Chapter Three: Habitat, Fish and Wildlife

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Chapter Three: Habitat, Fish and Wildlife

This chapter describes the onshore and offshore biota, fish, and wildlife living in or near the Cook Inlet and Susitna areas.

A. Onshore and Marine Habitat

1. Forest systems

Terrestrial vegetation in the Cook Inlet and Susitna basins is composed of several overlapping vegetation systems. Biomes provide important habitat for fish, wildlife, and human survival. The generalized forest and tundra habitats are not exact and local conditions may vary. Species composition of forest types is described in bold below.

The west side of Cook Inlet is covered by upland spruce-hardwood forest with patches of wet tundra near the coast. A lobe of lowland spruce-hardwood forest typical of the Matanuska-Susitna valley extends south of Beluga lake (AEIDC, 1974). North of Granite Point, forests are primarily mixed white spruce, with patches of hemlock, Sitka spruce and aspen. Black spruce, mosses, sedges and scrubs are found in poorly drained areas. South from Granite Point to Tuxedni Bay, sedges, mosses, willows, and scrubs are the dominant vegetation, with some cottonwood, and alder in areas with better drainage. (KPB, 1990:1-15).

Forest systems of the Kenai lowlands are dominated by upland spruce-hardwood with large patches of lowland spruce-hardwood near Tustumena lake and in the Kenai Moose Range. Other forest systems between the coast and the glaciated highlands include bottomland spruce-poplar along major river corridors of Deep Creek and the Kenai and Kasilof Rivers. Many areas of the Kenai plain are interspersed with wet tundra, low brush bog and muskeg. The entire coast of Kachemak Bay and the southern tip of the Kenai peninsula including higher elevations along the Kenai foothills and inland valleys are characteristic of coastal western hemlock-Sitka spruce forest. However, much of this forest is standing dead or dying due to a spruce-bark beetle epidemic in recent years. The local distribution and abundance of specific plants and animals varies considerably within each system and in transition zones as a result of local soil, climate, slope face, exposure to storm tracks, and other conditions (AEIDC, 1974:122).

Forests of the Anchorage bowl consist of upland and lowland spruce-hardwood forest with bottomland spruce-poplar growth along Campbell and Ship Creeks, and along Eagle River. Lowland spruce-hardwood forests dominate the central and eastern portions of Anchorage, and alpine tundra covers the foothills of the Chugach Mountains. A wet tundra forest covers Fire Island, Palmer Hay Flats, and the flats around the mouth of the Susitna and Little Susitna Rivers (AEIDC, 1974).

Forests of the Susitna basin consist primarily of lowland spruce-hardwoods with patches of low brush bog and muskeg associated with lowland and lake areas. Bottomland spruce-hardwoods are found along all major rivers of the valley. Mounts Susitna and Beluga are covered by an upland spruce hardwood forest up to the tree line (about 1,000 ft. elevation). This forest type also skirts the perimeter of the Susitna valley below its tree line. A band of high brush forest covers the western slopes of the Talkeetna Mountains below the tree line (AEIDC, 1974).

Real-time or instantaneous satellite images reveal the changing forests of the Cook Inlet basin. The Division of Forestry, USDA, the University of Alaska, and others are researching problems associated with beetle infestation and fire control (Agroborealis, 1997). Major forest groups of the Cook Inlet basin are described below. Local species composition may vary.

Upland spruce hardwood forests are dense compositions of black cottonwood, white spruce, Alaska paper birch, quaking aspen, and balsam poplar trees. Shrubs living beneath the protective canopy include willow, alder, rose, high bush cranberry, lingonberry, raspberry, and currant. Plants inhabiting the floor include fireweed, horsetail, and several species of ferns, lichens, mosses, mushrooms, and fungi. Lower level

organisms, like insects and fungi, are important for nutrient exchange and ultimate existence of creatures higher up the food chain. Young trees and shrubs in this forest provide food for moose, protective habitat for furbearers, and soil stabilizing root systems for erosion control (AEIDC, 1974: 127).

Lowland spruce-hardwood forests are composed of mixed groupings of white spruce, paper birch, quaking aspen and balsam poplar with pure stands of black spruce, and open areas of shrubs, mosses and lichens. Some shrubs include willow, dwarf arctic birch, lingonberry, blueberry, Labrador tea, crowberry, and bearberry. This forest system provides important browse for moose and winter forage for caribou (AEIDC, 1974:126).

Bottomland spruce-poplar forests consist of white spruce mixed with balsam poplar and tall cottonwoods. Birch, aspen, and black spruce also populate river terraces and flood plains. Young trees compete with aggressive shrubs including American green alder, thinleaf alder, willow, rose, blueberry, raspberry, high bush cranberry, bearberry, Labrador tea, and many others. Grasses and plants characteristic of upland and lowland forests also dominate the forest floor. The tall trees of this system provide important feeding habitat for riparian animals including hawks, eagles, wolverines, and black bears (AEIDC, 1974:126).

Coastal western hemlock-Sitka spruce forests of Cook Inlet and the Kenai peninsula represent the western reach of the temperate rain forest characteristic of southeast Alaska. The front of this forest's range includes the headwaters of Turnagain arm, the coasts of the Kenai Peninsula, and the northern tips of Kodiak Island. The upper canopy of this forest is dominated by Sitka spruce with western and mountain hemlock in higher elevations and on mountain slopes. Other trees found mostly on streambeds in this system are balsam poplar, and black cottonwood. Shrubs include Sitka alder, devils club, salmonberry, willow, Pacific red elder, rusty menziesia, copperbrush, blueberry, and huckleberry. The dense canopy and high moisture provide ideal habitat for abundant ferns and mosses characteristic of the forest floor (AEIDC, 1974:126). In higher elevations, tight groupings of underbrush provide habitat for nesting, breeding, and hibernating activities. The spruce trees of the Kenai peninsula have a shorter life cycle and are on average younger than the trees of the Tongass forest in southeast Alaska (Wahrenbrock, 1996). This forest in Alaska is at its northern fringe.

The coastal Sitka spruce forests of Southcentral Alaska have undergone dramatic changes in the last two decades with the proliferation of the spruce bark beetle. The beetle feeds on the bark of adult Sitka spruce resulting in eventual defoliation and mortality. Large regions of this forest system in Alaska are infested by the beetle, creating resource management and public safety problems. Species composition of infested areas is changing and the protective habitat many creatures depend on is being altered. Foresters are unclear what these changes may mean to fauna (ADN, 1996). Standing and fallen trees exacerbate any fire hazard, especially during the dry summer months. State and federal agencies are researching what this means to habitats of fish and wildlife, and man. More information on the beetle epidemic and fire prevention can be obtained from the Division of Forestry.

Low brush bog and muskeg forests are dominated by dwarf shrubs and a thick mat of sedges, mosses and lichens. Black spruce, western hemlock, and Alaska cedar are found in drier portions. Shrubs include Labrador tea, bog cranberry, willow, crowberry, blueberry, resin birch, and dwarf arctic birch. Plants include cottongrass, sedges, rushes, forbs, lichens, mosses, liverworts, mushrooms and other fungi. This system is especially important for many species of migrating and nesting waterfowl, and finfishes like salmon and trout (AEIDC, 1974: 130) (KPB, 1990:1-14).

Wet tundra biomes dominate in regions with high water tables. Ground cover consists of cottongrass and sedges in low-lying mats. Shrubs characteristic of muskeg forests are sparsely scattered and include flowering potentilla and Labrador tea, but most open areas are populated by grasses and plants including pendant grass, bur reed, mares tail, lyme grass, rushes, sedges, lichens, mosses, liverworts, mushrooms, and many other species (AEIDC, 1974: 131).

High brush biomes are dominated by dense thickets of shrubs including alder, devils club, willow, currant, blueberry, raspberry, lingonberry, soapberry, Alaska spirea, thimbleberry, salmonberry, and dogwood. Grasses, herbs, and other ground covers include bluejoint, fescue, yarrow lupine, Jacob's ladder, horsetail, fireweed, and several species of fern, lichens, and mosses. Lichens and grasses provide food for grazing caribou and other migrating mammals. Brown bears use highland valleys to feed on caribou and as migration

routes to salmon streams. This vegetation system provides important habitat for brown bears and other omnivorous animals (AEIDC, 1974: 128).

Finally, **alpine meadow and tundra scrub** surrounds the sale area at its northern, eastern and western fringe. This biome is composed mainly of low mat plants found on rock and rubble above 2,500 feet. Vegetation includes dwarf arctic birch, arctic willow, arctic sandwort, sedges, lichens, and mosses (AEIDC, 1974: 131).

2. Wetlands and Aquatic plants

The lakes, ponds, pools, ditches, and sluggish streams of Southcentral Alaska support a greatly varied flora. These aquatic plants range from unicellular green and blue-green algae, and more visible filamentous green algae to sedges, rushes, grasses, and other higher plants, many of which flower in their watery habitat. Aquatic mosses, present in many locations, and many other tender underwater herbs are favored foods of moose (AEIDC, 1974:132).

Wetlands are lands where saturation is the primary factor in determining how soil develops and the types of plants and animals living in the soil and on the surface. Wetlands must have one or more of the following attributes: 1) at least periodically, the land supports predominantly hydrophytes (water-loving plants); 2) the substrate is predominantly undrained hydric soil; and 3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin, et al., 1979). Wetland habitats are considered especially sensitive to the impacts of terrestrial creatures including beavers and man. They are also especially important to waterfowl and fishes including salmon, billed birds, loons, and ducks.

Salt marshes and wetlands are found throughout the coastal margins of the Cook Inlet basin. These areas are important to many different types of wildlife, especially migratory waterfowl. Ryegrass and associated plants dominate wetland plant communities farthest from saltwater. The hairgrass community dominates an intermediate band, and closest to salt water, sedges are predominant. Green marine algae may grow close to the mouths of streams. Eelgrass grows where the water is salty, and occasionally Brown algae may grow in brackish waters.

Some plant species found in salt marshes and wetlands of the sale area include:

Common Name	Scientific Name
Ditch grass	*Ruppia spiralis*
Horned pondweed	*Zanichellia palustris*
Arrow grass	*Triglochin spp.*
Alkali grass	*Puccinellia spp.*
Sedges	*Carex spp.*
Rushes	*Juncus spp.*
Reed bent grass	*Calamagrostis*
Hair grass	*Deschampsia spp.*
Lyme grass	*Elymus arenarius spp.*
Yarrow	*Achilla spp.*
Kamchatka fritillary, Sarana	*Fritillaria camschatcensis*
Shooting star	*Dodecatheon pulchellum spp. Superbum*
Buttercup	*Ranunculus spp.*
Beach pea	*Lathyrus maritimus spp.*
Indian paintbrush	*Castilleja spp.*
Marsh fivefinger	*Potentilla palustris*

Source: AEIDC, 1974

Wetlands have many important functions for not just birds and fish, but all of nature's inhabitants. Wetland values can include (Zinn and Copeland, 1997):

- Habitat for aquatic birds and other animals and plants, including numerous threatened or endangered species;
- Production of fish and shellfish;
- Water storage, including mitigating the effects of floods and droughts;
- Water purification;
- Recreation;
- Timber production;
- Food production;
- Education and research; and
- Aesthetic value

3. Marine Habitat

Phytoplankton are the plant life of the sea upon which all marine life are sustained. They are the food source for shellfish and invertebrates, and small animals, called zooplankton. Phytoplankton are essentially free-floating creatures, whereas zooplankton have some motility in the water column.

The review and synthesis published by Sambrotto and Lorenzen (1987) on studies of the primary productivity of Cook Inlet led them to conclude that, during the summer months, the lower Inlet was one of the most productive high latitude shelf areas in the world. Lower trophic-level communities can be thought of as either planktonic (floating or drifting in the water column), pelagic (swimming in the water column) or benthic (living on or in the sea bottom). Plankton populations include both animals (zooplankton) and plants (phytoplankton) (AEIDC, 1974:151). The abundance and distribution of plankton depend on many factors associated with the physical environment such as available sunlight, wind, currents, turbidity, temperature, nutrient availability, competition, and predation.

Cook Inlet marine water and sediment quality is described in Chapter Five. Effects of oil and gas activities on lower trophic-level organisms is described in Chapter Six.

B. Fish and Wildlife Populations

1. Intertidal Communities and Shellfish

Estuaries and some bays and coves are important nursery sites for juvenile fishes, shrimp, and crabs and also provide an important food source for sea birds, fish, and marine mammals. **In Cook Inlet,** marine species diversity generally decreases to the north with increased siltation and fresh water input. For information on human consumption of marine resources, see Chapter Four.

Brown algae (*Fucus sp*.) and red algae dominate benthic plant communities of lower Cook Inlet tidelands. Filamentous green algae (*Urospora sp*.), sea lettuce (*Ulva sp*.), and *Laminara* also inhabit the inter-tidal zone and provide important housing, food, and predator protection for many marine creatures. Kelp are present in the low intertidal areas out to about three meters in depth but are absent beyond the five-meter depth. The movement of winter ice is a possible cause for the lack of seaweed within the midtidal zone (Lees et al. 1986).

Dominant animal species inhabiting the intertidal and sub-tidal fringe south of the Forelands include sea urchins, chitons, limpets, whelks, mussels, clams, cockles, polychaetes, bryozoans, sponges, sea stars, sea cucumbers, snails, octopus, skate, barnacles, crabs, forage fish, and small flat fishes (Feder and Jewett, 1987) (Kessler, 1985).

Marine invertebrates of nearshore and offshore waters include sea cucumbers, many species of sea star, nudibranches, octopus, tunicates, worms, and sea leeches (Kessler, 1985).

Shellfish begin life as planktonic eggs released into ocean currents by gravid females. Mollusks usually settle to the bottom and with the exception of snails and octopus, permanently attach themselves to a suitable substrate in the sub-tidal zone. Most crustaceans sink to the bottom and spend their adult life there where they must find protection or be consumed by cod, halibut, flounder, octopus, skate, and other shellfish.

Razor clams (*Siliqua sp.*) are abundant in commercial quantities in Cook Inlet. Stocks are concentrated in the Polly Creek area on the west side, and along the east side from Anchor Point to the Kasilof River, although harvest in the latter vicinity is limited to sport and personal use (Ruesch and Fox, 1995:2) (See Figure 3.1). Littleneck (*Protothaca sp.*) and butter clams (*Saxidomus sp.*) also settle in Kachemak Bay to the south of the sale area. Other clams (*Axe sp., Mya sp., Tresus sp., Spisula sp., Telina sp., Macoma sp.*) inhabit beaches of Cook Inlet and the Gulf of Alaska (Kessler, 1985). Migrating birds and resident shorebirds may depend on Macoma stocks of saltwater marsh habitat. A small stock of scallop (*Patinopecten caurinus*) inhabit Kamishak Bay and some may be found in outer Kachemak Bay (Kessler, 1985) (ASMI, 1995). For information on human consumption of marine resources, see Chapter Four.

Historically, commercially significant populations of tanner, king, and Dungeness crab; and several species of shrimp have inhabited the lower inlet. Kachemak Bay once supported healthy commercial harvests of shrimp and king crab during peak fishing efforts in the 1970s and early 1980s (CFEC, 1995). However, populations of these species have been depressed since the middle 1980s (Trasky, 1995:5, citing RPI, 1994)(ADF&G, 1995a).

2. Fish

The following subsections describe life cycle and species population trends. Population status varies among species and fluctuates depending on ecological factors such as food and predator abundance, reproductive success and survival, and ocean circulation phenomena. Current populations of individual species by region in and near the sale area can be obtained from ADF&G (http://www.state.ak.us/local/akpages/FISH.GAME/adfghome.htm) and NMFS (http://www.nmfs.gov/) Historic abundance (ex: anadromous fish returns) has varied widely over the last several decades. Anadromous fish returns are estimated by ADF&G annually. The harvest of all species described is regulated by either ADF&G or the NMFS. Management plans and guideline harvest levels are set annually by either the Alaska Board of Fish or the North Pacific Marine Fishery Management Council. The use of fish and their value are described in Chapter Four.

a. Salmonids and Trout

Pacific salmon (*Oncorhynchus sp.*) as well as Dolly Varden (*Salvelinus malma*) and steelhead trout (*Salmo gairdneri*) spend portions of their life cycle in the sale area. Most salmon spawn in freshwater streams between June and September, although some pink salmon also spawn intertidally. Eggs and juveniles are present in freshwater year-round, and smolt migrate to the ocean from mid-April through mid-July. Young salmon may be found in marine waters throughout the year (Trasky, 1995:4, citing to Bucher and Hammerstrom, 1993; Ruesch and Fox, 1995; USCG/EPA/ADEC, 1995). Pacific salmon spend up to seven years in the open ocean before migrating back to freshwater in Alaska to spawn and die.

Ten million adult salmon returned to Cook Inlet (1995), beginning in early May and continuing into October. Sockeye salmon are the most numerous species (7 million), followed by pink, coho, chum, and chinook. Three-fourths of these fish return to or pass through the sale area (Trasky, 1995:4).

Sockeye (red) salmon is the most valuable commercial-salmon species in the Cook Inlet region, with extensive runs to streams and lakes. These fish migrate in large schools over much of the North Pacific Ocean and into the eastern Bering Sea. Adult sockeye spawners return to the Cook Inlet and Shelikof Strait region in late June, and the runs continue through early August. Juvenile sockeye spend one to two winters in upstream lakes before their seaward migration. They remain at sea for 2-4 years before returning as mature adults (McPhail and Lindsey, 1970). The majority of the production and harvest of Cook Inlet sockeye occurs in the Upper Cook Inlet area north of Anchor Point (Trasky, 1998).

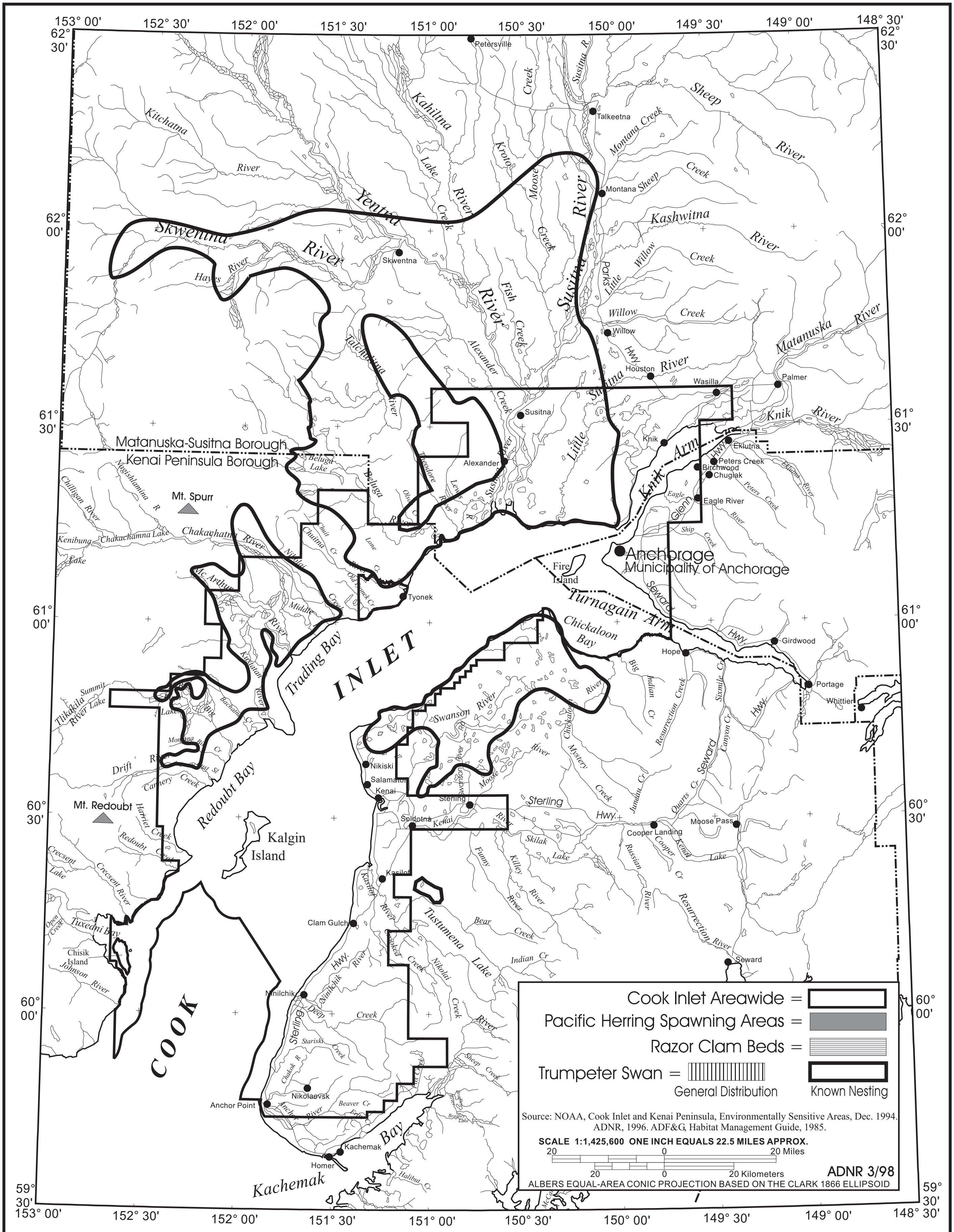


FIGURE 3.1 Important Fish And Wildlife Habitat

Pink salmon are the smallest of the five species of Pacific salmon. They are distributed throughout Cook Inlet from spring through early fall and exhibit cyclical population variance with larger numbers occurring during even numbered years. Spawning pink salmon reach the lower Cook Inlet region in early July, where they spawn in most streams of this region. Pink salmon may also spawn in some estuarine streams. Females deposit between 1,500 to 2,000 eggs in the gravel of spawning streams. After about six months, the eggs hatch into yolk-feeding alevins (Mickelson, 1989). The alevins remain in the gravel for several weeks and emerge in April and May. The fry migrate downstream, form large schools in estuarine areas and remain there for several months before migrating out to sea. They remain at sea for two years where they feed mainly on crustaceans, squid, and small fish (McPhail and Lindsey, 1970).

Chinook (king) salmon are the largest of the Pacific salmon species at maturity. Chinook salmon rear in freshwater for two winters before their seaward migration, and they may spend three to four years in the ocean. In most areas, spawning takes place in late June through late July. A large female may contain up to 8,000 eggs. The eggs hatch in about 7 to 9 weeks depending on the water temperature. The young emerge from the gravel 2to 3 weeks after hatching (McPhail and Lindsey, 1970). They rear in freshwater for two winters before their seaward migration; they may spend 3 to 4 years in the ocean. Spawning chinook salmon enter Cook Inlet during early May and are present in some spawning streams by the end of that month. Chinook salmon are distributed widely throughout the sale area with large runs to the Kenai, Anchor, Ninilchik, and several other rivers of this region. (MMS, 1995: III.B.7).

Chum (dog) salmon are reared throughout the Cook Inlet/Susitna region. They enter the lower Cook Inlet region beginning in early July, and runs continue through early August. Chum salmon spawn in many streams throughout the region. Average females carry 2,000 to 4,300 eggs that hatch in early spring. Chum salmon migrate to sea in the same spring or early summer in which they emerge from the gravel. They return to spawn after two to four years at sea (Rogers, 1987). Chum salmon are an important source of nutrition for wildlife and domestic animals (sled dogs), especially in interior Alaska.

Coho (silver) salmon are the last of the Pacific salmon to return to the sale area each year to spawn. They enter the region in late July, and the runs continue until late September. Females deposit between 2,500 to 5,000 eggs in stream gravel, and emergent fry remain in the stream for two winters before migrating to the ocean. In Cook Inlet, this migration usually occurs annually from March through June. Coho remain in the North Pacific Ocean for two to three winters before returning to spawn in their natal stream (MMS, 1995: III.B.6).

Dolly Varden and steelhead trout are found in rivers throughout the Cook Inlet/Susitna region, and the 1990s have brought particularly large numbers the Kenai, Kasilof, and Anchor rivers. Dolly Varden spawn from July through December; steelhead trout generally spawn during May and June. Both Dolly Varden and steelhead occur in nearshore marine waters from mid-April through November (Trasky, 1995:4, citing to ADF&G, 1994a; ADF&G, 1985c; USCG/USEPA/ADEC, 1995). The number of eggs for Dolly Varden generally ranges from 600 to 8,000 per female (ADF&G, 1985b:173). Steelhead probably enter the ocean after a year in freshwater streams. Larger females may have egg complements of as many as 7,600 eggs (McPhail and Lindsey, 1970).

Other fresh water fishes in rivers and streams throughout the sale area include rainbow trout, whitefish, and burbot. For information on human consumption of fish in the sale area, see Chapter Four.

b. Herring and Smelts

Pacific herring *(Clupea harengus)* Herring spawn in lower Cook Inlet waters and may enter sale area marine waters. Herring primarily range south of the sale area, although some spawning occurs in Tuxedni Bay and a feeding concentration area occurs in nearshore waters between Homer and Ninilchik. They deposit their eggs on rocky substrate kelp and other vegetation of the littoral zone. These eggs are fertilized by extensive concentrations of milt that may cloud the water along many miles of coastline during the spawning season. In the lower Cook Inlet region, herring usually first spawn in their second year and may continue to spawn annually for up to 15 years. The number of eggs per female may range as high as 134,000; however, 20,000 per female is a more realistic number. Depending on water temperature, eggs hatch in about three to seven weeks, and due to limited mobility, may remain in nearshore waters for some time (MMS, 1995: III.B.IV).

Herring are present in the Inlet from April through November (Trasky, 1995:5). Herring spawn in the spring, from approximately May to mid-June. Several spawning areas have been documented just south of the sale area in nearshore waters of Kachemak Bay. Significant numbers of herring also spawned in Tuxedni Bay prior to 1988 (Trasky, 1995:5, citing to ADF&G, 1985c; USCG/USEPA/ADEC, 1995; Ruesch and Fox, 1995).

Eulachon *(Thaleichthys pacificus)* also known as candlefish or hooligan return annually to river mouths of the Cook Inlet/Susitna region. **Capelin** (*Mallotus villosus*) are also present in the region. Anadromous eulachon move nearshore in early May and spawn in drainages throughout Cook Inlet. The eggs are deposited on stream gravel, and they hatch in about 30 to 40 days (depending on water temperature). The larvae then move downstream to enter marine waters. Capelin inhabit mainly the pelagic zone and are filter feeders consuming planktonic organisms. These fish are harvested by humans in small-scale gill and dip net fisheries on some Kenai Peninsula streams and in upper Cook Inlet. Eulachon and capelin are important food for marine birds and eagles; fishes, including salmon; and marine mammals, including beluga whales (MMS, 1995: III.B.5).

Sandlance are an important food for seabirds and dominate the nearshore waters of lower Cook Inlet, whereas offshore and southern waters of Cook Inlet are dominated by juvenile walleye pollock, and capelin. Fish density in Chisik Island waters are less dense than in the waters surrounding Gull Island in Kachemak Bay, and the Barren Islands (Piatt and Roseneau, 1997). Changes in abundance of these forage fish may be related to changes in prey species abundance, like seabirds, beluga whales, seals, and the Steller sea lion (see Steller sea lion, under marine mammals)

c. Groundfish

Walleye pollock Walleye pollock *(Theragra chalcogramma)*, Pacific cod (*Gadus macrocephalus*), and Pacific Tomcod (*Microgadus proximus*) inhabit waters of Shelikof Strait, lower Cook Inlet, and Kachemak Bay. The distribution of these species is not well documented (Trasky, 1995:13, citing to ADF&G, 1993b). Pollock dominates overall fish density in offshore waters of lower Cook Inlet and the Barren Islands. In recent years, juvenile pollock have been found right off the Homer Spit (Piatt, 1997)

Pacific cod Pacific cod are bottom dwelling fish, although like other benthic dwellers, they move upward in the water column at night to feed. They are fast growing, maturing in three years. There is currently rapid turnover in the populations as predation and commercial fishing take their toll. Pacific cod spawn during an extended period, possibly February through July. The adhesive, demersal eggs hatch in about 13 to 14 days (depending on temperature). The species is distributed over most of lower Cook Inlet and Shelikof Strait region (MMS, 1995: III.B.7). Evidence exists that Kachemak Bay may also provide rearing habitat for cod (Trasky, 1995:13, citing to ADF&G, 1993b). Large year-classes of Gulf of Alaska cod and pollock in the last decade is correlated with declines in other species, most notably crabs.

Sablefish and Rockfish. Sablefish *(Anoplopoma fimbria)*, commonly called black cod, and several species of rockfish (*Sebastes sp.*) are also found in deeper waters of the lower inlet to the south of the sale area (Trasky, 1995, citing to Bechtol, 1995:5). These finfish spend most of their adult life foraging for food near the sea floor. During early life stages, these species are pelagic (OCSEAP Staff, 1987).

Sablefish inhabit depths between 150 and 1,200 m and are predominately between 400 and 500 m. Spawning occurs during the winter at depths of between 250 and 750 m. Both the spawning activities and the widespread adult migrations are similar to those of halibut (OCSEAP Staff, 1987). Red, black, and banded rockfishes including Pacific Ocean Perch are usually found in gravel, rocky, or boulder-strewn substrates in and along the gullies, submarine canyons, and depressions of the upper continental slope. More than 30 species of rockfish have been recovered from the Gulf of Alaska. This group is unique in that many are very long-lived and bear their young alive. The Pacific Ocean perch was formerly a much-sought-after commercial species whose stocks have since been depleted (MMS, 1995: III.B.8).

Pacific Halibut are the largest and most voracious of all flatfishes and are preyed upon by few if any marine species. They live at depths ranging from 50 to 500 m and may venture into shallower waters in search of food. Halibut are long-lived, with those under eight years of age considered juveniles. Adults may live as long as 50 years and weigh several hundred pounds. The northern Gulf of Alaska is an important nursery area for Pacific halibut eggs, larvae, and juveniles; it also provides habitat for local adults as well as for those transient adults that migrate into the area. (OCSEAP Staff, 1987).)(Miles, et al, 1982:23).

Other flatfishes that may inhabit sale area waters include Greenland turbot (*Reinhardtius hippoglossoides*), Arrowtooth flounder (*Artheresthes stomias*), Flathead sole (*Hippoglossoides elassodon*), Yellowfin sole (*Limanda aspera*), Rock sole (*Lepidopsetta bilineata*), Butter sole (*Isopsetta isolepis*) Starry flounder (*Platichthys stellatus*), Rex sole (*Glyptocephalus zachirus*), Dover sole (*Microstomus pacificus*), and Alaska plaice (*Pleuronectes quadrituberculatus*) (Kessler, 1985).

Kachemak Bay also supports a healthy resident rock sole and flathead sole group, and serves as a nursery for juvenile flatfishes. In a recent study, flathead sole were concentrated on mixed mud sediments from 40 to 80 m in depth year-round. In spring and summer, rock sole concentrate on sand sediments at 10 to 30 m in depth, and in winter, they move offshore to the 150 meter depth (Abookire and Norcross, 1997).

Other fish species inhabiting Gulf of Alaska waters and that may range into Cook Inlet include greenlings, ronquils, eelpouts, wolf eel, lingcod, and sculpins. Other important predatory species inhabiting lower Cook Inlet include skates, spiny dogfish, and occasionally shark (Kessler, 1985).

3. Birds

Over 147 species of birds use marine or estuarine habitats in the Gulf of Alaska and overall populations are estimated to be in the millions. (DeGange and Sanger, 1987). Over 100 species of waterfowl, shorebirds, and seabirds occur in the Cook Inlet/Susitna areas. A list of these species is presented in Table 3.2.

Migratory waterfowl and shorebirds begin arriving in Cook Inlet in early April. The greatest variety and numbers of birds are found on exposed mud flats, deltas, flood plains, and salt marshes. Loons, grebes, cormorants, sea ducks, and alcids are most frequently found on bays and exposed inshore waters. Geese and dabbling ducks primarily use river flood plains and marshes, while diving ducks spend most of their time on bay waters. Shorebirds are found primarily on mud flats and gravel areas. Gulls use a variety of habitats, especially lagoons (MMS, 1995: III.B.9). An ongoing waterfowl mortality study funded by the U. S. Army at Fort Richardson revealed that dabbling ducks are primary users of upper Cook Inlet salt marshes and flats (Susitna Flats, Eagle River Flats, Palmer Hay Flats, and Goose Bay). As many as 60,000 to 100,000 of these birds appear each spring in upper Cook Inlet These ducks may be feeding on fingernail clams (*Macoma*) or large amphipods, however a lack of information prevents researchers from identifying what the upper Cook Inlet baseline population may be. Biologists cannot rely on any one survey year for good information on bird abundance and behavior, because of large annual variability of tideflats use due to freeze and thaw times (Eldridge, 1997).

Kachemak Bay is the most important marine bird habitat south of the Forelands (Trasky, 1995:13). Thousands of waterfowl and close to a million or more shorebirds rest and feed in Kachemak Bay during the spring and fall migrations. Most of these migrants stage at the head of the bay on the Fox River Flats. During the spring and summer, over 10,000 seabirds, primarily black-legged kittiwakes and common murres, nest on Gull Island near the mouth of China Poot Bay. In addition, approximately 100,000 waterfowl winter in Kachemak Bay because of the availability of protected open water and abundant food (Trasky, 1995:13, citing to ADF&G, 1990; ADF&G, 1991c; ADF&G, 1993b).

Trading Bay, Redoubt Bay and the Susitna Flats, are located along the northwest shore of Cook Inlet, and are best known for their prime waterfowl habitat (Trasky, 1995:9, citing to ADF&G, 1989a; ADF&G, 1991a and b; ADF&G, 1994b). The first habitat to be used in spring is a narrow band of ice-free coast where hundreds of thousands of waterfowl and shorebirds rest and feed. Thousands of geese are included in this number, and the area provides critical spring staging habitat for cackling Canada geese, Pacific white-fronted geese, and snow geese. The numbers of geese observed in Trading and Redoubt Bays during spring surveys conducted from 1986 to 1992 are presented in Table 3.3 (Trasky, 1995:10, citing to ADF&G, 1994b).

Nesting generally occurs from late April through July, and the fall migration extends from August through October. Major spring and fall staging areas in the sale vicinity occur in the Palmer Hay Flats, Susitna Flats, Goose Bay, Trading Bay, and Redoubt Bay; in the Polly Creek area; in coastal wetlands between Nikiski and the Chickaloon Flats; in Kachemak Bay; and at the mouths of the Kenai and Kasilof rivers (Trasky, 1998). With the exception of these latter two areas, birds also nest at these locations, as well as in wetlands between

Tustumena Lake and the coast. In addition, many waterfowl over-winter in and around Kachemak Bay (Trasky, 1995:1, citing to RPI, 1994; USCG/USEPA/ADEC, 1995).

Tule white-fronted geese also breed in upper Cook Inlet (See Figure 3.2). Tule geese arrive in early April and begin nesting in May. In the sale area vicinity, Tule goose nesting and molting habitat has been identified in the Bachatna Flats and Big River area, along the McArthur River drainage, and Susitna Flats (Trasky, 1998). There is only one other area where Tules are known to nest, which is north of the sale area along the Kahiltna River. They start to leave for wintering grounds in California by mid-August, prior to the hunting season (ADNR, 1993:15). There have been no recent counts of Tule geese in Alaska; however, winter surveys conducted in 1989-90 in California indicate that the population is about 6,900 birds (Trasky, 1995:10, citing to ADF&G, 1994b; D. Timm, 1986, Pers. Comm.; T. Rothe, 1994, Pers. Comm.).

Table 3.1 Waterfowl, Shorebirds, and Seabirds Found in the Cook Inlet Region.

Common Name	*Scientific Name*	Common Name	*Scientific Name*
Red-throated loon	*Gavia stellata*	Pink-footed shearwater	*P. creatopus*
Pacific loon	*G. pacifica*	Flesh-footed shearwater	*P. carneipes*
Common loon	*G. immer*	Fork-tailed storm-petrel	*Oceanodroma furcata*
Yellow-billed loon	*G. adamsii*	Leach's storm-petrel	*O. leucorhoa*
Horned grebe	*Podiceps auritus*	Double-crested cormorant	*Phalacrocorax auritus*
Red-necked grebe	*P. grisegena*	Brandt's cormorant	*P. penicillatus*
Northern fulmar	*Fulmarus glacialis*	Pelagic cormorant	*P. pelagicus*
Sooty shearwater	*Puffinus griseus*	Red-faced cormorant	*P. urile*
Short-tailed shearwater	*P. tenuirostris*	Great blue heron	*Ardea herodias*
Greater white-fronted goose	*Anser albifrons*	Marbled murrelet	*Brachyramphus marmoratus*
Snow goose	*Chen caerulescens*	Trumpeter swan	*C. buccinator*
Emperor goose	*C. canagica*	Eurasian wigeon	*A. penelope*
Black brant	*Branta bernicla*	American wigeon	*A. americana*
Canada goose	*B. canadensis*	Canvasback	*Aythya valisineria*
Green-winged teal	*Anas crecca*	Redhead	*A. americana*
Mallard	*A. platyrhynchos*	Ring-necked duck	*A. collaris*
Northern pintail	*A. acuta*	Greater scaup	*A. marila*
Blue-winged teal	*A. discors*	Lesser scaup	*A. affinis*
Northern shoveler	*A. clypeata*	Common eider	*Somateria mollissima*
Gadwall	*A. strepera*	King eider	*S. spectabilis*
Steller's eider	*Polysticta stelleri*	Spectacled eider	*S. fischeri*
Harlequin duck	*Histrionicus histrionicus*	Sandhill crane	*Grus canadensis*
Oldsquaw	*Clangula hyemalis*	Black-bellied plover	*Pluvialis squatarola*
Black scoter	*Melanitta nigra*	Lesser golden-plover	*P. dominica*
Surf scoter	*M. perspicillata*	Semipalmated plover	*Charadrius semipalmatus*
White-winged scoter	*M. fusca*	Killdeer	*C. vociferus*
Common goldeneye	*Bucephala clangula*	Black oystercatcher	*Haematopus bachmani*
Barrow's goldeneye	*B. islandica*	Greater yellowlegs	*Tringa melanoleuca*
Bufflehead	*B. albeola*	Lesser yellowlegs	*T. flavipes*
Common merganser	*Mergus merganser*	Short-billed dowitcher	*Limnodromus griseus*
Red-breasted merganser	*M. serrator*	Long-billed dowitcher	*L. scolopaceus*
Solitary sandpiper	*T. solitaria*	Common snipe	*Gallinago gallinago*
Wandering Tattler	*Heteroscelus incanus*	Red-necked phalarope	*Phalaropus lobatus*
Spotted sandpiper	*Actitis macularia*	Red phalarope	*P. fulicaria*
Whimbrel	*Numenius phaeopus*	Pomarine jaeger	*Stercorarius pomarinus*

Common Name	*Scientific Name*	Common Name	*Scientific Name*
Bristle-thighed curlew	*N. tahitiensis*	Parasitic jaeger	*S. parasiticus*
Hudsonian godwit	*Limosa haemastica*	Long-tailed jaeger	*S. longicaudus*
Bar-tailed godwit	*L. lapponica*	Bonaparte's gull	*Larus philadelphia*
Ruddy turnstone	*Arenaria interpres*	Mew gull	*L. canus*
Black turnstone	*A. melanocephala*	Ring-billed gull	*L. delawarensis*
Surfbird	*Aphriza virgata*	Herring gull	*L. argentatus*
Red knot	*Calidris canutus*	Glaucous-winged gull	*L. glaucenscens*
Sanderling	*C. alba*	Glaucous gull	*L. hyperboreus*
Semipalmated sandpiper	*C. pusilla*	Black-legged kittiwake	*Rissa tridactyla*
Western sandpiper	*C. mauri*	Sabine's gull	*Xema sabini*
Least sandpiper	*C. minutilla*	Arctic tern	*Sterna paradisaea*
Baird's sandpiper	*C. bairdii*	Aleutian tern	*S. aleutica*
Pectoral sandpiper	*C. melanotos*	Common murre	*Uria aalge*
Sharp-tailed sandpiper	*C. acuminata*	Thick-billed murre	*U. lomvia*
Rock sandpiper	*C. ptilocnemis*	Pigeon guillemot	*Cepphus columba*
Dunlin	*C. alpina*	Parakeet auklet	*Cyclorrhynchus psittacula*
Tundra swan	*Cygnus columbianus*	Crested auklet	*Aethia cristatella*
Kittlitz's murrelet	*B. brevirostris*	Rhinoceros auklet	*Cerorhinca monocerata*
Ancient murrelet	*Synthliboramphus antiquus*	Tufted puffin	*Fratercula cirrhata*
Cassin's auklet	*Ptychoramphus aleuticus*	Horned puffin	*F. corniculata*

Source: Trasky, 1995, citing to ADF&G, 1993b, 1994b.

Table 3.2 Spring Aerial Surveys of Geese at Trading Bay and Redoubt Bay[1]

Trading Bay												
	1986				1987				1989	1992		
	April 17	April 25	May 3	May 6	April 18	April 28	May 5	May 12	April 28	May 1	May 5	May 7
Canada Goose	0	3,154	3,000	1,130	1,025	1,977	4,705	356	695	686	2,185	1,504
Tule Goose	--[2]	415	286	---	---	225	262	41	30	110	75	633
Snow Goose	---	290	4,899	175	---	981	2,424	75	2,350	762	311	481
Unidentified Geese	0	200	0	0	0	0	0	0	0	0	0	0
Total Geese	0	4,059	8,185	1,305	1,025	3,185	7,391	472	3,075	1,558	2,571	2,618

Redoubt Bay												
	1986				1987				1989		1992	
	April 17	April 25	May 3	May 6	April 18	April 28	May 5	May 12	April 28	May 8	April 28	May 8
Canada Goose	232	3,443	1,478	128	326	3,166	4,602	548	720	2,045	966	527
Tule Goose	---	121	160	6	5	52	344	53	200	262	137	15
Snow Goose	4	366	6,456	1,250	---	7,304	12,520	690	1,680	1,660	6,570	4,413
Unidentified Geese	0	15	150	6	0	0	0	0	---	---	---	---
Total Geese	236	3,945	8,244	1,390	331	10,522	17,466	1,291	2,600	3,987	7,673	4,955

[1]These observations represent "snapshots" of geese populations. Surveys always miss periods when peak numbers are present, they always miss some individuals, and do not account for turnover as birds move through the area.
[2] Species not counted.
Source: Adapted from ADF&G, 1994b.

Trumpeter swan nesting is widespread in the Trading Bay and Redoubt Bay areas; with the most concentrated use occurring in the drainages of the Kustatan River, Bachatna Creek, North Fork Big River, and the lower Big and Chakachatna rivers. A summary of available swan nesting data for Trading Bay SGR and Redoubt Bay CHA is presented in Table 3.4 (Trasky, 1995:10, citing to ADF&G, 1994b).

Table 3.3 Aerial Surveys of Trumpeter Swans in Redoubt Bay CHA and Trading Bay SGR

Redoubt Bay					
	1968	**1975**	**1980**	**1985**	**1990**
Number adult swans	35	49	83	145	98
Number adult pairs	12	16	30	44	41
Number broods	5	5	15	12	19
Number cygnets	22	14	57	34	48

Trading Bay					
	1968	**1975**	**1980**	**1985**	**1990**
Number adult swans	52	65	137	184	154
Number adult pairs	23	23	37	50	59
Number broods	10	10	18	13	23
Number cygnets	37	30	63	31	94

Data collected by U.S. Fish and Wildlife Service (Conant et al. 1991) and mapped on 1:63, 360-scale overlays Typically, about 90% of adult swans are seen in aerial surveys; cygnets are missed more often.
Source: ADF&G, 1995

Trumpeter swans prefer secluded regions, where they frequent shallow bodies of water and build their nests in extensive areas of marsh vegetation. Most breeding pairs are at their nest sites by early May and the first hatching dates range from June 16 to June 29. In Alaska, young swans are unable to fly until 13 to 15 weeks of age. After leaving the breeding areas large numbers of trumpeter swans congregate on ponds and marshes along the coast in late summer and early fall. Most swans depart by mid-October but in some years may remain until freeze-up in November (ADF&G, 1985b:160). They winter on ice-free freshwater outlets. However, they may utilize saltwater, during extremely cold periods, when freshwater locations freeze (ADF&G, 1985b:158).

Steller's eiders winter from the eastern Aleutian Islands to lower Cook Inlet. The USF&WS listed the Steller's eider as threatened on June 11, 1997. The Steller's eider *(Polysticta stelleri)*, the smallest of the eiders, is approximately 18 inches long and usually weighs about 2 pounds. The Steller's eider is unusually colorful and has a unique plumage pattern for a sea duck (ADF&G, 1994).

Most Steller's eiders nest in northeastern Siberia, with less than five percent of the population breeding in North America. It is the least abundant eider in Alaska with a discontinuous breeding range along the coast from the Alaska Peninsula northward, including Seward Peninsula, St. Lawrence and Nunivak islands, and the Beaufort Sea coast. The species was most abundant on the Yukon Delta where 3,500 pairs were thought to nest, but sightings are now rare and no nests have been found in the region since the mid-1970s. The North Slope may harbor over 4,000 breeding pairs. The unexplained disappearance of Steller's eiders from the Yukon-Kuskokwim Delta has caused great concern and recently stimulated intensive research into the problem (ADF&G, 1994).

Steller's eiders have been surveyed in the lower Cook Inlet area. The most recent information comes from an aerial survey of marine birds in Lower Cook Inlet during the summer of 1993 and winter of 1994 conducted by USF&WS. It found Steller's eiders present in Kachemak Bay and counted 22 birds from Anchor Point to Homer (MMS, 94-0063:123).

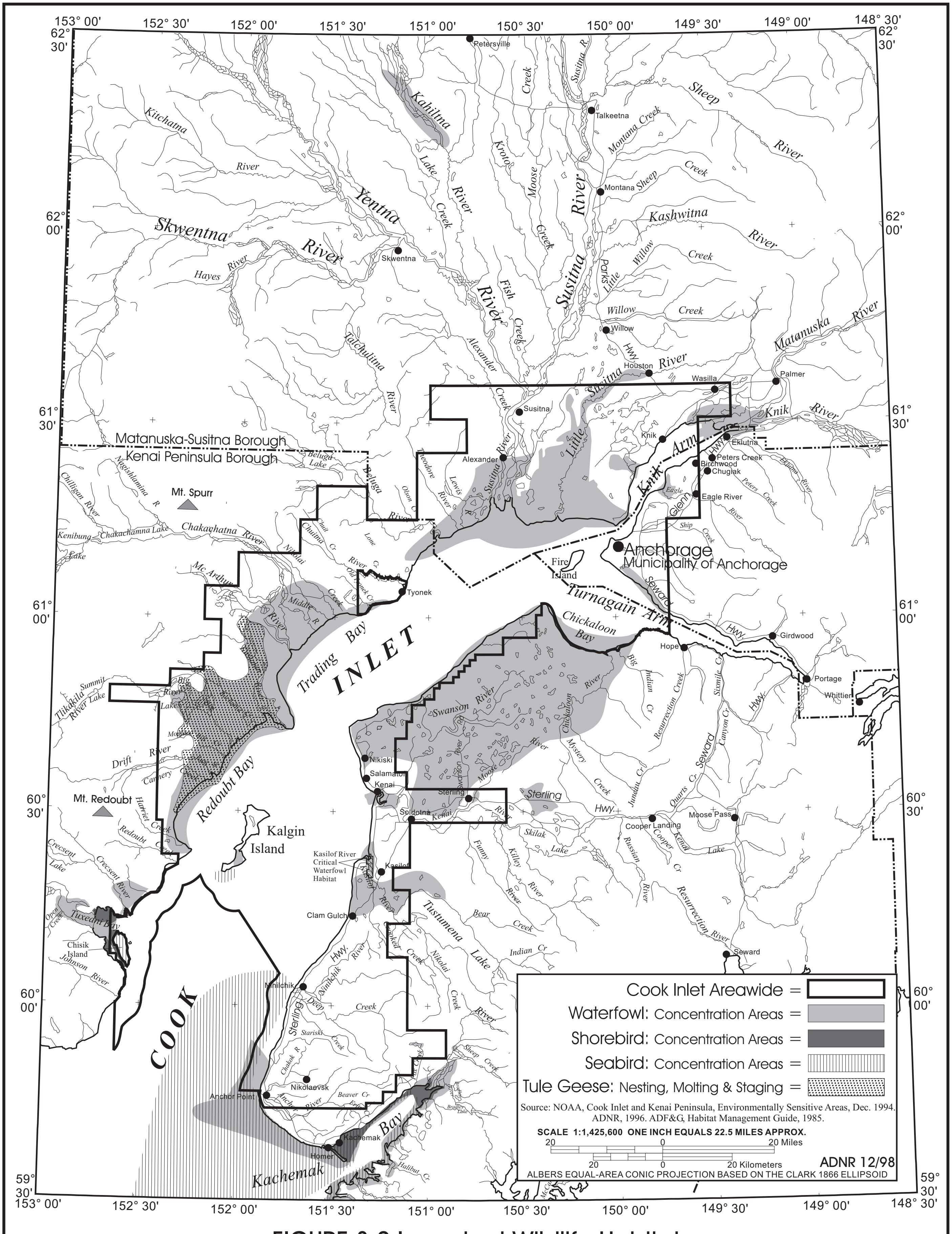


FIGURE 3.2 Important Wildlife Habitat

Little is known of the breeding biology of Steller's eiders. It is reported to be the latest spring migrant of the four species of eiders, arriving during the middle to end of May. Nests are located on peninsulas and shores of tundra ponds and lined with grass and black-brown down. Six to ten olive-buff eggs are laid. Males leave breeding areas by early July to begin molt, and large flocks gather at Izembek Lagoon and other Alaska Peninsula estuaries. Most of the population (Alaskan and Russian birds), about 200,000, winter along the Alaska Peninsula and the Aleutian Islands (ADF&G, 1994).

Seabirds utilize Cook Inlet waters from mid-April through October, when they come ashore to nest. The two largest seabird colonies near the sale area are on Chisik and Duck Islands in Tuxedni Bay, and on Gull Island in Kachemak Bay. Approximately 60,000 birds nest at Chisik and Duck Islands and approximately 17,000 seabirds nest at Gull Island (Trasky, 1998). The most abundant species at both colonies are black-legged kittiwakes, common murres, and horned or tufted puffins. Several smaller colonies also occur in the sale area, such as the Arctic tern colony near the mouth of the Kasilof River (Trasky, 1995:2, citing to Sowls et al., 1978; ADF&G, 1993; RPI, 1994).

In a 1993-94 survey of seabird presence in lower Cook Inlet, the most common species seen in summer were murres and gulls. Winter populations consisted mostly of skoters, murres, and gulls. Seabirds are distributed throughout lower Cook Inlet in summer, though highest concentrations occur near breeding colonies. During winter, most birds were located near protected bays along the southern shore of Kachemak Bay, and to the north and west of the Homer Spit (Kendall, et al., 1997). Kittiwakes, cormorants, and puffins were absent in lower Cook Inlet in winter. Seabirds use portions of the lower Inlet because of upwelling associated with gyres to the west and south of Kachemak Bay. Other habitat modifiers include tide rips on both sides of the Inlet, and high freshwater inputs and turbidity associated with the west side of Cook Inlet (Kendall, 1997).

Research into the long-term relationship between seabirds and marine fish is being conducted by the USFWS. The abundance of these birds and their foraging behavior may be linked to capelin, pollock, and sandlance densities in lower Cook Inlet. Sandlance, an important food for kittiwakes, guillemots, and murres, dominated nearshore waters, whereas juvenile walleye pollock and capelin (important food for murre and puffins) dominated offshore and southern waters of Cook Inlet. Density of forage fish was correlated with breeding success. Chisik Island seabird populations are in decline and lower fish density was measured around the island. In contrast, Gull Island and Barren Island waters have higher densities of fish, and seabird populations there are healthy. "Differences in forage fish and seabird productivity between areas of lower Cook Inlet appear related to differing oceanographic regimes." (Piatt and Roseneau, 1997).

Shorebirds arrive in coastal Cook Inlet in spring. Species include common snipe, short-billed dowagers, plovers, western sandpipers, least sandpipers, and dunlins. Shorebirds inhabiting tidal flats and feed on bi-valves, Macoma balthica (a small clam) and Mytilus (mussel). "Redoubt Bay supports the largest concentration of shorebirds in lower Western Cook Inlet during spring migration." (Bennet, 1996:44). In a recent survey of shorebird use of coastal Cook Inlet (1996), Susitna Flats had the greatest numbers of shorebirds compared to Trading and Redoubt Bays. These birds nest in spruce bog above the tideland. Several thousand sandpipers were observed on Susitna Flats in February. Based on 1996 surveys**,** about 20,000 rock sandpipers inhabit the Beluga River Flats in winter, which represents a significant portion of the Bering Sea Island breeding stock. Possibly, the rising and falling tide causes winter ice to scour tide flats, thereby exposing Macoma. Southern Redoubt Bay hosted most of the 300,000 shorebirds recorded in northwest Cook Inlet during the spring 1997 migration. Most of these birds were western sandpipers (Gill and Tibbitts, 1997).

Bald eagles *(Haliaeetus leucocephalus)* are a common and visible raptor in the sale area (See Figure 3.3). These birds are protected by the federal Bald Eagle Act of 1940, which makes possession of an eagle, either alive or dead, illegal (ADF&G, 1994). Eagle distribution is influenced by the availability of open water and anadromous streams containing adequate food resources. Eagles concentrate around spawning streams during fall and winter. Juveniles utilize spawned-out salmon as a major food source (Mickelson, 1989). Eagles are most abundant from spring through fall during the nesting and brood rearing season. Nest sites have been documented at numerous locations along the coast, with the highest nest densities occurring outside the sale area, in and along the southern shore of Kachemak Bay (Trasky, 1995). Eagles congregate at the mouths of major rivers where salmon and hooligan school, such as the Twentymile, Placer, Eagle, Knik, Matanuska,

Susitna, Beluga, Fox, and other Rivers. Eagles in Southcentral Alaska commonly nest in old cottonwood trees near water (ADF&G, 1994).

During a partial nest survey conducted in June 1992, the U.S. Fish and Wildlife Service counted 55 active and 84 inactive nests around Kachemak Bay (Trasky, 1995:13, citing to L. Dugan, Pers. Comm.). Hundreds of eagles also winter in Kachemak Bay and, to a lesser extent, other areas around the inlet (Trasky, 1995:2, citing to ADF&G, 1993; RPI, 1994). Herring, flounder, pollock, and salmon provide the main diet for eagles. Interior populations may depend heavily on salmon. Eagles also feed on waterfowl, small mammals, sea urchins, crabs, and dead animals (ADF&G, 1994). Seabird colonies, waterfowl concentrations, large fish resources, including frequent salmon runs and even garbage dumps in the coastal region provide an abundance of food in the coastal areas (ADF&G 1985a:107). Eagle populations are healthy throughout Alaska. Golden eagles (Aquila chrysaetos), also protected by the Bald Eagle Act, are found throughout the Cook Inlet basin. These raptors feed primarily on ground squirrels, hares, and birds, such as ptarmigan, cranes, and owls. (ADF&G, 1994).

Chickadees are common throughout Alaska's forests with some species associated with conifers and others with deciduous forest cover. These small birds live an average of 2 to 3 years, and feed on insects, including several considered to be forest pests. Hawks and other flying predators eat chickadees.

Both the **Sharp-shinned Hawk** (*Accipiter striatus*) and the **Northern Goshawk** (*Accipiter gentilis*) are abundant in Alaska, but rarely seen. These birds are natural enemies and nest in woodland forests most frequently in middle age (20-45 years old) spruce trees. Eggs hatch in late May or early June. Goshawks eat snowshoe hares, grouse, ptarmigan, ducks, squirrels, voles, shrews, and some songbirds and shorebirds. Sharp-shins eat songbirds, small mammals and large insects. While hawks have few natural predators, sometimes bears, lynx, and other climbing predators can reach their nests (ADF&G, 1994).

The **Boreal Owl** (*Aegolius funereus*) ranges throughout the circumpolar forests including Alaska. The **Saw-whet owl** lives in southcentral coastal and southeast areas of the state. Owls nest in closed-canopy forests with at least some deciduous trees. Owls feed at night on voles, mice, shrews, and small birds. Marten are the main predator of the Boreal owl, and population cycles of voles are a limiting factor in owl populations. The **Northern Hawk Owl** (*Surnia ulula*) is a resident species found throughout Alaska. The owl hunts mostly during the day, is noted for its unusual tolerance of human activity, and will nest close to human settlements. In the Denali area, these owls feed primarily on red-backed voles and mice. Main predators are the Great Horned Owl and Northern Goshawk (ADF&G, 1994).

The **Common Raven** (*Corvus corax*) is a member of the Corvidae family, which also includes jays, crows, and magpies. The raven is the largest all-black bird in the world. Ravens feed on a variety of both plant and animal foods, and are accomplished scavengers. Ravens breed at age 3 or 4 years, mate for life, and can live up to 30 years. Ravens congregate near human settlements during non-breeding times (ADF&G, 1994).

Spruce grouse (*Canachites canadensis*) or **spruce hens** are common throughout Alaska. Preferred habitat includes spruce-birch forest with a thick understory of cranberry, blueberry, crowberry, and spirea, above a moss-covered ground. During summer, spruce grouse eat flowers, green leaves, and berries. Insects provide food for newly hatched chicks. Ruffed grouse (Bonnasa umbellus) are common to woodlands along interior Alaska rivers. They were recently introduced to the Matanuska-Susitna Valley, where they are flourishing. Summer foods include blueberries, high-bush cranberries, rose hips, and aspen buds. In winter, they feed primarily on the buds and twigs of aspen, willow, and soapberry. Game bird populations in Alaska fluctuate in a 10-year cycle. Coastal populations in Alaska remain more stable than interior ones (ADF&G, 1994).

Willow ptarmigan (*Lagopus lagopus*), Alaska's state bird, are found everywhere throughout Alaska's high, treeless country. Rock and White-tailed ptarmigan also inhabit all major treeless area of southern Alaska. Willow ptarmigan tend to live closest to the tree line. Hens nest on the open ground after snowmelt and hatchlings arrive in late June or early July. Ptarmigan populations fluctuate dramatically and the causes remain a mystery (ADF&G, 1994). These three species of ptarmigan on the Kenai Peninsula are stable at relatively low levels (ADF&G, 1997).

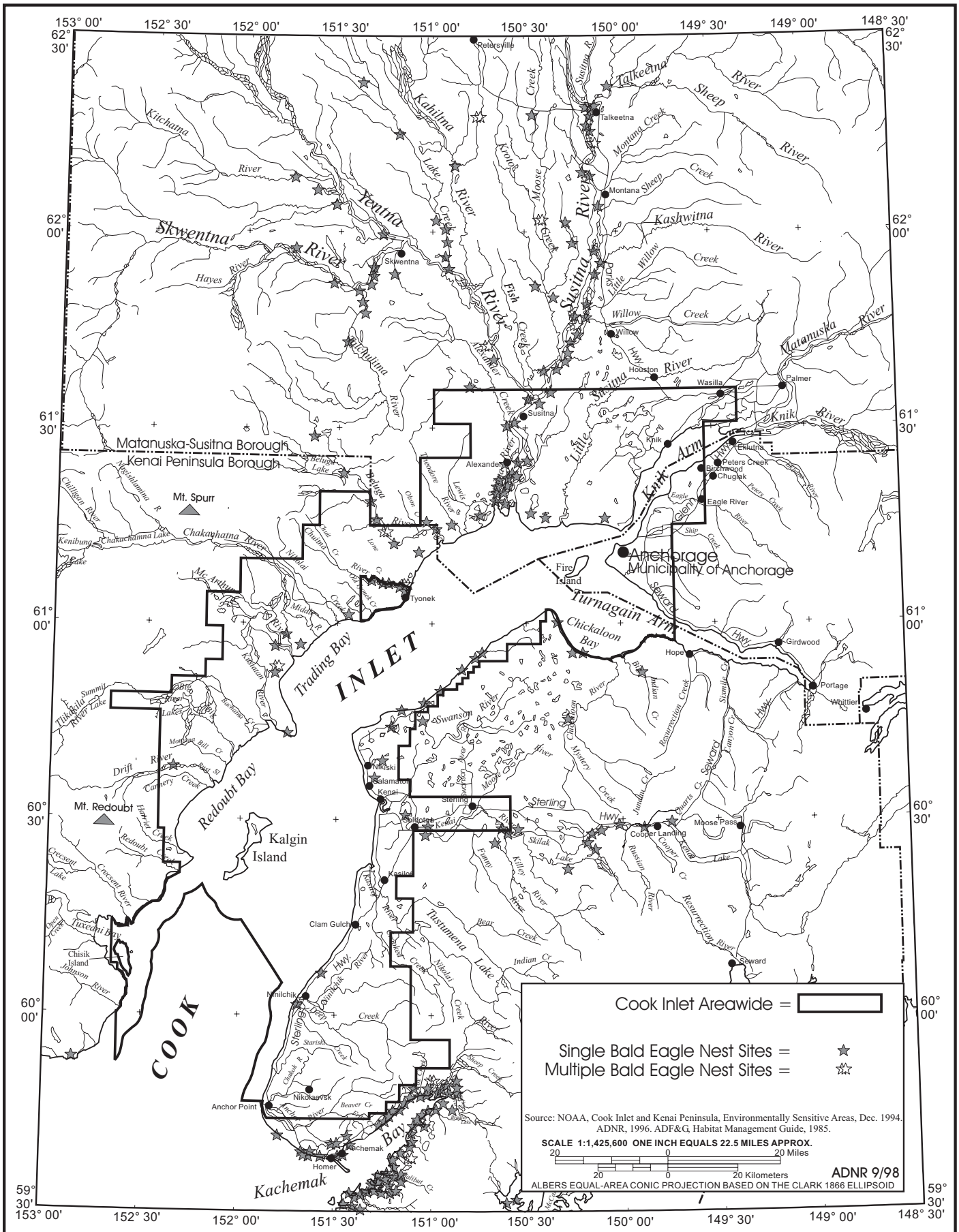


FIGURE 3.3 Bald Eagle Nest Sites

Common loons (*Gavia immer*) spend the summer on lakes throughout the interior, southcentral, and southeast portions of the state, and winter along the coast from the Aleutians to Baja California. The **Pacific loon** (*Gavia pacifica*) is the most common wintering loon on the coasts of Southcentral Alaska. **Red-throated loons** are also common throughout the state. Loons migrate to coastal areas in September or early October, and return to their freshwater nesting habitat in May. Loons mate for life and return each year to the same area to breed. Breeding success may be related to the presence of gulls, jaegers, and foxes. Loons are also susceptible to disturbance by floatplanes and fishers who force them to abandon their nest allowing the chicks to chill and die. Loons are excellent divers and feed on small fish, aquatic vegetation, insects, mollusks, and frogs (ADF&G, 1994).

4. Mammals

a. Terrestrial

Numerous species of terrestrial mammals inhabit the Cook Inlet basin. Big game species include moose, caribou, black bear, brown bear, Dall sheep, and mountain goat (See Figures 3.4 and 3.5). Other terrestrial mammals include furbearers and small game. Amphibians common throughout Southcentral Alaska include both spotted *(Rana pretiosa*) and wood frog (*Rana sylvatica*).

Moose (*Alces alces*) range throughout the Cook Inlet and Susitna basins. Moose generally calve between late May and early June. Known calving areas on the Kenai Peninsula include regions northeast of Kenai, along the coast between the Kenai and Kasilof rivers, northeast of Homer, and at the head of Kachemak Bay (Trasky, 1995:3). They are year-round residents, although many exhibit seasonal movements related to snow depth and the availability of food. They are found in both lowland and upland shrub communities and lowland areas with ponds during summer and fall. In winter, moose concentrate in areas of relatively shallow snow depth, frequently along river drainages. Wintering areas have been identified along several drainages in Trading and Redoubt; the lower McArthur River, upper Middle River, Noautka Slough, lower Chakachatna River, and Nikolai Creek. On the east side of Cook Inlet wintering areas occur northeast of Kenai, in the Soldotna area, along the coast between the Kasilof River and Ninilchik, along the Anchor River and Fritz Creek, and at the head of Kachemak Bay (Trasky, 1995:3, citing to ADF&G, 1985a, b, and c). Moose also winter and calve along the Skwentna, Yentna, Kahiltna, Susitna, Little Susitna, and Matanuska Rivers (ADF&G, 1985b) (See Figure 3.4).

Moose depend on and prefer willow, birch, aspen, and cottonwood, in order of preference. Alder and willow are more important nutritionally in summer than birch leaves, while in winter, browse species of aspen and low-bush cranberry are more nutritionally important than birch twigs (Boggs, et al., 1997:180). Moose have high reproductive potential and can reach the carrying capacity of their range if not limited by predation, hunting and severe weather (ADF&G, 1994). ADF&G estimates the Matanuska and Susitna Valley moose population at 18,000 and declining slightly due to increased wolf predation. The population on the Kenai Peninsula of about 8,000 remains relatively stable as it has since 1983. As many as 1,000 moose winter in the Anchorage bowl (ADF&G, 1997). Moose populations greatly increase following wildfires, due to emergence of browse. The three main causes of moose mortality on the Kenai Peninsula are winter kills, kills by predators, and road kills (PC, 1997).

Caribou (*Rangifer tarandus*) of the Kenai Lowlands Caribou Herd (KLCH) inhabit part of the sale area seasonally (See Figure 3.5). This is one herd of five that inhabit the Kenai Peninsula. Indigenous caribou of the Kenai Peninsula were over-harvested shortly after the turn of the century and disappeared. In 1965, 15 caribou were reintroduced at the gas line airstrip adjacent to the Chikaloon River. In 1966, 29 caribou from the Nelchina herd were transplanted to Watson Lake. (Boggs, et al., 1997:187). By 1969 the animals had formed two distinct groups; the Kenai Mountains Herd and the KLCH. The Kenai Mountain Herd established itself in the mountainous area west of the headwaters of Resurrection Creek. In June 1996, the Kenai Mountains herd numbered 425 (ADF&G, 1997) and two years later 419 animals were counted (Spraker, 1998).

The KLCH occupied an area north and east of the Kenai airport and on the Moose River flats (Boggs, et al., 1997) (ADF&G, 1985a:46). The KLCH can be found north and south of the Kenai River and along the coast to the Kasilof River (Spraker, 1998). The principal browse food for this herd may be sedges as lichens

are not present in the lowlands (Boggs, et al., 1997:187). Caribou calve from approximately mid-May through early June. Wetlands in the vicinity of the Kenai airport and along the coast to the south of the Kenai River provide calving habitat for the KLCH. Caribou stay in the vicinity of the calving grounds all summer. Following the rutting season in October, the herd moves northeast to winter on the Moose River Flats. Caribou remain on the Flats through April or early May, and then return to the Kenai area to calve (Trasky, 1995:3, citing to State of Alaska, 1981; ADF&G 1885a and c).

The KLCH declined from an estimated 115-130 animals in 1988 to approximately 90 caribou in 1994 Low calf survival, due in large part to predation by canines, appeared to be one of the primary reasons for the population decline (Trasky, 1995:3, citing to Spraker, 1994, Pers. Comm.). By 1996, the herd had increased to 96 animals, and the 1998 estimate for the KLCH is 124 animals, indicating a possible rebound in the population due to management efforts (Spraker, 1998).

Additional transplants were made in 1985-86 at Lake Emma, Caribou Lake, and Green Lake. ADF&G, in cooperation with the USF&WS, reintroduced caribou in unoccupied range on the Kenai National Wildlife Refuge in the central and southern peninsula. This effort resulted in three additional herds: Twin Lakes, Killey River, and Fox River herds. The Killey River herd can be found between the Killey River and Tustumena Lake. The Twin Lakes herd is found north of the Killey River to Skilak Lake, and the Fox River herd is located between the Fox River and Tustumena glacier. In 1995, population estimates for the Twin Lakes, Killey River, and Fox River herds numbered 48, 261, and 83 respectively. In June 1998, these herds increased to 70, 350, and 96 respectively (Spraker, 1998)(ADF&G, 1997).

Black bear (*Ursus americanus*) range throughout Southcentral Alaska. Most of the Redoubt Bay CHA is intensively used by brown bears from spring through fall. Black bears are most abundant in wooded areas, and along the Cook Inlet shoreline in the vicinity of streams, bogs, and clearings. Black bear spring concentration areas have been documented along the shore at the Kustatan River, the upper McArthur River, and the slopes bordering the critical habitat area between Drift River and the South Fork Big River. Both species are concentrated along salmon streams in late summer and fall, particularly the Kustatan River (Trasky, 1995:10, citing to ADF&G, 1994b). Known intensive use areas for black bear include the Susitna River at its mouth and an area about the river west of Willow. Black bears also present in the Anchor River and Fritz Creek CHA during their active period (i.e., May-September), and probably den within the South Fork of the Anchor River and Fritz Creek drainages.

Brown bears also inhabit the area, and both species concentrate along the South Fork of the Anchor River in July and August to feed on spawning salmon. Brown bears continue to feed on salmon at the headwaters of the South Fork of the Anchor River through early October (Trasky, 1995:12, citing to ADF&G, 1989b). Salmon heads and abundant streamside blueberries are favorite foods for bears.

After emerging from their dens in late April, black and brown bears move into grassy flatlands to graze on sedges, grasses, and other plants. Brown bears are found throughout the coastal wetlands of Redoubt Bay during this time of year, and several black bear spring concentration areas have been documented in Redoubt and Trading bays. Bears also concentrate along salmon streams during the summer and fall. The Kustatan River, Anchor River, and headwaters of the Ninilchik River and Deep Creek support particularly high numbers of bears during salmon spawning periods. With the onset of winter, bears enter their dens in October or November. Most remain in their dens until the following spring, although some bears may be active during the winter months if the weather is unseasonably warm. Another factor affecting winter activity is the physical condition of the bear prior to denning. If it has been a poor salmon or berry season and the bear is hungry, it will leave the den in search of food. Most bears in this condition die from starvation (Westlund, 1996, Pers. Comm.) Bear densities on the west -side of Cook Inlet are probably stable or increasing (ADF&G, 1997).

Kenai Peninsula Brown Bear *(Ursus arctos)* On the Kenai Peninsula, the ends of several large lakes have been identified as important brown bear travel corridors (Trasky 1998; citing to Schwartz and Arthur 1997). Most brown bear movement corridors are outside of the sale area although some overlap exists (See Figure 3.6). This overlap occurs at the west end of Skilak Lake, the west end of Tustumena Lake, along the Anchor River drainage, and near Caribou Lake. Additional important brown bear concentrations along salmon streams include the Moose and Killey rivers (Trasky, 1998).

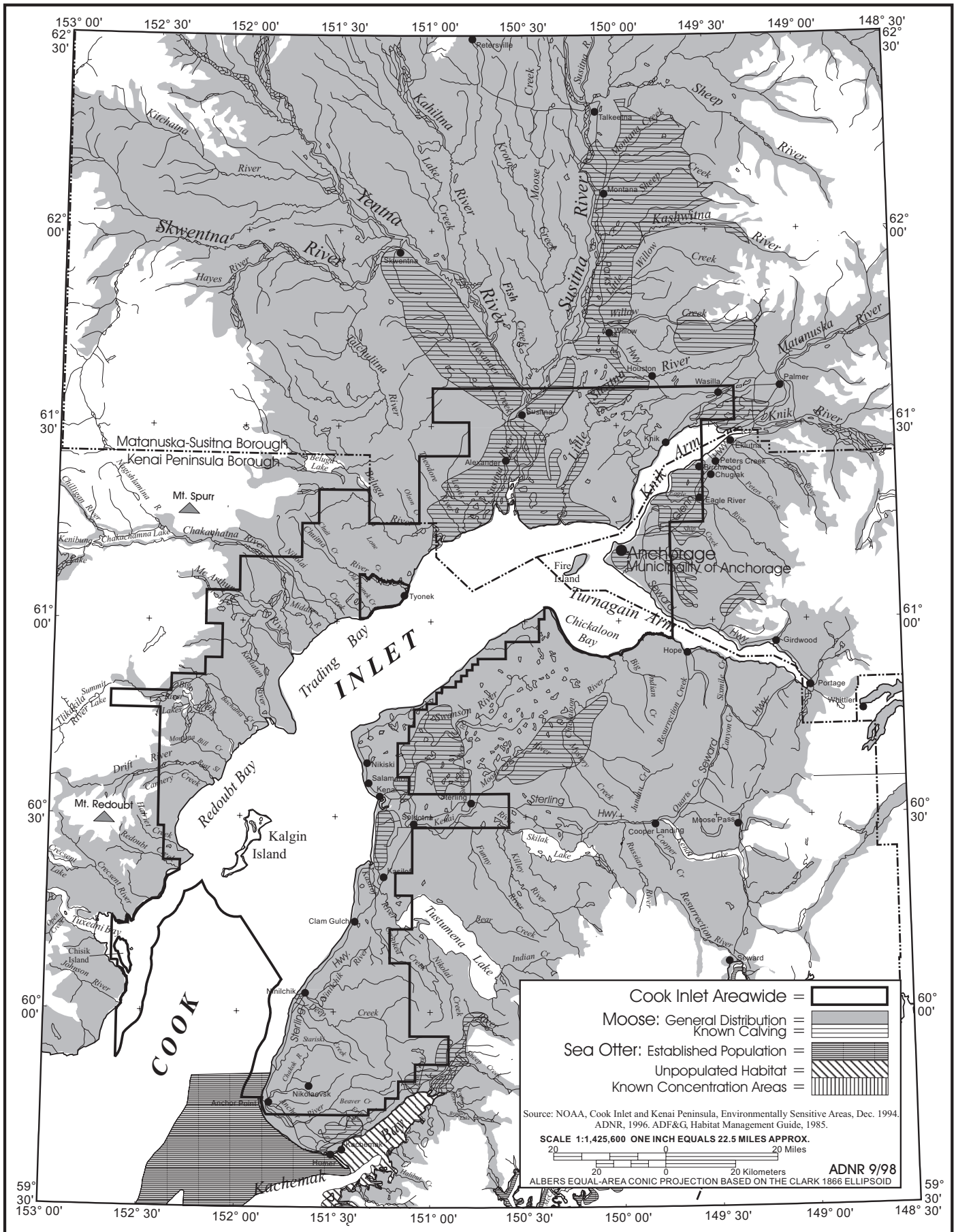


FIGURE 3.4 Important Wildlife Habitat

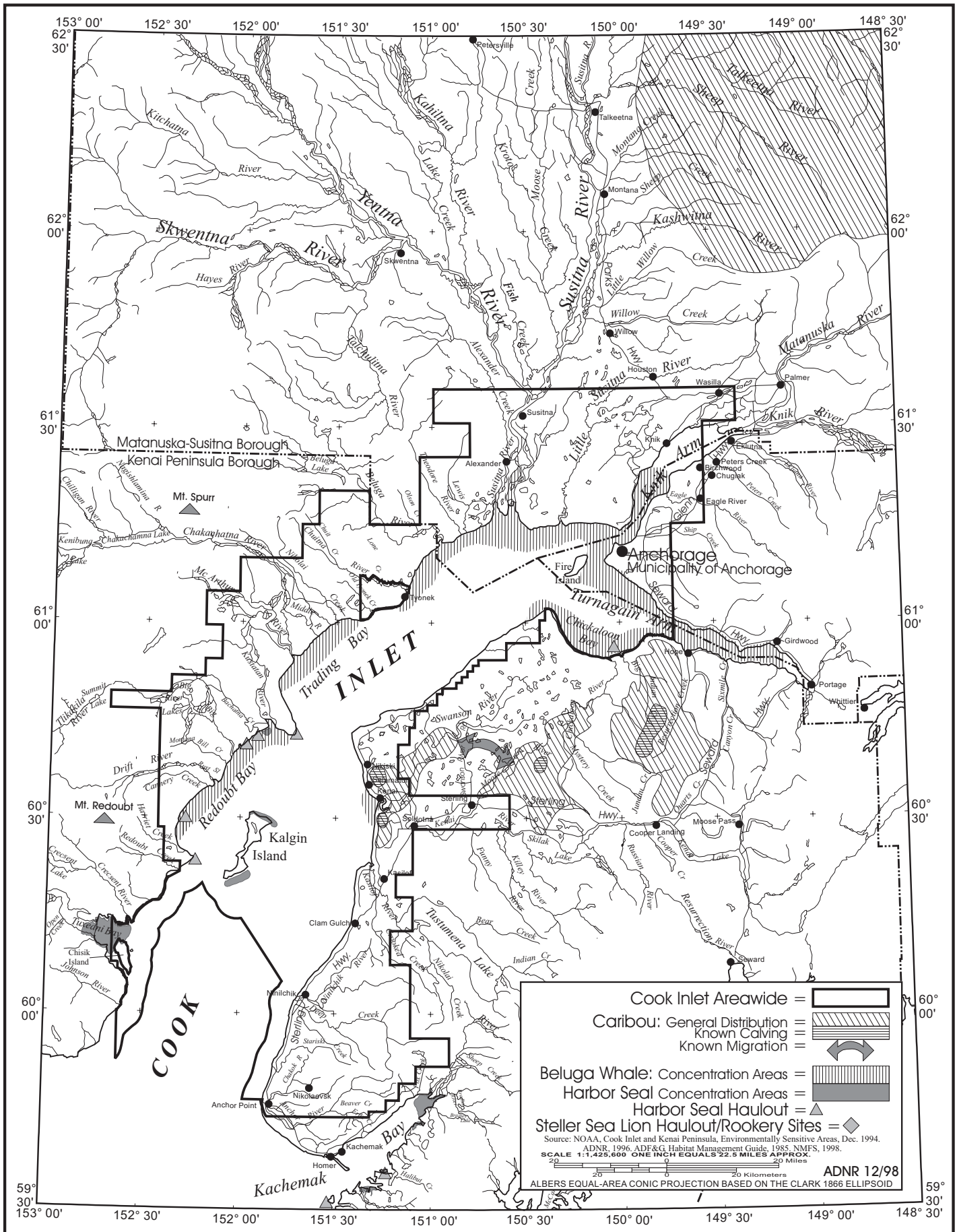


FIGURE 3.5 Important Wildlife Habitat

Information is limited on brown bear population size, seasonal habitat use, and movements. Brown bears are difficult to count because of dense cover over most of the peninsula. In 1993, biologists estimated there were a total of 277 brown bears on the Kenai Peninsula. This estimate was based on 13,848 sq. Km. of habitat and an average density of 20 bears per 1,000 sq. Km. (Trasky, 1998; citing to Del Frate 1995). For management purposes, a viable population size is between 250-300 bears with a sex and age structure that will sustain a harvest of less than 40 percent females annually (Trasky, 1998; citing to Miller et al. 1997).

The Kenai Peninsula brown bears are genetically the same as other brown bears in southcentral and Interior Alaska, but are isolated geographically and are managed as a separate population. (Office of the Governor, 1998) The population is apparently stable but there is concern about future human-bear conflicts.

Responding to concerns about the long-term health of this isolated population of bears, ADF&G in November 1998 added the Kenai Peninsula Brown Bear to its list of "species of special concern." The listing will focus research and management attention on the population and is intended to prevent the bears from being listed by the federal government as a threatened or endangered species at some point in the future. A team of state and federal biologists has begun a major research project on the bears, looking at habitat needs, rate of reproduction and movement patterns. (Office of the Governor, 1998)

ADF&G is beginning to develop a brown bear conservation strategy plan, and will work closely with local communities, land managers and Kenai residents to help them understand the needs of the bears and to balance the needs of the bears with other needs such as forest management, oil and gas development, tourism and fishing. (Office of the Governor 1998). ADNR will participate in the development of the state brown bear conservation strategy. After the conservation strategy plan is completed, ADNR will initiate a process for modifying the Kenai Area Plan in order to incorporate the strategy plan's recommendations. The process for modifying the Kenai Area Plan will be consistent with 11 AAC 55.030(f). (ADNR, 1998).

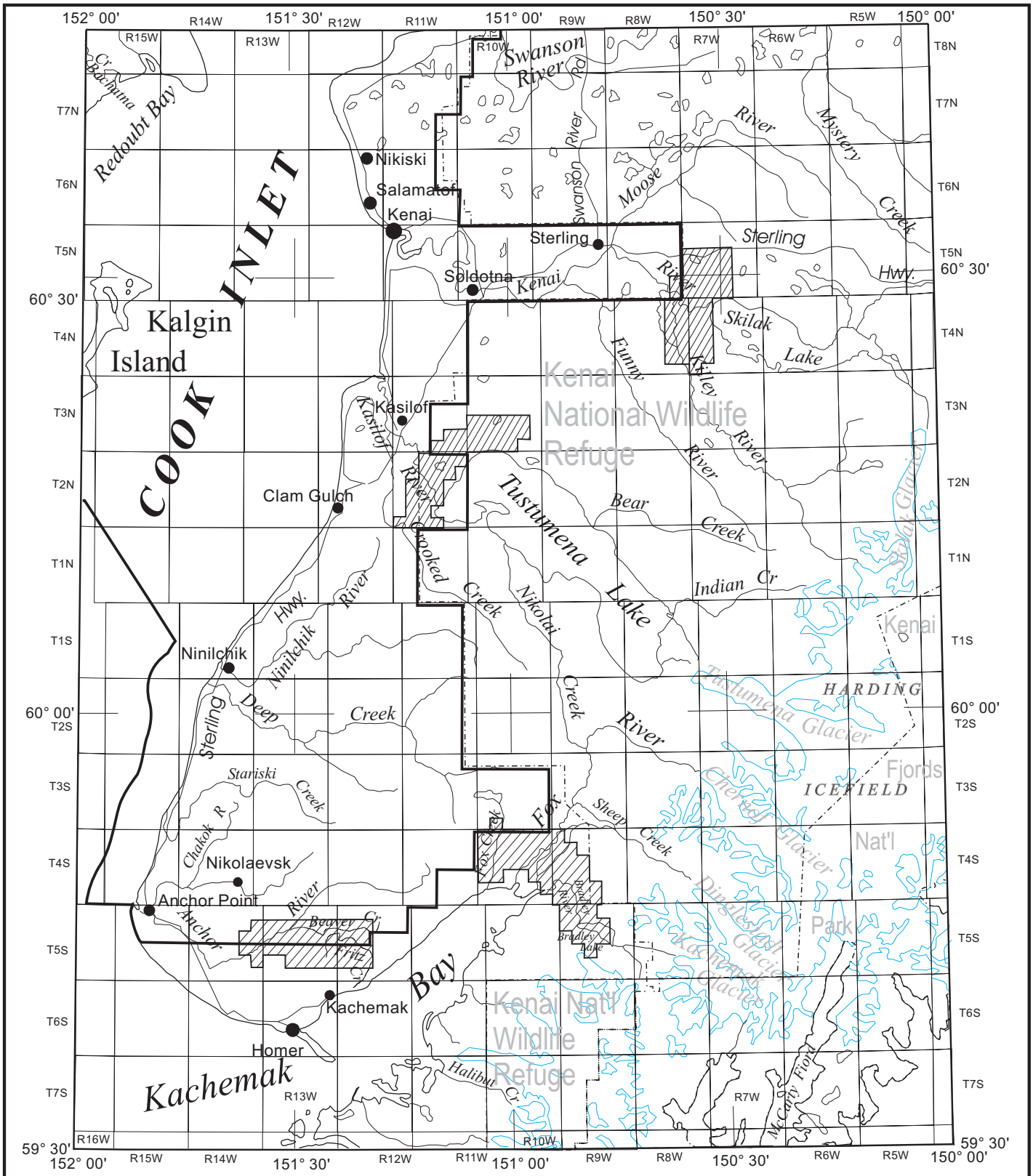
Adding the Kenai brown bears to the state's list of "species of special concern" has no regulatory effect or legal implications. Regulated hunting for bears will still be allowed on the Kenai and the action does not impose any special restrictions on businesses, landowners or recreational users in the area. (Office of the Governor, 1998).

This finding may be amended to incorporate any new significant information about the status of the Kenai Peninsula brown bears, the results of the brown bear conservation strategy, and if warranted, new mitigation measures may be added to protect the bears.

Dall Sheep (*Ovis dalli dalli*) inhabit mountain ranges of Alaska, are generally high country animals, but occasionally occur in rocky gorges below the treeline. No portion of the sale area includes identified Dall sheep habitat (ADF&G, 1985).

Mountain goats (*Oreamnos americanus*) are relatively abundant in Alaska and occupy steep and broken mountain areas from sea level to as high as 10,000 feet. In Southcentral Alaska, they are confined to the Chugach and Wrangell mountains, although their range extends into the Talkeetna Mountains. Goats graze on grasses, herbs, and low-growing shrubs in high alpine meadows. In winter, they migrate closer to the treeline in search of browse. Hemlock is an important winter food for Mountain Goats (ADF&G, 1994). They are characterized by relatively short horns and a fondness for living in rugged terrain. Little was known about the mountain goat until almost 1900 because of the remote habitat of the mountain goat. Mountain goat populations can be found from near sea level to as high as 10,000 feet.

Throughout their lives mountain goats remain in or near steep, broken terrain, a behavior pattern which most likely evolved as a means of avoidance of predators such as wolves or bears. Mountain goats mate in November and December. Billies (male goats) may wander considerable distances in search of receptive females (nannies). Usually a single kid is born in late May or early June after a gestation period of approximately 180 days. Twinning occurs rarely but is more frequent following mild winters. Kids can keep up with adults when only hours old and hardly larger than snowshoe hares. Nannies seek solitude prior to giving birth but soon join other nannies with newborn kids to form nursery flocks. Kids usually remain with their mothers until the next breeding season. Mountain goats may live 14 to 15 years, though most live fewer



Brown Bear Movement Corridors

Cook Inlet Areawide =

Brown Bear Movement Corridors =

Source: U.S. Forest Service, Chugach National Forest, Interagengy Brown Bear Study Team, 1998.

SCALE 1:700,000 ONE INCH EQUALS 11 MILES APPROX.

20 MILES 0 20

20 KILOMETERS 0 20

ALBERS EQUAL-AREA CONIC PROJECTION BASED ON THE CLARK 1866 ELLIPSOID

ADNR 9/98

FIGURE 3.6

than 12. Many goats show healed wounds and missing teeth, indicating a high incidence of accidents, presumably from falls (ADF&G, 1994).

Mountain goats are both grazing and browsing animals, depending on the particular habitat and season of the year. They normally summer in high alpine meadows where they graze on grasses, herbs, and low-growing shrubs. Most goats migrate from alpine summer ranges to winter at or below tree line, but some may remain on windswept ridges (ADF&G, 1994).

The Kenai Peninsula goat population declined steeply in the late 1960s through the early 1970s, then grew until the early 1990s when it then stabilized. The population is estimated at 4,200 - 5,400, including goats in the Kenai Fjords National Park. Portions of the sale area east of Anchorage and possibly on the West Side of Cook Inlet include mountain goat habitat (ADF&G, 1997).

Wolves (*Canus lupus*) are present throughout the Cook Inlet and Susitna basins. Wolves den in dug-out holes in well-drained soils as deep as 10 feet. Wolves usually live in packs with parents and pups of the year. Larger packs may have two or three litters of pups from more than one female. Pack size normally ranges from 2 to 12 wolves (with an average of 6 or 7), however packs as large as 20 to 30 wolves may occur. Wolf packs tend to be territorial and stay within a particular range. On the other hand, wolves that depend on migratory caribou may temporarily abandon their territory and travel long distances for food. Pack territory size ranges from 300 to 1,000 square miles with an average of 600 square miles of habitat. Breeding occurs in February and March, and litters are born in May or early June. Moose or caribou are the wolf's primary food source. The wolf's summer diet is supplemented by voles, lemmings, ground squirrels, snowshoe hares, beaver, and occasionally birds and fish (ADF&G, 1994).

In 1997, ADF&G considered wolf numbers high in southcentral Alaska (ADF&G, 1997). Distribution of wolves has remained relatively constant in recent decades. While birth rates are high, mortality is also high. Abundance varies with prey availability, disease, malnutrition, accidents, harvest pressure, and intra-specific strife (ADF&G, 1994). In 1995, there were an estimated 200 wolves on the Kenai Peninsula. In a study of wolves on the Kenai Peninsula in the 1980s, Peterson et al. (1984) estimated that the rate of wolf predation on moose in winter averaged one moose per pack every 4.7 days. About half of all moose killed were calves, although calves made up only 20 percent of the moose population (Boggs, et al., 1997). There are 180 to 200 wolves on the Kenai Peninsula; 150-160 in Game Management Unit 15 (west of Kenai Mountains), and 40 to 50 wolves in GMU 7 (remainder of peninsula). These wolves average 8 to 10 per pack (Spraker, 1998). In the Mat-Su Borough (GMU 14A, 14B and 16, there are an estimated 114 to 189 wolves. The population increased between 1991 and 1996 (ADF&G, 1997). (Spraker, 1998).

Wolves are highly social animals and usually live in packs that include parents and pups of the year. Larger packs may have two or three litters of pups from more than one female. Some yearlings may stay with the pack. A dominance hierarchy characterizes the social order in the pack with a separate rank order among females and males. Fighting is uncommon within packs except during periods of stress, with the dominance order being maintained largely through ritualized behavior. Although pack size usually ranges from 2 to 12 animals, packs of as many as 20 to 30 wolves sometimes occur. The average size pack is 6 or 7 animals. In most areas wolf packs tend to remain within a territory used almost exclusively by pack members, with only occasional overlap in the ranges of neighboring packs. Wolves that are primarily dependent on migratory caribou may, however, temporarily abandon their territory and travel long distances if necessary. In Alaska the territory of a pack often includes from 300 to 1,000 square miles of habitat with the average being about 600 sq. mi.(ADF&G, 1994).

Other terrestrial mammals also inhabit the Cook Inlet and Susitna regions. Small furbearers include coyote, beaver, lynx, marmot, marten, mink, muskrat, squirrel, red fox, river otter, weasels, and wolverine. The Kenai Peninsula, and Copper, Matanuska, and Susitna River basins have the highest coyote population densities in the state. Small game include bats, hares, lemmings, pikas, porcupine, shrews, voles, and mice (ADF&G, 1994). Furbearers are present in nearly all types of habitat, although most species occur in riparian, wetland, or forested areas (ADNR, 1993:20).

Furbearer populations on the Kenai Peninsula are stable or increasing. In 1997, ADF&G considered wolf, coyote, beavers, land otters, mink, and weasel numbers to be high. Wolverine numbers appear stable, and lynx, responding to an increasing hare population, are increasing. Muskrat and red fox density and

distribution is limited. The red fox population, abundant prior to 1930, declined with an increase in coyote population. Martens are rare on the western Kenai Peninsula. Numerous lakes, streams, and abundant fish and small mammals support a strong mink population on the peninsula (ADF&G, 1997).

Snowshoe hares are common on both sides of Cook Inlet. Population peaks have followed a 10-year cycle since the early 1960s. In the Matanuska-Susitna valley, furbearer population status is difficult to assess. Lynx are stable at low density throughout the area. Ermine and beavers are abundant. Land otters and mink and common. Muskrats are typically common to abundant, although a deep freezing of wetlands in the winter of 1996-1997 is believed to have reduced the muskrat density in the coastal marshes of Knik Arm. Coyote and red fox populations are common to abundant with populations fluctuating with prey abundance. Marten populations increased through 1995, but may have declined since. Wolverine populations have increased slightly in recent years (ADF&G, 1997).

b. Marine Mammals

Beluga whales (*Delphinapterus leucas*) are toothed whales found in Cook Inlet waters year round. Local distribution is associated with availability of primary food species, such as eulachon (hooligan) and salmon smolt, and other life-cycle factors. Belugas also feed on smelt, capelin, herring, cod, and on some invertebrates. In other parts of their range, belugas eat over 100 species of fish. The Cook Inlet stock is thought to be an isolated population. The nearest belugas to the Cook Inlet stock are found in Bristol Bay (Calkins, 1987)

Important beluga habitat in or near the sale area includes the mouths of the Kenai, Susitna, Little Susitna, Ivan, Beluga, Eagle and Chickaloon Rivers. Habitat also includes the mouths of the Drift, Big, Kustatan, McArthur, Middle, and Chuitna Rivers, and Fish and Ship Creeks. The waters of Knik Arm are important for migration, feeding, and juvenile rearing behaviors (NMFS, 1998) (See Figure 3.5).

Aerial surveys of the beluga whale have been flown since the 1960s, but more systematic surveys of beluga density and distribution were flown during June and July 1993-1998. The National Marine Mammal Laboratory in cooperation with NMFS, the Alaska Beluga Whale Committee (ABWC), and the Cook Inlet Marine Mammal Council (CIMMC) began a program to study the viability of the Cook Inlet beluga stock in 1993.

The seasonal distribution of whales is not fully understood, but they have been observed regularly in Cook Inlet from March through November and are most abundant from June through August (Trasky, 1995:11, citing to ADF&G, 1994b). In spring, belugas concentrate in large estuaries of the upper Inlet and at the mouth of the Kenai River. Specific calving areas have not been documented; however, it is believed that calving occurs from mid-June to mid-July in the same estuaries where the whales concentrate in spring. Beluga sightings have not been documented in Cook Inlet for the months of December through February, although they likely move to the more ice-free waters of the lower inlet. During heavy ice years, some belugas may leave Cook Inlet entirely (Trasky, 1995:2, citing to NMFS, 1992; RPI, 1994; Small and DeMaster, 1995). Because winter distribution (November to March) of beluga whales is unknown, the Minerals Management Service is conducting aerial surveys of the lower Cook Inlet. Fisheries observer reports also provide information on abundance and distribution of beluga whales (Hubbard and Hansen, 1997). Recent surveys indicate that essentially all Cook Inlet whales occupy the upper Inlet during the summer months (NMFS, 1998).

Density and distribution of Cook Inlet beluga whales changes during the year in association with movements and abundance of food sources. The density of beluga groups increases throughout Spring, then declines at the end of summer following eulachon (*Thaleicthys pacificus*) and salmon (*Oncorhynchus spp.*) runs. In early June 1993, all beluga sightings were in upper Cook Inlet with 56 –percent were near the Susitna Rivers (Big and Little). Two months later, ¾ of all belugas sighted were near the Susitna Rivers. By the first two weeks of September, whales were more abundant in Knik and Turnagain Arms and in the lower Inlet.

In 1997, beluga whales congregated in large groups (up to 300) in the northeastern portion of Cook Inlet near the mouths of the Susitna Rivers and Knik Arm. In that year, 61 percent of all belugas sighted during NMFS aerial surveys in Cook Inlet were in Knik Arm. A small group of 10-50 whales has been consistently found between Chickaloon River and Point Possession. Other groups occasionally occur in Turnagain Arm, and Kachemak, Redoubt, and Trading Bays (Smith and Mahoney, 1997).

Differences in beluga sighting reports of the 1970s and 1980s relative to the 1993-1997 sightings suggest that the open water distribution of beluga whales may have changed. In the past, whales were more often sighted in the offshore portions of lower Cook Inlet, whereas today whales are concentrated in water less than 60-feet deep (nearshore), near river mouths north of the Forelands. Beluga sightings near the Susitna Rivers increased during the early 1990s and remained stable until 1997. The shift in distribution is likely related to availability and abundance of food sources. Weather events, such as a strong El Nino in 1997 may also affect the distribution of Cook Inlet beluga whales. While there have been changes in distribution, there is no evidence of changes in density of whale groups through June and July 1993-1997 (Rugh, Shelden, and Mahoney, 1998).

NMFS estimates the 1998 population of the Cook Inlet beluga stock to be 347 animals, a decline from an estimated 594 animals in 1996 and 653 animals in 1994. (Hobbs, Rugh, and DeMaster, 1998) In the summer of 1998, 198 beluga whales were counted, and scientists use a correction factor to estimate total abundance. Earlier surveys in Cook Inlet resulted in beluga whale counts of approximately 300-400, but these survey counts may not have been derived from reliable data. The method for calculating whale abundance has been refined to consider new video-image and surfacing frequency data. For example, in 1994, NMFS estimated the population to be 1,250 whales, but that number should have been 653 whales. The 5-year average population between 1994 and 1998 is 505 whales. While NMFS believes there were more than a thousand whales in Cook Inlet prior to the 1990s (Mahoney, 1998), “an apparent declining trend in the annual abundance estimates between 1994 and 1998 is not statistically significant.” (Hobbs, Rugh, and DeMaster, 1998:1).

The beluga whale is a candidate species for “threatened” protection status under the Endangered Species Act of 1973 and is listed as a “species of concern” by ADF&G under AS 16.20.190. It has been listed as a candidate species, because NMFS believes the annual subsistence harvest is too large for the stock to sustain (Hobbs, 1998). In November 1998, NMFS initiated a status review of the Cook Inlet beluga whale to determine whether designation under the MMPA or a change of listing classification under the ESA is warranted. The review will give consideration to the current status of Cook Inlet belugas (distribution, population abundance and trends, reproductive parameters, food habits). The effects of the Native subsistence harvest, and the potential effects of other humanly induced impacts, as well as beluga natural mortality will also be examined (63 Fed. Reg. 64,228 (November 19, 1998)).

As with most mammals, contaminants ingested by pregnant belugas are readily passed from mother to fetus. The National Marine Fisheries Service is studying the presence of chlorinated hydrocarbons and trace elements in marine mammal tissue and is archiving frozen samples for current and future study. The Service has been working with local subsistence hunters to collect samples for contaminant analysis (Smith and Mahoney, 1997).

Killer whales (*Orcinus orca*) in small pods of up to five individuals have been observed feeding in Cook Inlet, but they mostly concentrate in continental shelf waters south of the sale area (MMS, 1995: III.B.14). A pod has been observed in Knik Arm in the summer since 1991 (Morris, 1996). As predators, they frequent areas, such as river mouths or seal haul-outs with a high concentration of potential prey, including returning salmon, beluga whales, and seals (MMS, 1995: IV.B.1-45). Killer whales feed seasonally off the mouth of the Susitna River and as far as Fire Island and Chickaloon Bay (Smith, 1998). No Cook Inlet population data are available.

Harbor porpoises (*Phocoena phocoena*) are seen nearshore in harbors, bays, and river mouths, and in Kachemak Bay. Harbor porpoises probably reside locally throughout the year, though sightings are much less frequent in fall and winter. These cetaceans usually travel singly or in pairs and probably feed on herring, capelin, pollock and eulachon (Calkins, 1987). It is unknown how many porpoises inhabit or migrate through Cook Inlet waters in any given year or season. Based on a 1991 aerial survey, it is estimated that 422 harbor porpoises (about 1.7 percent of the Alaska population estimate) inhabit Cook Inlet (Small and DeMaster, 1995). While harbor porpoise sightings are most numerous south of the sale area, they may enter sale area waters seasonally in search of eulachon or herring (MMS, 1996). Harbor porpoises have been observed recently (1997) north of West Foreland, however most sightings have been in relatively clear water south of Tuxedni bay (Hobbs, 1998). During the Spring of 1998, NMFS received phone reports of 50 to 100 harbor

porpoises in Turnagain Arm. Winter distribution is unknown, but harbor porpoises utilize sale area waters seasonally (Mahoney, 1998).

Harbor seals (*Phoca vitulina richardsi*) inhabit Cook Inlet year-round. Although predominately a coastal species, individual seals are sometimes seen offshore. When not in the water, harbor seals commonly haul out on sandbars and protected tidal rocks. Several haul-outs have been identified in the sale area near the West Forelands, on Kalgin Island, at Harriet Point, and near the sale area in Tuxedni and Kachemak Bays (Trasky, 1995, citing to Loughlin, 1992). Harbor seals are generally non-migratory, with local movements associated with tides, weather, season, food availability, and reproduction. Strong fidelity of individuals for haul-out sites year-round has been recorded (Small and DeMaster, 1995).

Pupping and breeding occur from late May through July (KPB, 1990:1-48). Haulout areas are especially important to seals during pupping and molting. Preferred haulout sites are protected from waves and winds, have ready access to water and food, and are isolated from predator disturbance. Offshore reefs, rocks, ledges, beaches of isolated islands, beaches backed by cliffs, sand or mud bars in estuaries, and floating sea ice are favorite seal haulout sites. Breeding occurs between mid-June to late July (ADNR and ADF&G 1993:16-17). The nursing period is variable from three to six weeks, and the pups more than double their weight. From birth to weaning, mother and pup are seldom apart (Hoover 1988:128-129). Seals are particularly sensitive to human disturbance during pupping. Separation of mother and pup may result in the death of the pup (ADNR and ADF&G 1993:B-17; Hoover 1988:128).

Molting occurs following the pupping season, generally from late June to October. Molting lasts from 4 to 6 weeks, and the seals spend more time hauled out during the molt than at other times (Hoover 1988:129).

Harbor seals are opportunistic feeders and eat mainly fish, such as herring, walleye pollock, Pacific cod, capelin, salmon, and eulachon; octopus; squid; and sometimes shrimp (ADNR and ADF&G 1993:B-17). Known predators of the seal are the killer whale, Steller sea lion, and shark. Humans also hunt seals for subsistence (Hoover 1988:130).

Surveys conducted by the NMFS in 1992 indicate that several hundred seals resided in Cook Inlet. In September 1992, 288 harbor seals were counted along the coast near the mouth of Big River in Redoubt Bay. Five days earlier, 522 seals were counted at the head of Kachemak Bay with the largest numbers hauling out on the Fox River Flats and Yukon Island. Smaller numbers of seals were also observed at other locations along the Cook Inlet shoreline. Surveys conducted in 1991 and 1992 revealed an average of 12,232 harbor seals in the Gulf of Alaska with 695 estimated for the Kenai Peninsula and 1,105 for Cook Inlet. (Small and DeMaster, 1995)

Population declines of up to 78 percent had been recorded for harbor seals in the northern Gulf of Alaska since the mid-1970s, prompting management concerns (Fadley, et al., 1997)(Trasky, 1995, citing to Loughlin, 1992). Causes of the decline are unknown, but may include natural population fluctuations or cycles, reduced environmental carrying capacity due to natural or human causes, predation, and subsistence harvests, direct fishery related mortality, entanglement in marine debris, pollution, and emigration (Hoover-Miller, 1994:17). Limited availability of marine forage fish is also being looked at as a possible cause of marine mammal decline (Spies, 1997).

Recent aerial surveys indicate a possible increase in the Gulf of Alaska and Cook Inlet harbor seal population. Winthrow & Loughlin (1997) estimated the mean population of harbor seals in the Cook Inlet to Cape Douglas region based on Fall aerial surveys. In this region, 1,139 more seals were located in 1996 (2,244) than in 1992 (1,105). More seals may have been observed in 1996 due to better weather conditions and sampling results. NMFS believes the actual number of seals has increased in the Cook Inlet to Cape Douglas region by as much as 20 percent over 1992 (Winthrow & Loughlin, 1997:125).

Important haulouts in the sale area identified in 1996 include Big River, Little Jack Slough, and Chickaloon. In the Big River area, about 12 percent more seals were observed in 1996 than in 1992. During the 1996 surveys, an average of 118 seals were observed north of Big River; 46 at Big River; 16 at Little Jack Slough; and 10 at Chickaloon (Winthrow & Loughlin, 1997).

Sea otters are present near the sale area and occur in high numbers in Kamishak Bay and outer Kachemak Bay near Seldovia and Nanwalek. Preferred habitat includes rocky reefs, offshore rocks, and kelp beds. Sea otters rest and forage in the vicinity of kelp beds but can occupy areas without kelp. They will haul out on rocky points, islets, sandy beaches, and tidally exposed sandbars or float on their backs and eat shellfish.

Some breeding occurs year-round but the main activity is during September and October and pups are birthed in May. Females usually begin breeding at three to four years of age, and breeding intervals of females appears to be two years. Survival of pups is good until weaning, but food availability may limit them thereafter (ADNR, 1994:G-30).

Sea otters generally inhabit the nearshore waters with sandy or rocky sea floor that can support populations of benthic invertebrates. They eat a wide variety of benthic species including sea urchins, abalone, mussels, clams, crustaceans and fishes (MMS, 1995: III.B.17). They feed heavily on invertebrates until they deplete the supply, then the otters move to unoccupied habitat or consume fish. Abundant food at accessible depths is probably the most rigid habitat requirement. The seasonal movements of otters are apparently influenced, in addition to the availability of food, by factors such as breeding, pup-rearing, boat traffic patterns, and protection from inclement weather (Calkins, 1987).

In 1994, sea otters were found continuously from Anchor Point to the western entrance of Prince William Sound. In 1989, 2,300 sea otters were observed along the Kenai Peninsula (USFWS, 1994:8). In a summer 1993 survey of lower Cook Inlet, USFWS researchers counted 6,000 sea otters. The following winter, 1,100 sea otters were counted in the eastern portion of the USFWS study area (Kendall, 1997).

Steller sea lions *Eumetopias jubatus)* normally range to the south of the sale area, but are occasionally sighted foraging for food in upper Cook Inlet waters (Loughlin, 1998). Along the coast, adult animals congregate on “rookeries” during the reproductive season. These typically occur on relatively remote islands, rocks, reefs, and beaches. (ADF&G, 1994). Sea lions can be found in Kachemak Bay, and are known to feed on hooligan in summer at the mouth of the Susitna River. One sea lion has been observed in upper Turnagain Arm, at the Twentymile River (Morris, 1996).

Breeding occurs mainly from late May to mid-July. Most pups are born in June, although mid-May to mid-July births also occur. During the breeding and pupping season from May through July, only adult females, adult males, and newborn pups are present at the birth rookeries (ADNR and ADF&G 1993:B-21). Females with pups usually feed at night during the breeding period, while males remain onshore and do not feed. Dominant males, usually nine years or older, maintain territorial areas at the rookeries. Most births are of single pups which are born with their eyes open and able to crawl and swim, if necessary. The female nurses the pup from 5 to 13 days before going to sea to feed, then returning to nurse again. The foraging range of females with newborn pups appears to occur within 20 meters of the rookeries and is restricted by the need to return to nurse the pups. Females without pups are able to forage at locations far removed from their rookeries (Federal Register, 1993:45270). Pups enter tide pools or shallow water at around two weeks. They are taken to sea by the mother at 24 to 32 days of age, and have become proficient swimmers at 36 to 41 days of age. They usually double their weight within their first seven weeks of life. Pups are generally weaned within the first year prior to the female returning to the rookery. Non-pregnant females may remain with the juvenile longer than a year. Sea lions feed on a variety of prey, including, salmon, cod, octopus, rockfish, bivalves, clams, mussels, herring, and snails. Foraging strategies and ranges change seasonally, and according to the age and reproductive status of the animal (NMFS, 1992).

The distance the sea lions are found offshore seems to vary with the seasons. During the summer, the sea lions are found closest to shore, especially around the rookeries, at a range from 1 to 13 km. During the fall, the range is from 7 to 59 km (Hoover 1988:161-164). The sea lions themselves are prey to killer whales and sharks (Hoover 1988:165-166) and fishermen (NMFS 1992:15, citing Matkin and Fay 1980; and Wynne 1990:19-22).

Aerial surveys of sea lion presence show an extensive decline in numbers within their range over the last 30 years. The number of sea lions in Alaska declined 50 percent from the mid-1970s to the mid-1980s. In the 1970s the worldwide population of Steller sea lions was about 281,000, with the Alaska population estimated at 242,000, including pups. (Trasky, 1998). Counts from 1976 to 1979 indicated about 104,000 sea

lions in the Western U.S. stock (west of Cape Suckling) Small and DeMaster, 1995). This decline continues today and the Steller sea lion is listed as endangered under the ESA (Trasky, 1998). The Western U.S. stock of Steller sea lions is estimated at 43,200, with 22,000 occurring in the Gulf of Alaska. No population estimate for Cook Inlet is available. Management actions implemented to stem the decline include no-entry buffer zones around rookeries, and restrictions on commercial fishing operations and harvests (Small and DeMaster, 1995).

It is unknown why the Steller sea lion population is in decline. Possible causes may include a natural shift in prey species abundance; human harvesting of key prey species, like pollock; and incidental mortality in ghost-fishing gear; direct mortality (shooting); and disease (Federal Register, 1993:45269). Evidence may suggest there are inter-decade shifts in prey species abundance in continental shelf marine ecosystems. Shifts in the abundance of zooplankton in the Gulf of Alaska affect marine survival rates for forage fish and salmon. This affects the balance between species competing for the same food resource. In a natural fluctuation or equilibrium, species composition of fish communities changes, but overall marine biomass remains relatively stable. For example, shrimp and crab stocks in the Gulf of Alaska of the 1960s and 70s crashed in the early 1980s, which happened to coincide with a rapid increase in cod, pollock and flatfishes in the same area. Additionally, a one-degree F rise in sea surface temperature in recent decades may have affected reproduction of fish and predator-prey relationships (Spies, 1997).

Other marine mammals have been observed in the sale area. Sei, Minke, and Fin whales have been seen in Cook Inlet, although their presence is rare. Gray whales occasionally enter Cook Inlet and Turnagain Arm on their migration route to the Bering Sea, probably by accident (Morris, 1996).

About 60 to 80 humpback whales have been seen near the Barren Islands, but none north of Kachemak Bay. The range of the Fin whale is limited to Shelikof Strait, Raspberry Island and lower Cook Inlet (Smith, 1998).

Minke whales are relatively common in the Bering and Chukchi Seas and in the inshore waters of the Gulf of Alaska, including Cook Inlet. Minke whales are considered common off the coast of Alaska and human-related mortality is currently thought to be zero. No data on population trends are available and no estimates of population abundance off Alaska have been made for Minke whales. (Small and DeMaster, 1995).

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