Endangered Species Act. Steller's eider are concentrated in the areas shown on the map during winter and spring.

Shorebird concentration areas – Intertidal staging areas where large numbers of shorebirds rest and feed during spring and fall migrations. A large number of species can be present, with the dominant species including least sandpiper, western sandpiper, and semipalmated plover. Areas identified as shorebird concentrations contain dense populations of *Macoma* clams which are a critical food item for shorebirds. If clam beds are impacted by oil, shorebird populations would also be severely impacted.

Marine Mammals

Harbor seal haulout concentration areas — Locations where harbor seals *(Phoca vitulina richardsi)* have been documented to concentrate for resting, molting, and pupping. Both points and polygons are used to depict these locations. 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. Sea lions are present year-round; however, they are most sensitive when hauled out. Sugarloaf Island and Pye Island are the only known rookeries in the region and thus are of major concern. 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 —Sea otters *(Enhydra lutris)* are concentrated in the areas of Kamishak and Kachemak Bays and along the southern shoreline of the Kenai Peninsula. On the peninsula the otters have the highest concentrations at the heads of the bays. Sea otters are highly sensitive to oil spills, suffering death from hypothermia and severe internal injuries from ingestion and inhalation of oil.

Beluga whale concentration areas — Areas where beluga whales *(Delphinapterus leucas)* concentrate. Belugas are year-round residents but tend to concentrate near river mouths in the upper inlet in the spring and early summer. In fall and winter, belugas spread out to cover Upper Cook Inlet from Kalgin Island north.

Gray whales - Gray whales' spring migration (April to May) route follows the Kenai Peninsula south past the Barren Islands enroute to their summer feeding grounds in the Chukchi and Bering Seas.

Humpback and Killer whales - Humpback whales concentrate around the Barren Islands in the summer and fall. Killer whales are most common in the summer around the islands of the Kenai Peninsula and in Kachemak Bay.

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 Cook Inlet and the Kenai Peninsula. Certain significant cultural resources were not included on these maps due to their widespread distribution.

Other than the beluga, whale species are not common in Cook Inlet, although they pass by the Kenai Peninsula during migration. Fin whales have been spotted occasionally in the mouth of the inlet. Humpback whales are very common off the Barren Islands in summer. 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.

OTHER MAPPED INFORMATION

The maps include other human-use resources and oceanographic features related to oil-spill planning and response. The boundaries of national and state parks, wildlife sanctuaries, refuges, and special management areas are shown. Aquaculture facilities are shown with a symbol and the facility name. Set-net sites are plotted as a line along the shore. The locations of oil-production platforms and marine pipelines are indicated, as well as onshore terminals. Permanent rip zones have been mapped because they are also areas where floating debris, and thus oil, tends to concentrate on the water surface. Ice coverage is shown for the maximum limits of up to 50 percent ice coverage for each month in a season.

DATA SOURCES

Nearly all of the information shown on the maps was provided in digital form from the Alaska Department of Natural Resources and the Kenai Peninsula Borough. These digital data then were synthesized into seasonal distributions and the final map compositions generated used Geographic Information Systems (GIS) software.

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REFERENCES

Agler, B.A., S.J. Kendall, P.E. Seiser, and D.B. Irons, 1994. Field report: marine bird survey of lower Cook Inlet, February-March 1994: Unpubl. report, U.S. Fish and Wildlife Service, Anchorage, Alaska, 17 pp.

Alaska Department of Fish and Game, 1984. *Alaska habitat management guides, south central Alaska map series:* Habitat Division, Anchorage, Alaska.

Alaska Department of Fish and Game, 2001, *Anadromous Streams - Southcentral Region*, 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.

LaBelle, J.C., J.L. Wise, R.P. Voelker, R.H. Schulze, and G.M. Wohl, 1983. *Alaska Marine Ice Atlas*: AEIDC, University of Alaska, Anchorage, Alaska.

Pait, 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.), 1985, *Sensitivity of coastal environments and wildlife to spilled oil: Cook Inlet/Kenai Peninsula, Alaska, An atlas of coastal resources*: RPI, Columbia, S.C., 57 maps.

U.S. Fish and Wildlife Service, 2000, Beringian Seabird Colony Catalog - computer database, U.S. Fish and Wildlife Service, Migratory Bird Manageemnt, Anchorage, Alaska.

U.S. Fish and Wildlife Service, 1993, Eagle nest sites: Digital file generated by USFWS, Anchorage, Alaska.

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–November
Summer: June–August **Winter:** December–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. Herring gull
27. Murre
28. Glaucous-winged/ herring gull hybrid

Bald Eagle Nest Sites:

Concentration Areas:

Waterfowl: Seabirds:
Shorebirds: Steller's Eider:

MARINE MAMMALS

Steller Sea Lion Haulout/Rookery Sites:
Harbor Seal Haulout Concentration Areas:

Concentration Areas:

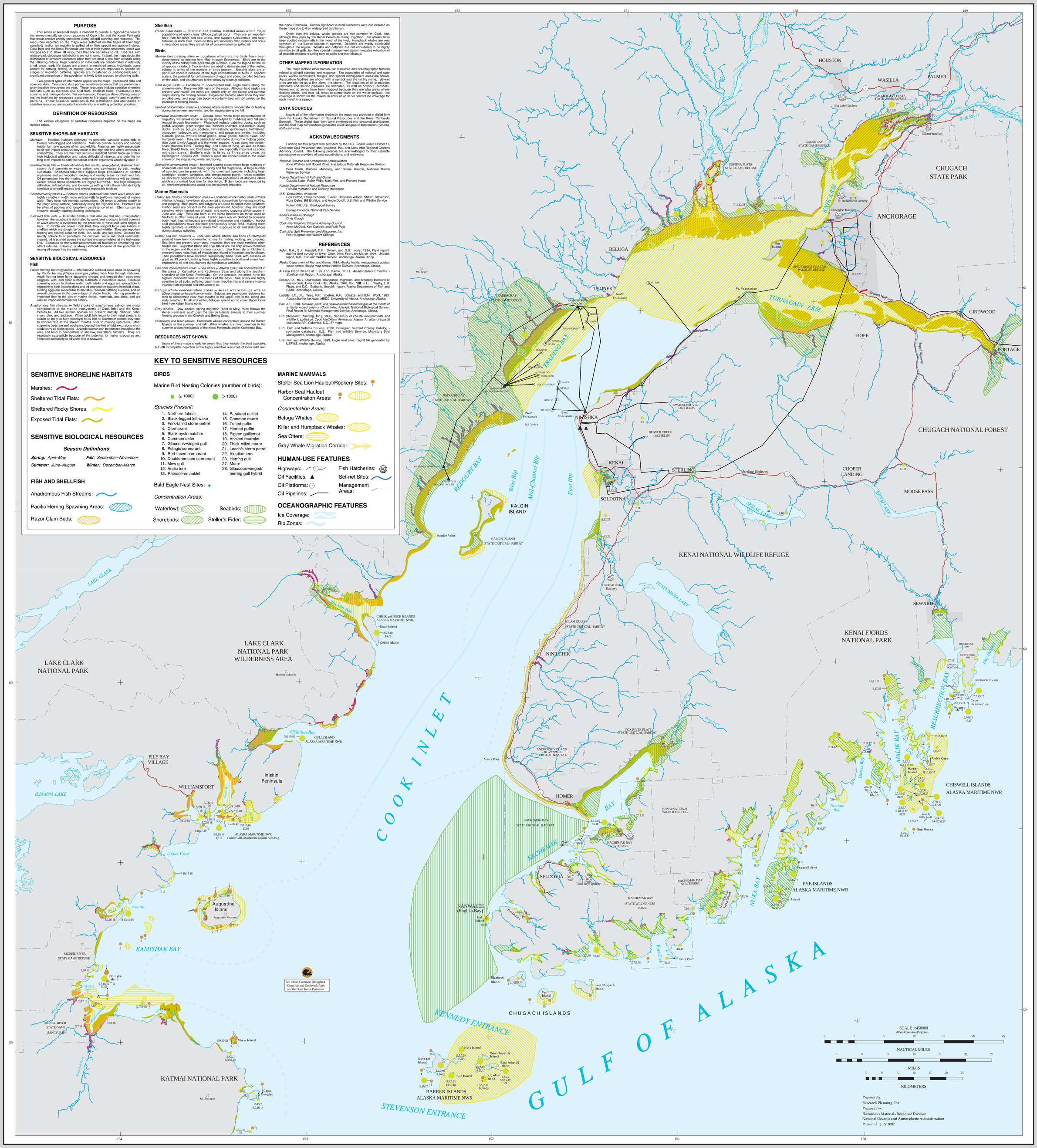
Beluga Whales:
Killer and Humpback Whales:
Sea Otters:
Gray Whale Migration Corridor:

HUMAN-USE FEATURES

Highways: Fish Hatcheries:
Oil Facilities: Set-net Sites:
Oil Platforms: Management Areas:
Oil Pipelines:

OCEANOGRAPHIC FEATURES

Ice Coverage:
Rip Zones:



Fall (September-November)