SENSITIVE AREAS: PART FOUR - BACKGROUND INFORMATION

INTRODUCTION

The background information contained in this section is a mixture of references to readily available documents, knowledgeable contacts, and data not readily available elsewhere. Industry-generated references that have had agency input and review are incorporated by reference.

For coastal information, see the Prince William Sound Tanker Oil Discharge Prevention and Contingency Plan (Tanker Plan)(1994) by the Prince William Sound Response Planning Group, and its Supplemental Information Document (SID) #13, which contains background information and data tables (as well as an appendix of large-scale maps) for Prince William Sound, including:

(1) Salmon and other Anadromous Fish
(2) Pacific Herring
(3) Halibut and Groundfish
(4) Crabs and Shrimp
(5) Other Intertidal/Subtidal Invertebrates (Mussels, Clams, Oysters)
(6) Birds (Water-Related, Shorebirds, Seabirds, Raptors)
(7) Marine Mammals (Cetaceans, Pinnipeds, Sea Otters)
(8) Terrestrial Mammals
(9) Threatened and Endangered Species
(10) Commercial Fisheries
(11) Sport Fisheries
(12) Human Use of Wildlife Resources
(13) Subsistence Utilization of Fish and Wildlife Resources

The Tanker Plan's automated Graphical Resource Database (November 2004) currently consists of the following data layers:

--Aerial Photo Locations
--Aquaculture Sites
--Commercial Fishing Areas-Salmon
--Community Sensitive Sites
--Equipment Storage Sites
--Historic Harbor Seal Sites
--Herring Spawning Areas
--Marine Features
--Recreation/Tourism Areas
--Salmon Streams--all
--Sea Lion Sites
--Seabird Colonies
--Small Boat Harbors
--Waterfowl Concentration Areas
--Shoreline Cleanup Assessment Team
--Eelgrass Bed Locations
--Port Valdez Sensitive Area Tactical Guide
--200 Foot Topographic Contours
--Narrow Rivers
--Tidal Flats
--Shoreline
--Geographic Response Strategies
--Salmon Collection & Release Sites
--Communities
--Bald Eagle Nest Sites
--Harbor Seal Sites
--Harbor Seal Areas
-- Hatchery Sites
--Marsh Shoreline
--Research Areas
--Salmon Index Streams
--Sea Otter Concentration Areas
--Sheltered Tidal Flats
--Subsistence Areas
--Whales
-- Land Features
--Valdez Marine Terminal
--NOAA Charts
--Wide Rivers and Lakes
--Land
--Chugach National Forest Shoreline

The Graphical Resource Database also covers the Copper River Delta and coastal resources from the eastern Kenai Peninsula coast to Shelikof Strait, including Kodiak.

See the Environmental Atlas of the Trans Alaska Pipeline System (1993), by Alyeska Pipeline Service Company (Alyeska Atlas). The Alyeska Atlas consists of 25 maps covering the length of the Trans-Alaska Pipeline System (TAPS) and brief narratives about mammals, birds and fish found along the TAPS corridor. Each map has an overlay with the following types of information identified:

(1) Recreation Sites/Areas
(2) Scenic Areas
(3) Special Areas
(4) Subsistence Use Areas
(5) Wildlife Areas (bears, bison, caribou, sheep, fox, wolf, grouse, moose, otter, raptor, swan, waterfowl, whale)
(6) Fish Hatchery
(7) Fish Stream (Anadromous, Non-anadromous, Overwinter)
(8) Site, Den or Nest
(9) Direction of View, Migration, Movement or Distribution
(10) Oil Spill Containment Site

LAND MANAGEMENT MAPS

The Alaska Department of Natural Resources, under agreement with the Alaska Department of Environmental Conservation, produced digital base and land management maps for each of the subareas using their ARC-INFO based Geographic Information System. The following land management maps provide an index to the Public Land Record and should not be viewed as legal documents. These maps are available on the internet at: http://www.asgdc.state.ak.us/maps/cplans/subareas.html

Insert land management index map here

http://www.asgdc.state.ak.us/maps/cplans/base/cover1n3.pdf

Insert land management designations map here--page 1 of 4

http://www.asgdc.state.ak.us/maps/cplans/pws/pws11n3.pdf

Insert land management designations map here--page 2 of 4

http://www.asgdc.state.ak.us/maps/cplans/pws/pws21n3.pdf

Insert land management designations map here--page 3 of 4

http://www.asgdc.state.ak.us/maps/cplans/pws/pws31n3.pdf

Insert land management designations map here--page 4 of 4

http://www.asgdc.state.ak.us/maps/cplans/pws/pws41n3.pdf

A. LAND MANAGEMENT DESIGNATIONS

1. Access to Lands

Land ownership must be determined and landowners contacted to evaluate incident-specific protection priorities, obtain land-use permitting requirements, and obtain permission to access lands. Native corporation lands, as well as local, State, and Federal government lands often require special use permits. If an incident affects private lands or Native Allotments, permission to enter lands should be sought from the landowner. The local Borough government is often the best source of private land ownership records.

2. State

Tanana Valley State Forest The Tanana Valley State Forest was first designated in 1983 and currently contains 1,822,100 acres. Its area extends from north of Fairbanks to north of Tetlin Junction and closely follows the Tanana River on the north. The Forest's area encompasses or is adjacent to many bodies of water including the Tanana, Healy and Robertson Rivers; Lakes George and Mansfield; Fish, Sand Healy and Wolf Lakes; and George, Sand, Mansfield, Fortymile and Billy Creeks.

State Game Refuges, Habitats, Sanctuaries The Alaska State Legislature has classified certain areas as being essential to wildlife and fisheries resources. These areas are designated as either a game refuge, critical habitat area or game sanctuary. Management of these essential areas is the joint responsibility of the Department of Fish and Game and Department of Natural Resources. Legislation pertaining to these lands may be found in Alaska Statutes Title 16, Chapter 20. Legal descriptions of area boundaries can be found in Alaska Department of Fish and Game's publication, State of Alaska Game Refuges, Critical Habitat Areas and Game Sanctuaries (1991). (See Part D.7, Recreational Sites and Facilities, for State Parks information.)

Copper River Delta State Critical Habitat Area The Area was established in 1978 to protect habitat crucial to perpetuation of fish and wildlife (especially waterfowl and shorebirds). The Area includes all public land, tideland, submerged land, and water covering the Copper River Delta from the mouth of Orca Inlet to Palm Point. This area is the largest contiguous Pacific coast wetland and is among the most productive and critical shorebird habitats in Alaska. The Copper River Delta is a feeding and resting area for more than 20 million shorebirds, which pass through on their spring migration. Among the migrants are nearly the entire Pacific coast population of dunlins and western sandpipers. During the spring and summer, the area also supports the entire U.S. nesting population of dusky Canada geese and a substantial number of trumpeter swans. The area is also popular for wildlife viewing, hunting and fishing.

State Marine Parks The Alaska State Legislature has classified certain areas as State Marine Parks (see Part 4.D.7, Recreational Sites and Facilities).

3. Federal

Chugach National Forest The nation's second largest national forest at 5.6 million acres, the Chugach stretches from the Kenai Peninsula for 200 miles to the Bering Glacier. Sport, subsistence and commercial fishing; hunting; sightseeing; outdoor recreation; boating; hiking; and wildlife habitat are some of the primary uses of the Chugach. Additional information may be found on the website: http://www.fs.fed.us/r10/chugach/

Research Natural Areas are set aside on the Chugach National Forest to allow ecological

processes to prevail with minimal human intervention and to provide opportunities for research to increase understanding of natural ecosystem processes and sustainability. Areas include:

--Green Island
--Kenai Lake/Black Mountain
--Wolverine Glacier
--Olsen Creek
--Copper Sands

Wrangell-Saint Elias National Park and Preserve Established in 1980, the 13 million acre Park and Preserve abut the border and Canada's Kluane National Park--together they have been designated on the World Heritage List as outstanding natural areas. The area contains the North American continent's largest assemblage of glaciers and its greatest collection of mountain peaks over 16,000 feet in elevation. The Malaspina glacier is larger than the state of Rhode Island. Mount Saint Elias, at 18, 008 feet, is the second highest peak in the United States. Wilderness backpacking, fishing and hunting, car camping, river running, cross-country skiing and mountain climbing are principal uses. The Dall sheep population is considered one of the finest in the world. Additional information may be found on the website:
http://www.nps.gov/wrst/index.htm

Wild and Scenic Rivers The upper Delta River and West and Middle Forks of the Gulkana River are nationally designated as Wild and Scenic Rivers and are managed by the Bureau of Land Management. The lower Nellie Juan River is proposed for Wild status by the U.S. Forest Service.

Alaska Maritime National Wildlife Refuge The Gulf of Alaska Unit of the Refuge includes some of the islands, rocks and forelands along the coast of the Gulf of Alaska. Alaska Maritime consists of over 2,400 islands, headlands, rocks, islets, spires, and reefs along the Alaskan coast, stretching from Southeast Alaska to Cape Lisburne on the Chukchi Sea. The Refuge is synonymous with seabirds. About 75 percent of Alaska's marine birds (15 to 30 million of 55 species) use the Refuge. The Refuge is also home to thousands of sea lions, seals, walrus, and sea otters. Wildlife viewing, photography and backpacking are primary uses of the Refuge. The Refuge was established in 1980. Additional information may be found on the website:
http://alaskamaritime.fws.gov/index.html

B. HABITAT TYPES

Shoreline habitats have been defined and ranked according to Environmental Sensitivity Index (ESI) standards produced by the National Oceanic and Atmospheric Administration (NOAA) in *Environmental Sensitivity Index Guidelines* (October 1997). Seasonal ESI maps in poster and atlas formats have been produced for the subarea, as shown on the following index map. These maps are available on the internet at: http://www.asgdc.state.ak.us/maps/cplans/subareas.html. Updated ESI information can also be found on the internet at: http://response.restoration.noaa.gov/order/esiindex.html

1. Benthic Habitats

Oil vulnerability is lower in benthic (near bottom) areas than in the intertidal zone since contamination by floating slicks is unlikely. Sensitivity is derived from the species which use the habitat. Benthic habitats have not been traditionally classed by ESI rankings, but are treated more like living resources which vary with season and location. Benthic habitats include: submerged aquatic vegetation beds, large beds of kelp, worm reefs, coral reefs.

2. Shoreline Habitats

Habitats (estuarine, large lacustrine and riverine) ranked from least (#1) to most (#10) sensitive (see the following table) are described below:

ESI #1--Exposed impermeable vertical substrates: exposure to high wave energy or tidal currents on a regular basis, strong wave-reflection patterns common, substrate is impermeable with no potential for subsurface penetration, slope of intertidal zone is 30 degrees or greater, attached organisms are hardy and accustomed to high hydraulic impacts.

ESI #2--Exposed impermeable substrates, non-vertical: exposure to high wave energy or tidal currents on a regular basis, strong wave-reflection patterns regular, substrate is impermeable with no potential for subsurface penetration over most of intertidal zone, slope of intertidal zone is less than 30 degrees, there can be accumulated but mobile sediments at the base of cliff, attached organisms are hardy and accustomed to high hydraulic impacts.

ESI #3--Semi-permeable substrate: substrate is semi-permeable with oil penetration less than 10 cm, sediments are sorted and compacted, slope is less than 5 degrees, sediment and potential for rapid burial mobility is low, surface sediments are subject to regular reworking by waves, there are relatively low densities of infauna.

ESI #4--Medium permeability substrate: substrate is permeable with oil penetration up to 25 cm, slope is 5 to 15 degrees, rate of sediment mobility is high with accumulation of up to 20 cm of sediments in a single tidal cycle, sediments are soft with low trafficability, low densities of infauna.

ESI #5--Medium to high permeability substrate: substrate of medium to high permeability which allows oil penetration up to 50 cm, spatial variations in distribution of grain sizes with finer ones at high tide line and coarser ones in the storm berm and at toe of beach, 20 percent is gravel, slope between 8 and 15 degrees, sediment mobility is high during storms, sediments are soft with low trafficability, low populations infauna and epifauna except at lowest intertidal levels.

ESI #6--High permeability substrates: substrate is highly permeable with oil penetration up to 100 cm, slope is 10 to 20 degrees, rapid burial and erosion of shallow oil can occur during storms, high annual variability in degree of exposure and frequency of wave mobilization, sediments have

lowest trafficability of all beaches, natural replenishment rate is the lowest of all beaches, low populations of infauna and epifauna except at lowest intertidal levels.

ESI #7--Exposed flat permeable substrate: flat (less than 3 degrees) accumulations of sediment, highly permeable substrate dominated by sand, sediments are well saturated so oil penetration is limited, exposure to wave or tidal-current energy is evidenced in ripples or scour marks or sand ridges, width can vary from a few meters to one kilometer, sediments are soft with low trafficability, high infaunal densities.

ESI #8--Sheltered impermeable substrate: sheltered from wave energy and strong tidal currents, substrate of bedrock or rocky rubble, variable in oil permeability, slope greater than 15 degrees with a narrow intertidal zone, high coverage of attached algae and organisms.

ESI #9--Sheltered flat semi-permeable substrate: sheltered from wave energy and strong tidal currents, substrate is flat (less than 3 degrees) and dominated by mud, sediments are water-saturated so permeability is low, width varies from a few meters to one kilometer, sediments are soft with low trafficability, infaunal densities are high.

ESI #10--Vegetated wetlands: marshes and swamps with various types of emergent herbaceous grasses and woody vegetation over flat mud to sand substrate—highly organic mud is common.

ShoreZone Mapping. A coastal habitat mapping effort has produced an on-line database, digital maps, and color aerial imagery and videos of the coastline in the subarea. This geo-referenced data set collected at low tide includes coastal geomorphology and biological habitat for intertidal and shallow subtidal areas. ESI types are cross-referenced. The information may be accessed at:

http://www.CoastAlaska.net

3. Upland Habitats

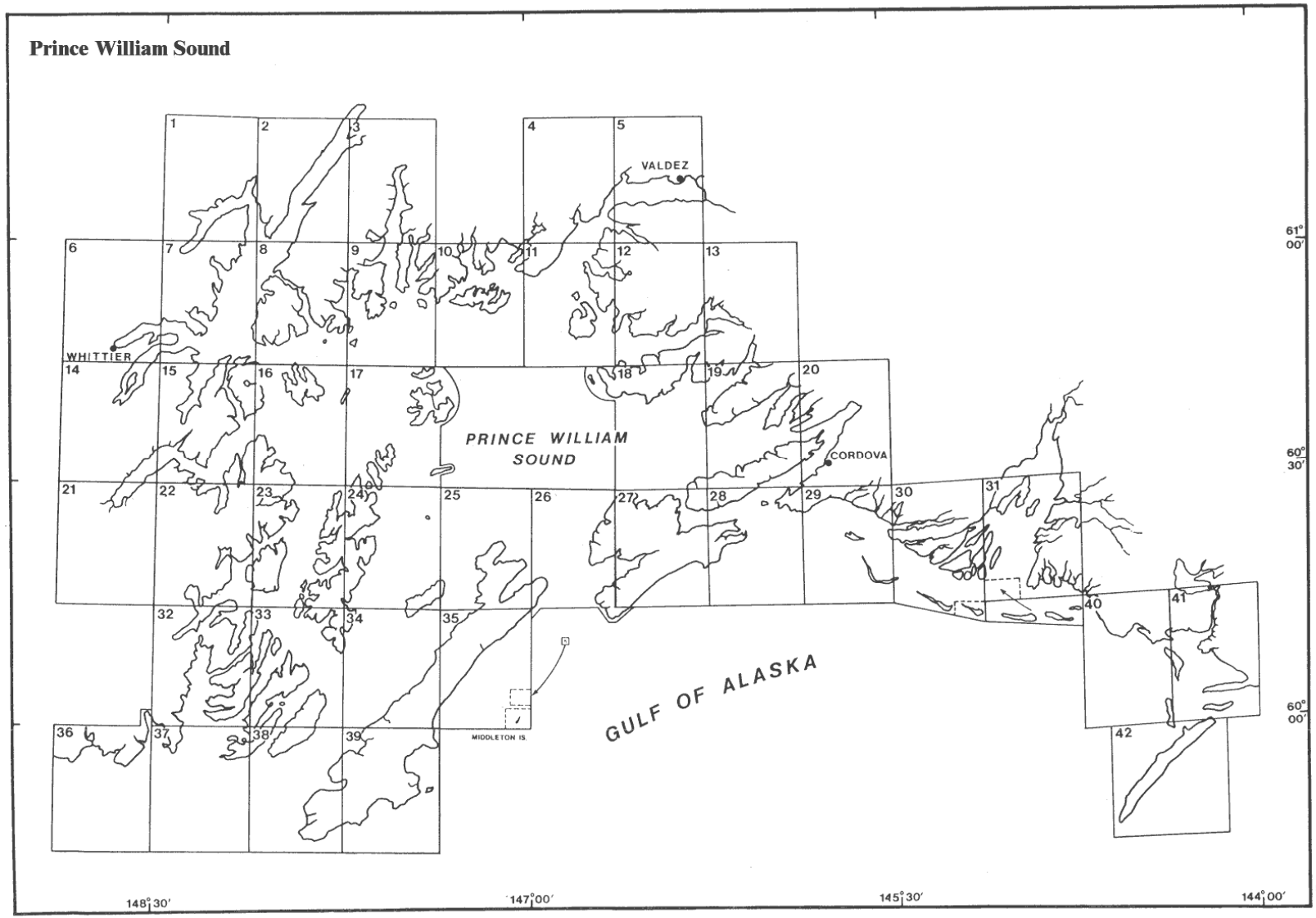
At this time, no uplands or wetlands classifications directly related to sensitivity to oil spills has been identified. A general wetlands classification has been developed by the U.S. Fish and Wildlife Service, National Wetlands Inventory, in Anchorage. Considerable mapping of wetlands has been completed, some of which are available in a Geographic Information System database (see the following figure). Updated map data is being placed on the National Wetlands Inventory Internet web site at: http://wetlands.fws.gov/

National Wetlands Inventory
ESIC/USGS
Anchorage
786-7011

ESI HABITAT RANKING

ESI NO.	ESTUARINE (marine)	LACUSTRINE (lake)	RIVERINE (large rivers)
1 A	Exposed rocky cliffs	Exposed rocky cliffs	Exposed rocky banks
1 B	Exposed sea walls	Exposed sea walls	Exposed sea walls
2	Exposed wave-cut platforms	Shelving bedrock shores	Rocky shoals; bedrock ledges
3	Fine- to medium-grained sand beaches	Eroding scarps in unconsolidated sediments	Exposed, eroding banks in unconsolidated sediments
4	Coarse-grained sand beaches	Sand beaches	Sandy bars and gently sloping banks
5	Mixed sand and gravel beaches	Mixed sand and gravel beaches	Mixed sand and gravel bars and gently sloping banks
6 A	Gravel beaches	Gravel beaches	Gravel bars and gently sloping banks
6 B	Riprap	Riprap	Riprap
7	Exposed tidal flats	Exposed flats	Not present
8 A	Sheltered rocky shores	Sheltered scarps in bedrock	Vegetated, steeply sloping bluffs
8 B	Sheltered sea walls	Sheltered sea walls	Sheltered sea walls
9	Sheltered tidal flats	Sheltered vegetated low banks	Vegetated low banks
10 A	Saltwater marshes		
10 B	Freshwater marshes	Freshwater marshes	Freshwater marshes
10 C	Freshwater swamps	Freshwater swamps	Freshwater swamps

"Environmental Sensitivity Index Guidelines" (October 1995) NOAA Technical Memorandum NOS ORCA 92



Environmental Sensitivity Index Map Atlas Index

Insert wetlands status map here

http://www.asgdc.state.ak.us/maps/cplans/base/wetlands99.pdf

C. BIOLOGICAL RESOURCES

1. Fish and Wildlife

(a) Threatened and Endangered Species

Federally listed threatened and endangered species are protected under the Endangered Species Act. Spill response activities which could impact a listed species should be coordinated with the U.S. Fish and Wildlife Service and National Marine Fisheries Service. The northern right whale, humpback whale, and short-tailed albatross are also on the State of Alaska's endangered species list. Threatened and endangered species potentially present in the Prince William Sound subarea include:

Table 1: The following species[a] and critical habitat occur in Alaska and have been provided protection under the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*.):

Listed species	Stock	Latin Name	Status
Blue whale		*Balaenoptera musculus*	Endangered
Bowhead whale		*Balaena mysticetus*	Endangered
Fin whale		*Balaenoptera physalus*	Endangered
Humpback whale		*Megaptera novaeangliae*	Endangered
Northern right whale		*Balaena (=Eubalaena) glacialis*	Endangered
Sei whale		*Balaenoptera borealis*	Endangered
Sperm whale		*Physeter macrocephalus*	Endangered
Steller sea lion	Western population	*Eumetopias jubatus*	Endangered
Steller sea lion	Eastern population	*Eumetopias jubatus*	Threatened
Leatherback sea turtle		*Dermochelys coriacea*	Endangered
Short-tailed albatross		*Diomedea albatrus*	Endangered
Steller's eider		*Polysticta stelleri*	Threatened

Designated critical habitat

Species Group	General Reference Area
Whales	No critical habitat has been designated for the above referenced whales in Alaskan
Steller's eider	
Steller sea lion	Most of PWS and around Middleton Island and Cape St. Elias (50 CFR Part
Pacific Salmon	No critical habitat has been designated for salmon species in Alaskan waters.

The short-tailed albatross and Steller's eider are under the jurisdiction of the U.S. Fish and Wildlife Service. All salmon species are under the jurisdiction of National Marine Fisheries Service, Northwest Regional Office, Seattle, Washington.

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[a] In its definition of species, the Endangered Species Act of 1973, as amended, includes the traditional biological species concept of the biological sciences and "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature" (16 USC 1532). NMFS uses the term *evolutionarily significant unit* as synonymous with *distinct population segment* and lists Pacific salmon accordingly. For the purposes of section 7 consultations, these are all "species."

The Alaskan bald and golden eagles, though not on the endangered species list, are fully protected (including their nests and nest trees) under the Bald Eagle Protection Act of 1940 and the Migratory Bird Treaty Act. Spill response activities that could affect these species should be coordinated with the U.S. Fish and Wildlife Service.

While the National Marine Fisheries Service has determined the gray whale is no longer a threatened or endangered species, monitoring of the species has continued since the 1994 delisting. All marine mammals, whether or not they are on the endangered species list, are protected by the Marine Mammal Protection Act of 1972. Any spill response activities, which could affect marine mammals, should be coordinated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service.

For updated information on the internet:

U.S. Fish and Wildlife Service National Threatened and Endangered Species web site:
http://endangered.fws.gov/

U.S. Fish and Wildlife Service Regional Threatened and Endangered Species web site:
http://alaska.fws.gov/es/te.cfm

Alaska Department of Fish and Game Threatened and Endangered Species web site:
http://www.state.ak.us/adfg/wildlife/geninfo/game/es_home.htm

(b) Fish

The Prince William Sound subarea is rich in biological resources. In addition to supporting a sizeable commercial fishing industry, the area is utilized by subsistence users, hunters and sport fishermen. Many islands in the Sound provide habitat for freshwater fish and provide anadromous spawning habitat. The National Marine Fisheries Service has classified all waters of Prince William Sound as essential fish habitat for: walleye pollock, Pacific cod, yellowfin sole, rock sole, flathead sole, arrowtooth flounder, sablefish, sculpin spp., pink salmon, chum salmon, chinook salmon, and sockeye salmon.

FINFISH

The waters of the Prince William Sound subarea are among the most productive in the world. Major freshwater systems of the region include the Copper River, Resurrection River, Bering River, and Eshamy River. Many of the nearshore waters along the Tatitlek Narrows have been designated as sensitive biological resources for fish (NOAA 2001). Most of the flowing waters and many of the lakes support populations of anadromous or resident species of fish. Lagoons and estuarine areas are important rearing and overwintering areas for anadromous fish. River deltas are particularly important areas for fish throughout the year. Shallow lakes, oxbows, and seasonally flooded wetlands connected to streams or rivers may support fish during the summer but may freeze to the bottom in winter. If the depth of the water exceeds that of the seasonal ice thickness, fish may be found in a particular waterbody year-round. Deep lakes and rivers, and spring-fed stream systems serve as overwintering areas for fish in the Prince William Sound subarea.

Arctic Grayling Arctic grayling spawn in May and June, typically in unsilted rapid-runoff streams and lake inlets and outlets; fry emerge by early June. Grayling commonly overwinter in deep, large rivers or lakes, or in smaller streams if adequate water quality and flow exists throughout the winter. No indigenous stocks of Arctic grayling occur in the Prince William Sound Management Area. ADF&G stocked 8 lakes with Arctic grayling along the Copper River

Highway between Cordova and the Million Dollar Bridge since 1984 and in Thompson Lake near Valdez. Thompson Lake is the only site in Prince William Sound that Arctic grayling are presently being stocked. The annual average harvest from 1990-1999 is 202 arctic grayling.

Arctic Char/Dolly Varden are widely distributed throughout the Prince William Sound Subarea. Fish return to freshwater spawning and overwintering areas from July through December. Char spawn from August through November; fry emerge in April and May. Dolly Varden spawn from September to October and may live to 18 years. Most Dolly Varden live under 10 years. Char typically overwinter in lakes. The Robe River drainage is the assumed main overwintering site for various spawning stocks in the Valdez Arm. Migration of anadromous char from overwintering areas to marine feeding areas occurs from April to June. Important areas for arctic char/Dolly Varden include Montague Island, Round Island, Controller Bay, Knight Island, Martin River Slough, Jackpot Bay, Cochrane Bay, Hawkins Island, Long Bay, Berring River and Resurrection River drainage. Montague and Knight Islands support rearing Dolly Varden. Eyak River provides important habitat for Dolly Varden.

Rainbow Trout and Steelhead occur in the Prince William Sound subarea. Rainbow trout are found in Copper River, on Round Island, and in Robe Lake. Steelhead (anadromous) are found in the Copper River Delta. Rainbow trout generally spawn during May and June, and fry emerge a few weeks to four months later. Steelhead spawn between mid April to June, and fry emerge during mid summer. Steelhead do not necessarily die after spawning. Many salmon will move slowly back to the ocean where, after at least one year, they may return to freshwater to spawn again. The annual harvest for rainbow trout between 1990-1999 in the PWS area is 474 fish. In 1999, the Board of Fisheries designated Copper River Special Management Area. This designates all fresh waters south of Miles Glacier, east of Copper River (excluding the Clear Creek drainage), and west of Cape Suckling as catch and release, using only unbaited, single-hook, artificial lures in the area year-round.

Eulachon. Small numbers of eulachon return to PWS glacial streams to spawn. Eulachon are broadcast spawners, spawning in April or May. Females lay between 17,000-60,000 eggs. Most die after spawning. Spawning eulachon provide a feeding feast for bears, eagles, killer whales, beluga whales, seals, sea lions, gulls, and humans. Fish are used by the Tinglet for oil and food (ADF&G 2002). There are less than 6 eulachon spawning systems in Prince William Sound Management Area (PWSMA), including the Copper and Martin Rivers, and Alaganik and Ibeck sloughs.

Cutthroat Trout inhabit coastal areas from Prince William Sound south. PWS is the most northern and western extreme for this species, making the Sound population small in size and distribution. They spawn in late April to early June, females producing from 750-1,200 eggs per pound of body weight. Many occur in streams, lakes, bogs, ponds and at sea. Life span varies depending on area, with lake residents living to 19 years, stream residents to 5 years, and sea-run to 10 years. Cutthroat trout are very sensitive to environmental change, pollution and introduced species. Rainbow trout often hybridize with cutthroat trout when they occur in the same area. Hawkins Island has an important spawning stream for cutthroat trout (*Exxon Valdez* Oil Spill Restoration Team 1993). Jackpot Bay supports several species of anadromous fish including cutthroat trout, Dolly Varden, and sockeye salmon (*Exxon Valdez* Oil Spill Restoration Team 1993). Controller Bay supports cutthroat trout. The highest population of cutthroat trout in western Prince William Sound occurs in the Eshamy Bay system. Cutthroat trout rearing occurs on Knight Island. Eshamy Creek drainage and Green Island Creek were closed by emergency order No. 2-CT-6-02-92 in 1992 during the spawning season. A similar order was released in 1993. The Natural Resources Damage Assessment program collected information following the Exxon Valdez oil spill, which indicated that cutthroat trout in the oil-impacted area had reduced

survival and growth (Hoffman and Miller 2000). The annual sport fish harvest from 1990-1999 has averaged 614 fish. Sport harvest of cutthroat trout in 1999 for the PWSMA was 449 fish, which was 29% below the ten-year average. The three major harvest areas for sport fishing in PWS include: Eshamy drainage, Eyak drainage, and other Cordova road-accessible streams.

Chinook, coho, sockeye, pink, and chum salmon occur within the Prince William Sound Region. Adult salmon are present in freshwater from mid-March through early October, depending on the species of salmon and the stream system. Salmon eggs incubate in the stream gravels over the winter; fry emerge from stream gravels from mid March through early June. Chinook, sockeye, and coho fry remain in fresh water from one to four years before migrating to sea. In 1990, Alaska outlawed the farming of salmon to protect native stocks from hybridization, pollution, disease and competition for food. The 1999 commercial salmon fishing harvest in Prince William Sound of 50.3 million fish is the highest in recorded history. Attachment two of this document provides average salmon escapement or average peak index counts for salmon streams in the Prince William Sound area.

Pink Salmon occur in over 200 streams in the Prince William Sound area that produce natural runs of pink salmon. Four hatcheries produce pink salmon for the PWSMA. Important wild pink salmon spawning streams are located in the Port Gravina area, while Sahlin Lagoon provides rearing habitat (*Exxon Valdez* Oil Spill Restoration Team 1993). Pink salmon utilize Montague Island. Nellie Martin River and Knight Island are major spawning areas for pink salmon. The Resurrection Bay pink salmon fishery is supported by natural pink salmon stocks that spawn in five streams at the head of the bay. Pink salmon spawn in the intertidal areas of most anadromous streams in the Sound, including the Cape Suckling area. The Copper River drainage supports pink salmon. The sport catch of 132,858 pink salmon in 1999 was the highest recorded since recording began in 1990 (Hoffman and Miller 2000). The 1999 Prince William Sound commercial harvest included 45 million pink salmon (ADF&G 1999b).

Sockeye Salmon- Sockeye salmon are found in select streams in the Prince William Sound area. In systems with lakes, juveniles usually spend one to three years in fresh water before migrating to the ocean in the spring as smolts. Sockeye salmon return to their natal stream to spawn after spending one to four years in the ocean. In mid-July to early October, sockeye run to Eshamy Lake to spawn (Mickelson 1989), and they are present in the Eshamy Bay system in large numbers (Hepler et al. 1994, Reeves et al. 1997). Sockeye spawn in the Campbell River and associated systems leading into Controller Bay. Knight Island provides spawning and rearing habitat for sockeye salmon. Jackpot Bay also contains sockeye salmon. While in fresh water, juvenile sockeye salmon feed mainly upon zooplankton (such as ostracods, cladocerans, and copepods), benthic amphipods, and insects. Sockeye salmon continue to feed upon zooplankton (such as copepods, euphausids, ostracods, and crustacean larvae) in the ocean, but also prey upon larval and small adult fishes (such as sand lance), and occasionally squid. Aboriginal people considered sockeye salmon to be an important food source and either ate them fresh or dry them for winter use. Sockeye salmon support one of the most important commercial fisheries on the Pacific coast of North America, are increasingly sought after in recreational fisheries, and remain an important mainstay of many subsistence users. The Copper River is world renowned for the production of Copper River sockeye (red) salmon and this river is a major commercial fishery. Historically the major recreational fisheries in PWS for sockeye have occurred at Eshamy, Cordova, Valdez, and Coghill (Hoffman and Miller 2000). Sockerye fisheries at Cogfhill and Eshamy have rebuilding from several years of poor return. The Coghill fishery was closed entirely in 1992, 1993 and 1994 and the seasons at Eshamy were restricted during those same years (Hoffman and Miller 2000). An increase in sockeye returns to Coghill between 1996 through 1999 met the escapement goals for that system. The average recreational harvest of sockeye salmon between 1990 to 1999 in the PWSMA was 6,116, with a harvest of 10,666

sockeye in 1999 (Hoffman and Miller 2000). From 1990 to 1999, there has been an increase of 163% in sockeye salmon recreationally harvested (Hoffman and Miller 2000). According to the Prince William Sound Management Area 1999 Annual Finfish Management Report, 2 million sockeye were commercially harvested in the Sound in 1999 (ADF&G 1999b).

Chum salmon are present through the Sound area and fry feed on small insects in the stream and estuary before forming into schools in salt water where their diet usually consists of zooplankton. Chum do not have a period of freshwater residence after emergence of the fry as do chinook, coho, and sockeye salmon. They are similar to pink salmon in this respect, except that chum fry do not move out into the ocean in the spring as quickly as pink fry. Significant chum salmon systems include Montague Island, Nellie Martin River, and Controller Bay. Sport fishers generally capture chum salmon incidental to fishing for other Pacific salmon in either fresh or salt water. Statewide sport harvest usually totals fewer than 25,000 chums. After entering fresh water, chums are most often prepared as a smoked product. In the last few years an average of 11 million chum salmon, worth over $32 million, have been caught in Alaska. Most chum are caught by purse seines and drift gillnets, but fishwheels and set gillnets harvest a portion of the catch. In many areas they have been harvested incidental to the catch of pink salmon. The development of markets for fresh and frozen chum in Japan and northern Europe has increased their demand, especially in the last decade. The Alaska Department of Fish and Game has built several hatcheries primarily for chum salmon products. In recent years the chum slamon returning to Wally Norenberg hatchery on Esther Island have been targeted by sport anglers (Hoffman and Miller 2000). On average, 1,724 chum salmon were harvested annually by sport anglers in the PWSMA from 1990 to 1999, with an average of 54% harvested in the Valdez Arm (Hoffman and Miller 2000). Chum salmon natural and enhanced returns to Prince William Sound set a record in 1999. The commercial harvest of chum salmon in 1999 for the Prince William Sound area totalled 2.99 million (ADF&G 1999b).

Chinook Salmon is Alaska's state fish and is one of the most important sport and commercial fish native to the Pacific coast of North America. It is the largest of all Pacific salmon, with weights of individual fish commonly exceeding 30 pounds. Unlike other salmon species, chinook salmon rear in inshore marine waters and are, therefore, available to commercial and sport fishers all year. This also makes them vulnerable to inshore marine pollutants year round. Juvenile chinook in fresh water feed on plankton, then later eat insects. In the ocean, they eat a variety of organisms including herring, pilchard, sandlance, squid, and crustaceans. Catches of chinook salmon in Southeast Alaska are regulated by quotas set under the Pacific Salmon Treaty. Resurrection Bay does not support any natural chinook salmon returns; however, hatchery-produced fish supports the sport fishery in and near Resurrection Bay. Major waterways in the Copper River area contributing to the fisheries include Martin River, Eyak River, Mountain Slough, and Strawberry Channel. Areas closed to sport chinook fishing include: Eccles Creek, Eyak Lake, Clear Creek upriver of the Carbon Mountain Bridge, and Hartney Creek (all near Cordova); all freshwater drainages of Valdez Arm except for a portion of Robe River and Solomon Gulch Creek; and all waters within 300 feet of a weir or fish ladder (Hoffman and Miller 2000). There is a major commercial and sport fishery for chinook salmon in the Copper River Valley. The mean sport fishing harvest for chinook salmon in PWSMA from 1990 to 1999 is 1,417, while the average catch for that same period is 2,119 (Hoffman and Miller 2000). Sixty three thousand four hundred chinook salmon were commercially harvested in 1999 in Prince William Sound (ADF&G 1999b).

Coho Salmon- Coho are extremely adaptable and occur in nearly all accessible bodies of fresh water-from large transboundary watersheds to small tributaries through out Prince William Sound. Coho salmon enter spawning streams from July to November, usually during periods of high runoff. Run timing has evolved to reflect the requirements of specific stocks. The coho

salmon is a premier sport fish and is taken in fresh and salt water from July to September. The streams in the Cape Suckling and Copper River Delta areas contain coho salmon. Nellie Martin River is a major spawning area for coho. Spawning and rearing of coho occurs on Knight Island, and in the Campbell River and associated systems leading into Controller Bay. Areas closed to sport coho fishing include: Eccles Creek, Eyak Lake, Clear Creek upriver of the Carbon Mountain Bridge, and Hartney Creek (all near Cordova); all freshwater drainages of Valdez Arm except for a portion of Robe River and Solomon Gulch Creek; and all waters within 300 feet of a weir or fish ladder (Miller and Stratton 2000). Since 1990, the annual average coho salmon sport harvest in PWSMA has doubled. Popular sport fishing areas for coho salmon include the Valdez Arm, with 68% of the harvest in 1999, along the Cordova road system, and in Whittier. Eyak River is the most popular fishing area for coho along the Cordova road system accounting for 56% of the Cordova area harvest in 1999 (Hoffman and Miller 2000). The estimated sport fishing harvest in the PWSMA for coho slamon during 1999 was 53, 089 (Hoffman and Miller 2000). The Copper River is a major commercial fishery for coho salmon. Commercial fisherman harvested 244,700 coho salmon in 1999 from Prince William Sound waters (ADF&G 1999b).

Pacific Herring are critically important in the Prince William Sound food web as many seabirds, fish and marine mammals rely on them as prey. Wide distribution of herring occurs from 50 to 100 meter depths and they aggregate in large schools for spawning in April in nearshore subtidal and intertidal areas. Herring biomass has ranged from 20,000 to well over 100,000 tons in the Sound. Spawning of Pacific herring occurs from late April to mid June. A major spawning area for herring extends from Stockdale Harbor around to Rocky Bay. Spawning also occurs in Sheep Bay, north side of Story Island, west sides of Naked Island, Hells Hole in Port Gravina (Brown and Carls 1998, Brown and Baker 1998, Willette et al. 1997). Spawning occurs in intertidal and subtidal areas. Kelp or eelgrass is typically the preferred spawning substrates. Rearing juvenile herring are found at the mouth of St. Matthew's Bay in Sheep and Simpson Bays (Brown and Baker 1998) and at Knowles Head (Thomas et al. 1997). At Jackpot and Whale Bays, major juvenile herring nurseries occur (Thomas et al. 1997). A rich supply of nutrients at the Hinchinbrook Entrance supports spawning in May. The Tatitlek Narrows support a major Pacific herring spawning area in the southern half of the Narrows, down into the mouth of Port Fidalgo (Brown and Baker 1998, Willette et al. 1997). Pacific herring spawn on the north side of Fairmount Island (Brown and Baker 1998). Overwintering grounds link Montague and Green Islands and are also found in Zaikof Bay and off Montague Point. Port Gravina holds a major over-wintering population (Brown et al. 1999).

Capelin. Infrequently harvested, capelin are nevertheless important forage fish for higher trophic predators such as seabirds and marine mammals because of their high oil content. Capelin spawn on sandy to small gravel beaches. They typically spawn from May through July, but they are inconsistent in timing, location, and numbers from year to year. Capelin are infrequently repeat spawners. Much of their life history in the Prince William Sound area is unknown, but they are known to spawn at the Hinchinbrook Entrance and their larvae is known to increase in Chenega Bay in August (Brown et al. 1999).

Pacific Halibut are found through out the Prince William Sound area and are important for commercial, sport, and subsistence fishing. They spawn in deep water from 600 to 1,500 feet from November to January. The fertilized eggs hatch in about 15 days. Older halibut spend winters along the deep water along the continental shelf. In summer, adult halibut move to shallow coastal waters with depths from 90 to 900 feet. Halibut are able to eat a large variety of fishes (cod, turbot, pollock) plus some invertebrates such as crab and shrimp. Sometimes halibut leave the ocean bottom to feed on pelagic fish such as sand lance and herring (ADF&G 2002). Halibut and their fisheries are managed under an international treaty, the Halibut Convention of 1982 and the 1979 Protocol. The International Pacific Halibut Commission was formed to assure

the optimal sustained yield of North Pacific halibut resources. In waters of the United States, halibut are governed under the Magnuson-Stevens Fishery Conservation and Management Act and the responsibility for allocation of the catch quota among fisheries falls to the North Pacific Fishery Management Council. The State of Alaska does not have direct management authority over halibut and halibut fisheries off Alaska. The average annual recreational harvest of Pacific halibut from 1990-1999 in the PWSMA was 21,210 halibut (Miller & Stratton 2001). Catch and harvest of halibut in PWS has increased dramatically. The average increase per year is 17% for recreational fishing. In 1983, the harvest of halibut was estimated at 3,493 and in 1999, the halibut harvest had risen to 27,600. As in the past, the majority of PWS halibut harvest (41%) in 1999 occurred from anglers out of Valdez (Miller and Stratton 2001).

Lingcod typically inhabit nearshore rocky reefs from 30 to 330 feet in depth. Lingcod is an increasingly popular recreational fish.

Groundfish. The following species are found through out Prince William Sound: arrowtooth flounder, flathead sole, Pacific cod, rock sole, sculpin, walleye Pollock, and yellowfin sole. Pollock spawn in Hinchinbrook Entrance in April and May and their larvae may be susceptible to oil contamination at that time. Cod spawn in late winter or early spring and due to their abundance, they are extremely important to the ocean's food web. Yellow fin sole juveniles stay in the nearshore area for 3 to 5 years.

Other Forage Fish - Numerous species of fish inhabit the nearshore area and these populations are often dominated by sand lance and rainbow smelt which might comprise 40% of the nearshore fish by number. Sand lance is one of the most important forage fish in the Prince William Sound subarea. Rainbow smelt is also an important subsistence food (to several thousand pounds per community).

SHELLFISH

Dungeness Crabs are found from the intertidal region to a depth of 230 m. Dungeness crabs are most common on sand or muddy-sand bottoms in the subtidal region, and are often found in or near eelgrass beds. However, they can also be found on a number of other substrata including various mixtures of silt, sand, pebble, cobble, and shell. Juvenile Dungeness crabs are found in similar habitats to adults, but they generally occupy shallower depths than adults. Juvenile crabs can be very abundant in the intertidal zone, but also occur in shallow subtidal areas. Survival of young crabs is greatest in habitats such as intertidal zones and eelgrass beds, where they can gain refuge from predators. Two areas of major Dungeness crab concentrations occur at the Orca Inlet District and the Copper River District. Dungeness crab harvesting was closed in 1999 by the BOF and in 2000, the BOF closed Dungeness crab fishing throughout Prince William Sound.

Three species of King Crab are located in Prince William Sound: red, blue, and brown. Red king crab larvae generally exhibit a diel movement being most abundant in the upper water column during the day and deeper at night. Young of the year crab occur at a depth of 50 m or less. They are solitary and need high relief habitat or coarse substrate such as boulders, cobble, shell hash, and living substrates such as bryozoans and stalked ascidians. Between the ages of two and four years, there is a decreasing reliance on habitat and a tendency for the crab to form pods consisting of thousands of crabs. Podding generally continues until four years of age (about 6.5 cm), when the crab move to deeper water and join adults in the spring migration to shallow water for spawning. Adult red king crabs occur to a depth of 365 m; preferred habitat for reproduction is water less than 90 m. Red king crabs are sparsely distributed throughout Prince William Sound with historic concentrations occurring in eastern Prince William Sound and Hinchinbrook

Entrance. Blue king crabs are located in the Port Wells-Harriman Fjord area with small isolated populations associated with glacial fjords in western Prince William Sound (Trowbridge 1993). Brown king crabs occur at depths of 150-400 fathoms and are found in central and western PWS (Trowbridge 1993). They move into waters of less than 10 fathoms from about mid-February to June 1 to mate and molt. In response to shellfish survey findings of depressed stocks, emergency orders were issued to close the king crab fishery in Prince William Sound from 1990-1999 (Miller and Stratton 2001).

Tanner Crab larvae are strong swimmers and perform diel vertical migrations in the water column (down at night). They usually stay near the depth of the chlorophyll maximum during the day. The length of time larvae take to develop is unknown, although it has been estimated at only 12 to 14 days. After settling to the bottom, Tanner crabs are widely distributed at depths up to 473 m. The Prince William Sound Management Area Tanner Crabs have historically been the primary shellfish resource in terms of landed weight, with 74 million pounds harvested over the last 24 years (Trowbridge 1993). Females are known to form high density mating aggregations consisting of hundreds of crabs per mound. The mounds likely form in the same general location each year, but the location of the mounds is largely undocumented. Important rearing habitat occurs around the north end of Montague and the north end of Green Island as well as south between Montague and Green Islands (Mickelson 1989). Emergency orders were issued to close the tanner crab fishery in PWS from 1990-1999 due to shellfish survey findings of depressed stocks (Miller and Stratton 2001). In 1999, the BOF closed the tanner crab fishery in the PWSMA.

Weathervane scallops occur in the Prince William Sound area. Weathervane scallops are found on sand, gravel, and rock bottoms from 25-100 fathoms (a fathom equals 6 feet). Generally weathervane scallops are sexually mature at age 3 or 4 and are of commercially harvestable size at 6 to 8 years (ADF&G 2002). Scallops are found in beds (areas of abundant numbers), and are dioecious, having separate sexes. Spawning occurs in June and July where the spermatozoa and ova are released into the water. In approximately one month hatching occurs and the larvae drift with the tides and currents. After two or three weeks the larvae will have gained shell weight, settled to the bottom, and attached to seaweed. Within four to eight weeks after settling, the juvenile will develop the ability to swim for locomotion. At this time, the juvenile scallop is approximately 3/8 of an inch in diameter and will take on the adult form. Scallops may live to age 18 and they feed by filtering microscopic plankton from the water. They have been commercially harvested throughout Alaska on a sporadic basis due to overharvesting scallop beds. Recent legislation has authorized bivalve farming in Alaska.

Shrimp. Pandalid shrimp (northern pink shrimp, humpy/flexed shrimp, spot shrimp/prawn, coonstripe shrimp, and sidestripe/giant red shrimp) are distributed throughout most major bays and certain nearshore and offshore areas in Prince William Sound. Spots and coonstripes are generally associated with rock piles, coral, and debris-covered bottoms, whereas pinks, sidestripes, and humpies typically occur over muddy bottom. Pink shrimp occur over the widest depth range (10-800 fathoms) while humpies and coonstripes usually inhabit shallower waters (3-200 fathoms) (ADF&G 2002). Spot shrimp seem to be caught in the greatest concentrations around 60 fathoms, but range from 2 to 250 fathoms (ADF&G 2002). Sidestripes are typically found from 25 to 350 fathoms, but most concentrations occur in waters deeper than 40 fathoms. Most shrimp migrate seasonally from deep to shallow waters. Pandalid shrimp will eat a wide variety of items such as worms, diatoms, detritus (dead organic material), algae, and various invertebrates. Shrimp are an important part of the ocean food chain and are often the diet of large predator fish such as Pacific cod, walleye pollock, flounders, and salmon. Fisheries for shrimp have occurred in the Prince William Sound area with limited harvest occurring in western PWS. Pink shrimp generally comprise more than 80 percent of trawl landings. The major pot shrimp

fisheries occur in Cook Inlet, Prince William Sound, and Southeast Alaska and usually total less than 500,000 pounds annually. Spot shrimp are the primary species caught in Prince William Sound and the waters of Southeast Alaska. During the 1999 Board of Fisheries Meeting, the Board reduced the number of pots allowed to no more than 5 pots per person with a maximum of 5 per vessel and defined the season from April 15 to September 15 to help reduce harvest of egg-bearing females (Miller and Stratton 2001). Starting in 2001, a permit is required to harvest shrimp in Prince William Sound.

Razor clams live in surf-swept and somewhat protected sand beaches of the open ocean throughout Prince William Sound. They are found from approximately 4 feet above the mean low water level down to depths of 30 fathoms. Razor clams subsist on minute plants and animal life (plankton) filtered from the surrounding seawater. Razor clams concentrations are found in the Copper River Delta/Controller Bay area. Commercial harvest of razor clams in Prince William Sound has occurred since 1916 in the Cordova area. Annual production levels have fluctuated greatly reaching approximately 600,000 pounds in Cordova. The 1964 earthquake adversely affected razor clam populations in the Cordova area. From 1990 through 1999, the average annual harvest of razor clams was 11,244. The majority of the PWS harvest is taken along the Cordova road system and in the Copper River Delta (Miller and Stratton 2001). In 1997, the proposal to require a permit to harvest razor clams on the Copper River Flats was approved.

Pacific Little Neck Clams are commercially harvested throughout Prince William Sound.

Blue mussels are found throughout the Prince William Sound area and are densely packed around Port Gavina, LaTouche Island's Sleepy Bay, Evans Island's Shelter Bay (Babcock 1996).

Essential Fish Habitat

Essential fish habitat in the Prince William Sound subarea, as identified by the National Marine Fisheries Service, can be found on their interactive mapping internet site:
http://www.fakr.noaa.gov/maps/

(c) Birds

Important Bird Habitats/Communities

Large numbers of waterfowl, seabirds and shorebirds are found in Prince William Sound and the Copper River Delta during spring and fall migrations, with populations peaking during April and May. Many birds also breed in the region during the summer and overwinter in sheltered areas. The following list is of summer birds. During spring bird migrations, many other species pass through, some species in flocks of thousands, others in flocks of hundreds of thousands.

COMMON BIRDS: Many of our birds are water birds. They nest in a wide variety of habitats: cliffs, gravel bars in streams, peatland bogs, hollows in dead trees, rockpiles, burrows, base of tree trunks, or marsh grasses along the edges of lakes. These include common loon, yellow-billed loon, red-throated loon, horned grebe, red-necked grebe, sooty shearwater, short-tailed shearwater, red-faced cormorant, double-crested cormorant, pelagic cormorant, great blue heron, Canada goose, green-winged teal, Barrow's goldeneye, northern fulmer, harlequin duck, oldsquaw, white-winged scoter, surf scoter, black scoter, common merganser, red-breasted merganser, common murre, thick-billed murre, pigeon guillemot, marbled murrelet, Kittlitz's murrelet, ancient murrelet, horned puffin, and tufted puffin. Species supported at the head of

Heather Bay include: loon, scoter, tern, murrelet, and many other species of waterfowl, shorebirds, seaducks, and seabirds, possibly drawn to the area by the upwelling of krill. The marine waters within Tatitlek Narrows have been identified as a sensitive biological resource for seabirds, waterfowl, invertebrates, and shorebirds. The north end of Montague Island is preferred feeding, nesting and staging habitat for many bird species. In May, large concentrations of seabirds feed on the dense concentration of prey fish.

Surfbirds. Tens of thousands of surfbirds are attracted to the herring roe in Rocky Bay (Norton et al. 1990). North Montague Island is also a migratory stopover for post-breeding surfbirds, rock sandpiper, and black turnstones numbering in the thousands (USFWS 2001). Seventy percent of the world's surfbird populations use Montague Island as their staging area as they prepare to migrate to inland alpine tundra (Senner and McCaffrey 1997).

Waterfowl. One third of the southwestern Sound harlequin duck population is found along Green and Channel Islands (Rosenberg and Petrula 1998). The eastern Sound population of harlequin duck is concentrated in Olsen Bay, Hell's Hole and Sheep Bay (Rosenburg and Petrula 1998). Harlequin ducks nest around Constantine Harbor (USFWS 2001). Wintering areas for harlequin duck and scoter include Harriman Fjord and Barry Arm (US Forest Service 2000). Eshamy Bay supports harlequin ducks wintering in the nearshore marine zone and they nest and brood on fast moving streams in the area (Esler et al 2000). Harlequin ducks molt and winter in the Tatitlek Narrows (*Exxon Valdez* Oil Spill Restoration Team 1993). An important waterfowl migratory stopover has been designated on Patton Bay. Both Heather and Columbia Bays have been identified as an important resource area for waterfowl.

Seabirds-In the southwest portion of PWS, almost two-thirds of the pigeon guillemot population resides with colonies on Evans Island (Sanger and Cody 1994). Tufted puffins have a large colony at Point Elrington and horned puffin, arctic tern, black-legged kittiwake, pelagic & red-faced cormorant, common murre and glaucous-winged gull also have colonies at Point Elrington (USFWS 2001). Glaucous-winged gulls are attracted to the herring roe in Rocky Bay in large numbers (Norton et al. 1990). The highest nesting densities of pigeon guillemot (1/4 of colonies nesting) in the Sound occur on Naked Island (Sanger and Cody 1994). One of the primary locations for marbled murrelet in the Sound is on Naked Island (Kuletz et al. 1994). Large congregations of seabirds including double-breasted and pelagic cormorant, glaucous-winged gull, pigeon guillemot, and tufted and horned puffin occur on the west side of Hinchinbrook Island in May (Scheel and Hough 1998). See the following regional summary Seabird Population Map.

The Alaskan Seabird Colony Catalog is an automated database that contains the distributions of breeding seabirds and the relative size of all the colonies in Alaska. The data reports indicating estimated species composition and numbers for seabird colonies of Prince William Sound are summarized from the catalog. The maps display colony locations. The Alaska Seabird Colony Catalog is maintained by the U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Marine and Coastal Bird Project, in Anchorage at 786-3444. For updated information see the internet at: http://164.159.151.5/seabird/main_seabird.html

Kittlitz's murrelet numbers have dropped dramatically over the last decade through out Glacier Bay and Prince William Sound (Lance et al. 1999, Piatt et al. 2000). The remaining Kittlitz's murrelet population, found almost exclusively in Alaska, are thought to occur in four glaciated fjords, with Harriman Fjord having the highest concentration. Marbled murrelet nest around Harriman Fjord in the old growth forests or cliff crevices (Agler et al. 1998, Kendall and Agler 1998). They also nest west of Fairmount Island at the mouth of Unakwik Inlet (Agler et al. 1998, Kendall and Agler 1998) and Kittlitz's murrelet occur in the upper end of Unkwik Inlet (Day and Nigro 1999) and they are also found on Olsen Island (Kendall and Agler 1998). Large numbers of tufted puffins, horned puffins and pigeon guillemot have been counted in this area (USFWS

2001). Marbled murrelet are known to nest at the north end of Green Island and there is a high density near Needle and Seal Island.

Common gull and gull-like birds include the glaucous-winged gull, mew gull, black-legged kittiwake, and Arctic tern. Skilled birdwatchers also frequently see the black-billed Aleutian tern and the large, Caspian tern. Parasitic jaegers often pursue gulls, terns, and kittiwakes making them disgorge their catch.

Insert seabird summary map here

http://asgdc.state.ak.us/maps/cplans/pws/pws3seabird.pdf

Every June, black-legged kittiwake are found at Knowles Head (Brown et. al 1999). Boswell Rocks and Pinnacle rocks hosts a major kittiwake colony. There are documented seabird colonies in 12 areas of Harriman Fjord and Barry Arm. Species within the colonies include pigeon guillemot, black-legged kittiwake, black oystercatcher, arctic tern, mew and glaucous-winged gull (USFWS 2001). Arctic terns and glaucous-winged gulls are present at Unakwik Reef (USFWS 2001). Arctic tern and glaucous-winged gulls breed on Danger Island (US Forest Service 2001). Porpoise rocks contain large colonies of black-legged kittiwakes as well as common murre and tufted puffin as well as smaller colonies of glaucous-winged gull and horned puffin. Arctic tern, tufted puffin and pigeon guillemot all nest around Constantine Harbor (USFWS 2001).

Areas identified as important for seabirds include Surprise Inlet, Patton Bay, and Serpentine Cove (NOAA 2001). The major seabird species on Patton Bay in descending order of abundance: tufted puffin, fork-tailed storm petrel, black-legged kittiwake, Leach's storm petrel, glaucous–winged gull, three species of cormorant, pigeon guillemot, common murre, parakeet auklet, and horned puffin (Mickelson et al. 1977).

Shorebirds-The Sound's shorelines provide a varied assortment of invertebrates for shorebirds to feed on. Common shorebirds include the black oystercatcher, black turnstone, forked-tailed storm petrel, surfbird, semipalmated plover, greater yellowlegs, spotted sandpiper, wandering tattler, common snipe, and least sandpiper. Black turnstones are attracted to the herring roe in Rocky Bay (Norton et al. 1990).

Black oystercatchers with their brilliant 3-inch long bills, bright orange eyes, and pale pink legs are locally common around Growler Island. Biologists estimate the world population at a mere 10,000 of which about 1,000 may live in Prince William Sound, occupying gradually sloping rocky spits left by the Pleistocene glaciers. Here, the black oystercatchers slowly stalk the tides in and out feeding on blue mussels and other invertebrates while nearby their young are hidden in the tall beach grasses from predators like bald eagles, ravens and river otters. Black oystercatchers feed on urchins, crabs, and mussels in the Unakwik area (Mickelson 1989). High densities of breeding black oystercatchers occur on Green, Little Green, and Channel Islands and hundreds of black oystercatchers over-winter on Green Island and Stockdale Harbor and Port Chalmers (Andres and Falxa 1995, Andres 1998). Two Moon Bay in Port Fidalgo, Bligh Island, and Sheep Bay are considered prime habitat for oystercatchers (Andres 1998, US Forest Service 2000). Black oystercatchers breed on Danger Island and the shores of Prince of Wales Passages are considered important habitat (US Forest Service 2001). They are known to nest around Constantine Harbor (USFWS 2001).

Orca Inlet is a staging ground for hundreds of thousands of birds including dunlin, western sandpiper, least sandpiper, and dowitcher as they travel to their breeding grounds (Isleib and Kessel 1992, Senner 1979). In early May, the tidal flats of the Copper River Delta come alive with the activity of hundreds of thousands of shorebirds. As many as 5 million shorebirds rest and feed on the Copper River Delta during spring migration.

Passerines-The upland mosaic of PWS habitats provide nesting, resting and feeding areas for a variety of birds including the rufous hummingbird, belted kingfisher, violet-green swallow, tree swallow, Steller's jay, black-billed magpie, common raven, northwestern crow, chestnut-backed chickadee, brown creeper, dipper, winter wren, varied thrush, hermit thrush, Swainson's thrush, golden-crowned kinglet, orange-crowned warbler, yellow warbler, Wilson's warbler, pine grosbeak, common redpoll, pine siskin, savannah sparrow, dark eyed Junco, golden-crowned sparrow, fox sparrow, Lincoln's sparrow, and song sparrow. Northwestern crows nest in the spruce copses around Growler Island and feed in the adjacent intertidal zones where one can watch them rolling over or shoving rocks aside with their bills as they seek worms and other invertebrates.

Raptors known to inhabit Prince William Sound include bald eagles and Peale's peregrine falcon. The breeding population of Prince William Sound is placed at 2,256 out of a North American population estimated between 71,000-96,000. Feeding habits of the bald eagle include preying on a wide variety of fish captured during flight. They also feed on carrion. Bald eagles concentrate at freshwater inlets of Eshamy Bay for the spawning sockeye salmon returning. There are approximately 1,638 eagle nests in the Prince William Sound area. Although Alaskan bald and golden eagles are not on the endangered species list, they are fully protected (including their nests and nest trees) under the Bald Eagle Protection Act of 1940 and the Migratory Bird Treaty Act of 1918. Spill response activities that could affect these species should be coordinated with the U.S. Fish and Wildlife Service.

(d) Marine Mammals

Harbor seals, Steller sea lions, sea otters, gray whales, finback whales, sei whales, minke whales, humpback whales, beluga whales, Cuvier's beaked whales, killer whales, Dall and harbor porpoises, Pacific white sided porposes are all present in the Sound (Hall 1981). The Marine Mammal Protection Act of 1972 protects all marine mammals. Any spill response activities, which could affect marine mammals, should be coordinated with the U.S. Fish and Wildlife Service or the National Marine Fisheries Service. Several species of endangered baleen whales migrate through the area and stop to feed in the Sound in the spring and summer. A large sea lion rookery is located on Seal Rocks and Wooded Island, and major haulouts are found on Pt. Elrington, the Needle and Cape St. Elias. Several harbor seal haulouts are scattered throughout the Sound and near the mouth of the Copper River. Dense concentrations of marine organisms occur in the Sound, including all five species of Pacific salmon, herring, crab, shrimp, clams, mussels and a variety of intertidal organisms, which attract the populations of marine mammals. Local kelp and eelgrass beds are critical components of the marine ecosystem supporting marine mammals.

Killer Whales in Prince William Sound are estimated to number about 230. Little is known concerning the species number in Alaska. A single group of 500 was spotted off Middleton Island. Killer whales prey upon warm-blooded vertebrates including marine mammals, sea birds, and many species of fish. There is evidence to suggest killer whales are preying more on sea otters in certain parts of Alaska due to the decline of seals and sea lions in Alaskan waters (USFWS 2002). Resident killer whales follow and feed on salmon through the Montague Straight area. Around Green Island, transient killer whales forage regularly for harbor seals. They also attack sea lions at the Needle. Killer whales rub their bodies on the rounded stones along the northern shore of LaTouche Island. One hundred or more killer whales have been seen in lower Knight Passage in the summer months (Matkin 1994). Transient killer whales hunt harbor seals in concentration areas such as Icy Bay and they hunt Dall's porpoises and harbor porpoises in the Knight Island Passage (Matkin 1994).

Humpback Whales -An estimated 60 or more humpback whales utilize the Sound (von Ziegesar 1994). Humpback whales feed regularly in the Green Island area in July and August in groups up to 30 individuals (Mickelson 1989). Humpback whales feed in the Southwest Passage and Knight Island Passage. The Knight Island Passage is a major migration corridor for humpbacks in the summer (Mickelson 1989, von Ziegesar 1994). Humpback whales are the third most depleted whale species in the Northern Pacific. They feed in the Hinchinbrook Entrance area in July and August as well as during the winter months.

Gray Whales are not regularly found in Prince William Sound. They are alone among baleen whales in feeding predominantly on infaunal invertebrates. Gray whales are the only baleen whales that are mainly bottom feeders. They apparently feed by lying on their sides and sucking

up sediment from the sea floor. The estimated daily consumption of an adult gray whale is about 2,600 pounds (1,200 kg). In the approximately five months spent in Alaska waters, one whale eats about 396,000 pounds (180,000 kg) of amphipod crustaceans (ADF&G, 2002). In 1948 the International Convention for the Regulation of Whaling banned all hunting of gray whales except by aboriginal people and by contracting governments when the meat and products are for aboriginal use. Gray whales have recovered slightly and their world population is now estimated at about 21,000. Two gray whales are harvested annually (range 0-6) in recent years by Alaska Eskimos.

Harbor Seals are found in nearshore waters throughout the Prince William Sound Region. In fact, about 5,500 inhabit the Sound and most exhibit strong site fidelity. Harbor seals tend to concentrate in estuaries and protected waters. Habitats used for haulouts include cobble and sand beaches, tidal mud flats, offshore rocks and reefs, and ice (frozen heads of bays, in fjords, etc.) when available. Harbor seals enter lakes and rivers on a seasonal basis. Known seal haulouts occur throughout the Prince William Sound area. Major haulout locations include: Fairmount Island, Applegate Rocks, Schooner Rocks, Icy Bay, Port Chalmers, Canoe Passage on Hawkins, Iktua Rocks, Danger Island, Agnes Island, Barry Arm, Surprise Inlet, Nuchek, Little Smith Island, Big Smith Island, the northwest tip of Evans Island, the southwestern tip of LaTouche, Olsen Bay, Gravina Rocks, Gravina Island, Stockdale Harbor, Strawberry Channel, Egg Island Channel, Islands around the Copper River entrance into the Gulf of Alaska, Rocky Bay, Kayak Island, Green and Little Green Islands, Seal and Channel Islands (Frost and Lowry 1994, Hoover-Miller et al. 2001, NOAA 2001). Other haulouts include: off Lone Island, Story Island, Blackstone Bay, and Perry Island. Concentrated harbor seal areas are located in Controller Bay and at the outfall of the Bering River.

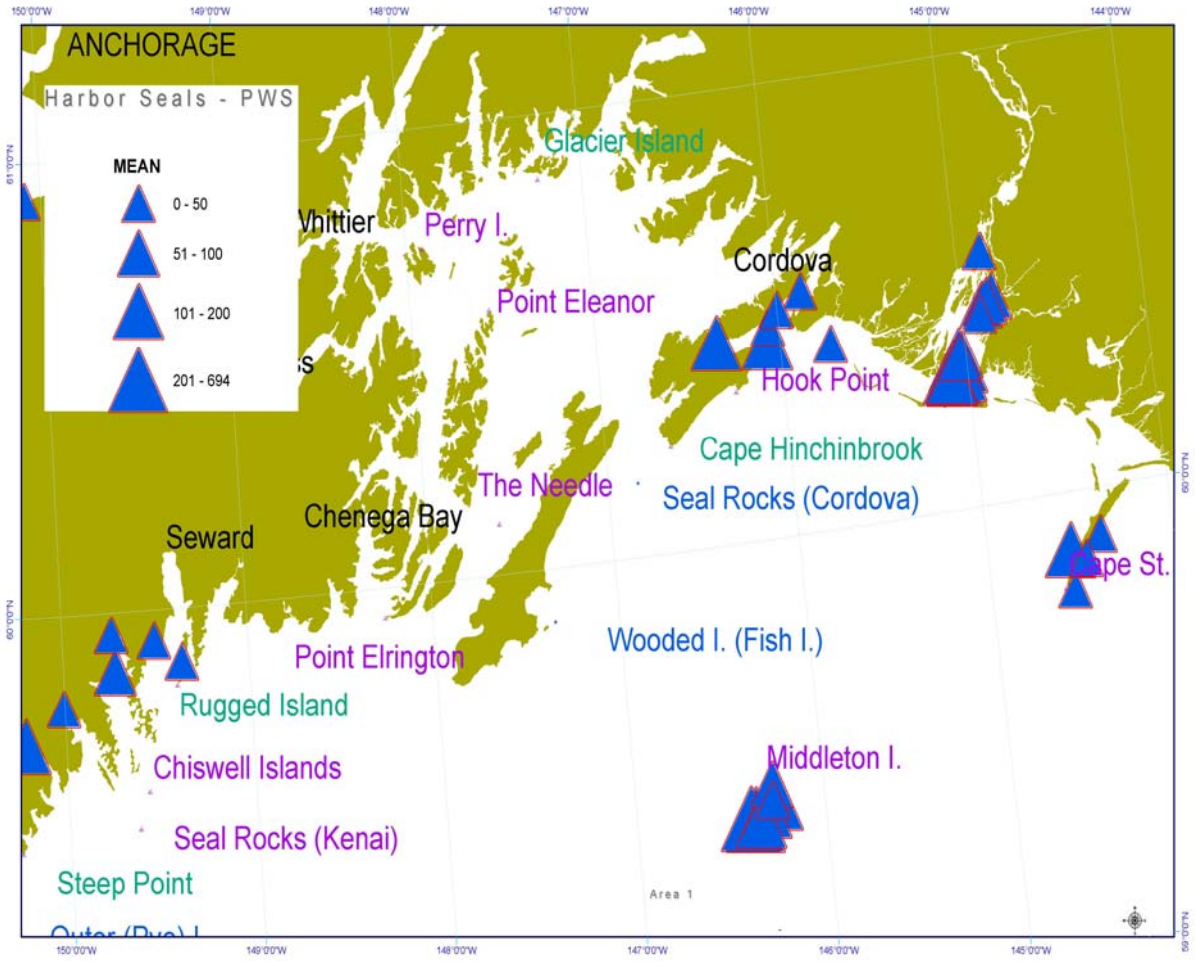
Haulouts are used for pupping, molting, and resting, and may be used year-round; peak haulout use occurs during June through early October. Pupping occurs between late May and early July; most pups are born during the first three weeks of June. Portions of the marine waters of Port Etches have been designated as a sensitive biological resource for harbor seals (NOAA 2001). Icebergs from tidewater glaciers provide resting areas for harbor seals and they are found in Harriman Fjord and around Surprise glacier. Surprise Inlet and Barry Arm are designated as a sensitive biological resource for seals (NOAA 2001). Columbia Bay has one of the highest harbor seal densities in the Sound and the icebergs in the area provide resting areas during pupping in early summer and molting in late summer through early fall (Frost and Lowry 1994, Hoover-Miller et al. 2001). A large haulout supporting over 500 harbor seals occurs near the head of Columbia Bay (NOAA 2001). The Copper River, as it enters the Sound provides a wealth of resources for the harbor seals flocking there in large numbers. There are ten known year-round harbor seal haulouts in this region with reported counts of one haulout containing 443 individuals. Please see sensitive biological resource maps below.

Sea Otters are estimated at 10,000 to 20,000 individuals occupying Prince William Sound with 90% of the world population residing in the near shore, coastal waters of Alaska (USFWS 2002). Extensive studies in Prince William Sound indicate that the recovery process may be constrained by oil spill residual effects (USFWS 2002). Food items preferred by the sea otters include crustaceans and mollusks, but they also eat fish and octopus. Sea otters often use stones to help crack shells of food items and frequently roll to clean their fur in the water. This is necessary to keep thermoregulation at an optimum since sea otters lack an insulating layer of fat (blubber) and they rely solely on their fur for insulation. Sea otters require ¼ their weight in food daily and often bring up 40 to 50 pounds of whole shellfish per day to meet this requirement (Arctic Environmental Information and Data Center 1990). The north west coast of Montague Island provides excellent habitat for sea otters (Bodkin and Udevitz 1999, Irons et. al 1988). High sea otter concentrations are found in Port Gravina, Sheep Bay, Simpson Bay and around Surprise

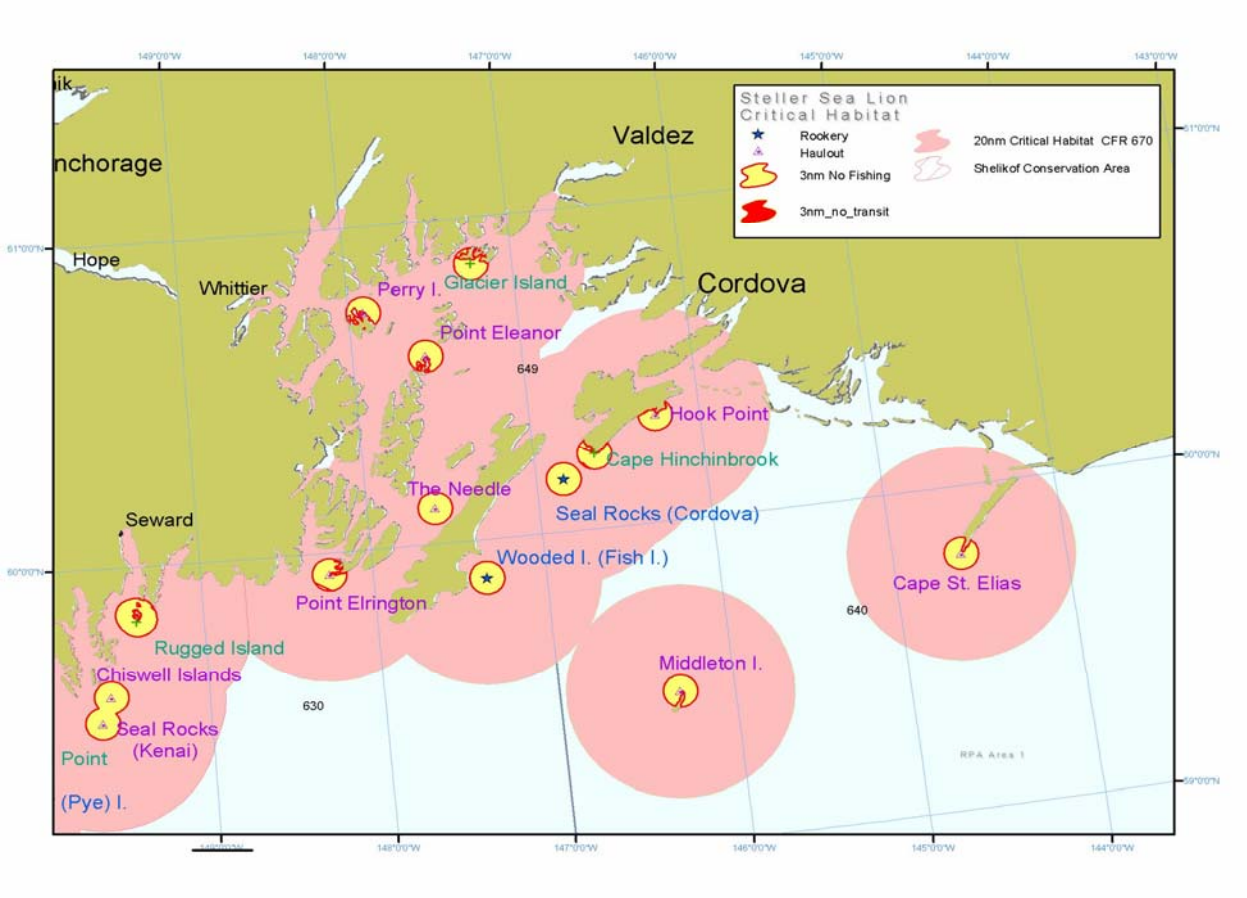
Glacier (US Forest Service 2000). Sea otters pup near the northeast end of Evans Island, and overwinter on the west side of LaTouche Island (*Exxon Valdez* Oil Spill Restoration Team 1993). Orca Inlet has one of the highest reported sea otter densities in the world. The nearshore waters and shoreline of Port Etches have been designated as concentration areas for sea otters (NOAA 2001). A high concentration of sea otters has been documented in Barry Arm (US Forest Service). The Chugach National Forest has documented large numbers of sea otters around Wooden Island (US Forest Service 2000). Strong populations of forage fish and invertebrates in Tatitlek Narrows support large populations of sea otters. High concentrations of sea otters are also found in the Bligh and Busby Islands (US Forest Service 2000, *Exxon Valdez* Oil Spill Restoration Team 1993). Sea otters utilize the shallow exposed waters in the lower half of Unakwik Inlet where greater benthic biomass exists (Irons et al. 1988). Eshamy Bay provides protected sea otter pupping areas and has been designated as a concentration area for sea otters (NOAA 2001).

The Steller Sea Lion population that occurs within the Prince William Sound Region is part of the population segment classified in 1997 as endangered under the Endangered Species Act. During May through August, territorial breeding behavior occurs on the rookeries. Pupping occurs from late May to early July; most pups are born during June. Steller Sea Lions use the Needle and Point Elrington, and the Pleiades Islands as year-round haulouts (Calkins and Pitcher 1982, NOAA 2001). The only two Steller sea lion rockeries in the Prince William Sound vicinity are Seal Rocks and Wooded Island. The National Marine Fisheries Service has designated both as critical habitat for the endangered species. Patton Bay and the surrounding islands provide for Steller sea lions with the dense concentrations of forage fish. Fish Island has been used as a haulout of Steller sea lions since the 1970's (Calkins and Pitcher 1982). A major haulout located at Kayak Island in the Gulf of Alaska has approximately 144 individuals. Please see map below for further Steller sea lion critical habitat delineations.

Harbor Seals in Prince William Sound



Stellar Sea Lion Critical Habitat in Prince William Sound



(e) Terrestrial Mammals

Several species of large terrestrial mammals are abundant throughout the Prince William Sound area. Brown and black bear, moose, Sitka black-tailed deer, Dall sheep and mountain goats are common throughout the Prince William Sound Region.

Sitka black-tailed deer were introduced throughout Prince William Sound between 1916 and 1923. During summer, deer generally feed on herbaceous vegetation and the green leaves of shrubs. During winter, they are restricted to evergreen forbs and woody browse. When snow is not a problem, evergreen forbs such as bunchberry and trailing bramble are preferred. During periods of deep snow, woody browse such as blueberry, yellow cedar and hemlock, and arboreal lichens are used (ADF&G 2002). Woody browse alone, however, is not an adequate diet and deer rapidly deplete their energy reserves when restricted to such forage. Islands known to have concentrations of deer include Elrington, Montague, Bligh, Hawkins, Port Gravina, Mummy, Hinchinbrook, LaTouch, and Evans (ADF&G 1985). The Prince William Sound population is estimated from 8,000 to 12,000 individuals and one estimate states that between 70% and 75% of the deer population in the Sound resides on Hawkins, Hinchinbrook, and Montague Islands (Arctic Environmental Information and Data Center, 1990). Total harvest for the 1999-2000 season in the Prince William Sound and North Gulf Coast areas was 2,265 deer (ADF&G 2000c). Montague Island provided 40% of the take, while Hinchinbrook and Hawkins Islands produced 17% and 21% of the take, respectively.

Moose occur in habitats throughout much of the Prince William Sound region, ranging from aquatic and riparian floodplains to sub-alpine willow-dominated areas. Sedge meadows, ponds and lakes with extensive aquatic vegetation, riparian and subalpine willow stands, and forested areas provide important summer habitat for moose. Important winter habitat includes shrub-dominated alpine and riparian areas, and forested areas. During fall and winter, moose consume large quantities of willow, birch, and aspen twigs. In some areas, moose actually establish a "hedge" or browse line 6 to 8 feet above the ground by clipping most of the terminal shoots of favored food species. Spring is the time of grazing as well as browsing. Moose eat a variety of foods, particularly sedges, equisetum (horsetail), pond weeds, and grasses. During summer, moose feed on vegetation in shallow ponds, forbs, and the leaves of birch, willow, and aspen. Riparian areas along the major rivers and tributary streams are particularly important during winter. Calving occurs in late May and early June, frequently in isolated marshy lowlands. Moose concentrations along the Copper River drainage are apparent. The harvest number in the Prince William Sound and north Gulf Coast areas for 1999 totaled 86 moose (ADF&G 2000e).

Brown Bears are distributed throughout Prince William Sound, with the exception of Middleton Island and small islands throughout the Sound. The population on Montague Island is recovering from over-harvesting in the 1970's and early 1980's. Bear concentrations may be found along rivers when spawning salmon are present. Brown bears consume a wide variety of foods including: berries, grasses, sedges, horsetails, cow parsnips, fish, ground squirrels, carrion, and roots of many kinds of plants. In some parts of Alaska, brown bears have been shown to be capable predators of newborn moose and caribou: also killing adults and domestic animals. Brown bears enter dens beginning in late October, with most bears denned by mid December. Bears emerge from their dens as early as mid March, depending on weather conditions. No census has been completed in Prince William Sound for population numbers, but population densities on the adjacent Copper River delta reportedly varies from 1 per 3.3 square miles to 4.6 square miles. Brown bears are abundant at the head of Port Gravina (Mickelson 1989, Sundet

1994). Brown bears are very numerous in the Nellie Martin River area due to the abundance of pink and silver spawning salmon. Bears concentrate at the freshwater inlets of Eshamy Bay for the spawning pink and sockeye salmon returning from the sea. Montague, Hitchinbrook and Hawkins Islands contain brown bears. East of the line from Point Freemantle out Montague Strait is brown habitat. Both black and brown bears visit tidal flats in the spring to graze on the grass and sedge communities. This occurs from mid-late April through late June. Use of intertidal areas decreases during mid-summer, although individuals will visit to dig clams or scavenge beached carcasses. Once the salmon return to streams in August, bears concentrate along the streams near tidewater to feed. In eastern PWS, brown bears mostly keep black bears away from streams. Brownies will stay near salmon streams until the runs play out, sometimes into October (pers. comm. Dave Crowley 2002). Harvest data in Unit 6 indicate 48 brown bears taken in the 1999-2000 season (ADF&G 2000b).

Black Bears are found throughout the Prince William Sound area with the exception of Montague, Hinchinbrook, Hawkins, Kayak and Middleton Islands and several other small islands in Prince William Sound. The black bear is omnivorous, and they consume freshly sprouted green vegetation, carrion, fresh kills of young moose and deer, and berries. In western PWS, black bears feed on salmon during August and then head for berry country, usually in the higher elevations. They measure about 26 inches at the shoulder and about 60 inches from nose to tail. Male black bears weigh around 200 pounds in spring and about 20% more in fall before denning. Three color phases of black bear occur in Alaska; jet black, brown (or cinnamon) and blue. The blue color bears, or glacier bears, occur in a restricted coastal belt from Prince William Sound to the northern fringes of southeast Alaska. Black bears lack a prominent shoulder hump and usually have a conspicuous patch of white on their chests. Reported densities of black bears in Prince William Sound range from 2.5 bears per square mile to 8 to 10 per square mile. Two hundred seventy-six bears were taken in the Prince William Sound and north Gulf Coast areas during the 1999-2000 season (ADF&G 2000a).

Furbearers-Beavers, coyotes, red foxes, lynx, martin, mink, muskrats, land otters and wolverines are all present in the Prince William Sound area. Historical information on population status is mostly anecdotal. Sealing monitors harvests of beavers, lynx, land otters and wolverines. Lynx are relatively scarce in the area. It is suggested by C. Rhode that coyotes are relatively new to the area and did not become a dominant canine until 1938 (ADF&G files). Marten densities are variable and excessive trapping is thought to result in low numbers in the Copper and Bering River areas.

In the Prince William Sound area, beaver, mink, and river otter are common inhabitants of aquatic and riparian floodplain and wetland areas, including marshes, ponds, lakes, streams, and rivers. Mink are considered to be common to abundant through the Sound area. They prey on a variety of animals and feed on anything they can capture and kill. They are adapted to capture aquatic and terrestrial prey including mammals, fish, birds, amphibians, crustaceans, and insects. Fish are their main food item. River otters are considered to be common to abundant in the Prince William Sound area (*Exxon Valdez* Oil Spill Restoration Team 1993). Diet of the river otters consist of fish, crustaceans, amphibians, insects, birds, and mammals. Fish compose the majority of the river otter's diet. High concentrations of river otters occur in the Bligh and Busby Islands due to the high quality intertidal and subtidal biota (Scheel et al. 1996). In the 1999-2000 season, 72 beavers and 46 otters were harvested in the Prince William Sound and north Gulf Coast management area (ADF&G 2000d).

Wolves and Foxes are found throughout Prince William Sound, however they have not become established on the major islands where deer would be adequate prey. Wolves are carnivores, and

in most of mainland Alaska moose and/or caribou are their primary food, with Dall sheep being important in limited areas. In Southeast Alaska, Sitka black-tailed deer, mountain goats, and beaver are the most important sources of food. During summer, small mammals including voles, lemmings, ground squirrels, snowshoe hares, beaver, and occasionally birds and fish are supplements in the diet (ADF&G 2002). The rate at which wolves kill large mammals varies with prey availability and environmental conditions. A current Alaska Department of Fish and Game report for the Prince William Sound and north Gulf Coast area suggests a stable wolf population of 50-65 wolves in 8 packs (ADF&G 2000f). An area harvest of 8 wolves was taken in the 1999-2000 season. Wolves and foxes select den sites where unfrozen, well-drained soils occur (e.g., dunes, river banks, and moraines). Wolves may initiate den construction in mid-April with pups being born from mid May through early June. Dens may be occupied until August. Red foxes have a reproductive pattern similar to that of wolves. They are relatively scarce in the Prince William Sound area. The last significant harvest of red fox was in 1972 in Unit 6C and the fox is thought to have been displaced as coyote populations increased (Griese 1990 and 1988).

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2. Vegetation

Rare plant species are identified below, as documented by the Alaska Natural Heritage Program. The map on the following page identifies the general locations of these rare plants. For further information, contact the Alaska Natural Heritage Program botanist at 257-2785.

RARE PLANTS KNOWN FROM THE PRINCE WILLIAM SOUND SUBAREA

Global Rank	State Rank	Scientific Name	Common name
G1G2	S1	Arabis codyi	
G1G2Q	S1	Isoetes truncata	TRUNCATE QUILLWORT
G1G2Q	S1S2	Cochlearia sessilifolia	
G1Q	S1	Cryptantha shackletteana	SHACKLETTES' CATSEYE
G1Q	S1	Draba kananaskis	TUNDRA WHITLOW-GRASS
G2G3	S2S3	Douglasia alaskana	ALASKA ROCK-JASMINE
G3	S1S2	Lesquerella calderi	CALDER'S BLADDER-POD
G3	S2	Lupinus kuschei	YUKON LUPINE
G3	S2	Poa laxiflora	LOOSE-FLOWERED BLUEGRASS
G3	S2S3	Douglasia arctica	MACKENZIE RIVER DOUGLASIA
G3	S2S3	Oxytropis huddelsonii	
G3	S2S3	Phacelia mollis	MACBRIDE PHACELIA
G3	S3	Aphragmus eschscholtzianus	
G3	S3	Douglasia gormanii	GORMAN'S DOUGLASIA
G3	S3	Draba ruaxes	RAINIER WHITLOW-GRASS
G3	S3	Montia bostockii	BOSTOCK'S MINER'S-LETTUCE
G3	S3	Platanthera chorisiana	CHORISO BOG-ORCHID
G3	S3	Romanzoffia unalaschcensis	UNALASKA MIST-MAID
G3	S3	Rumex beringensis	
G3	S3	Stellaria alaskana	ALASKA STARWORT
G3	S3	Thlaspi arcticum	ARCTIC PENNYCRESS
G3?	S2	Phyllospadix serrulatus	SERRULATE SURF-GRASS
G3G4	S1S2	Draba porsildii	PORSILD'S WHITLOW-GRASS
G3G4	S3	Papaver alboroseum	PALE POPPY
G3G4	S3S4	Draba stenopetala	ANADYR WHITLOW-GRASS
G3G4Q	S3S4	Atriplex alaskensis	ALASKA ORACHE
G3G4Q	S3S4	Castilleja annua	ANNUAL INDIAN-PAINTBRUSH
G3Q	S3	Taraxacum carneocoloratum	PINK-FLOWER DANDELION
G4	S1	Carex adelostoma	A SEDGE
G4	S1	Carex laxa	
G4	S1	Carex sychnocephala	MANY-HEADED SEDGE
G4	S2	Carex heleonastes	HUDSON BAY SEDGE
G4	S3	Asplenium trichomanes-ramosum	GREEN SPLEENWORT
G4	S3	Colpodium vahlianum	
G4	S3S4	Festuca brevissima	
G4	S4	Erysimum pallasii	PALLAS WALLFLOWER
G4?	S2	Carex holostoma	
G4G5	S2	Lonicera involucrata	
G4Q	S3	Pedicularis macrodonta	BIGTOOTH LOUSEWORT
G4T2T3Q	S2?	Phlox richardsonii ssp richardsonii	RICHARDSON'S PHLOX
G?	S2S3	Elymus calderi	
G4T3	S2?	Draba lonchocarpa var vestita	
G5	S1	Agoseris glauca	PALE FALSE-DANDELION
G5	S1	Draba densifolia	DENSE-LEAF WHITLOW-GRASS
G5	S1	Viola sempervirens	REDWOODS VIOLET

Global Rank	State Rank	Scientific Name	Common name
G5	S1S2	Juniperus horizontalis	
G5	S2	Agrostis thurberiana	THURBER BENTGRASS
G5	S2	Ceratophyllum demersum	COMMON HORNWORT
G5	S2	Salix hookeriana	HOOKER WILLOW
G5	S3	Zannichellia palustris	HORNED PONDWEED
G5	S3S4	Malaxis monophyllos	WHITE ADDER'S-TONGUE
G5	S3S4	Minuartia dawsonensis	
G5T2Q	S2	Arnica lessingii ssp norbergii	NORBERG ARNICA
G5T2T3Q	S2S3	Smelowskia calycina var porsildii	
G5T2T4Q	S2	Dodecatheon pulchellum ssp alaskanum	ALASKAN PRETTY SHOOTING-STAR
G5T3	S3	Astragalus harringtonii	
G5T3Q	S3	Carex lenticularis var dolia	GOOSE-GRASS SEDGE
G5T3T4	S2	Saxifraga nelsoniana ssp porsildiana	HEART-LEAF SAXIFRAGE
G5T4Q	S2	Trisetum sibiricum ssp litorale	SIBERIAN FALSE-OATS
G5T5	S1	Poa douglasii ssp macrantha	

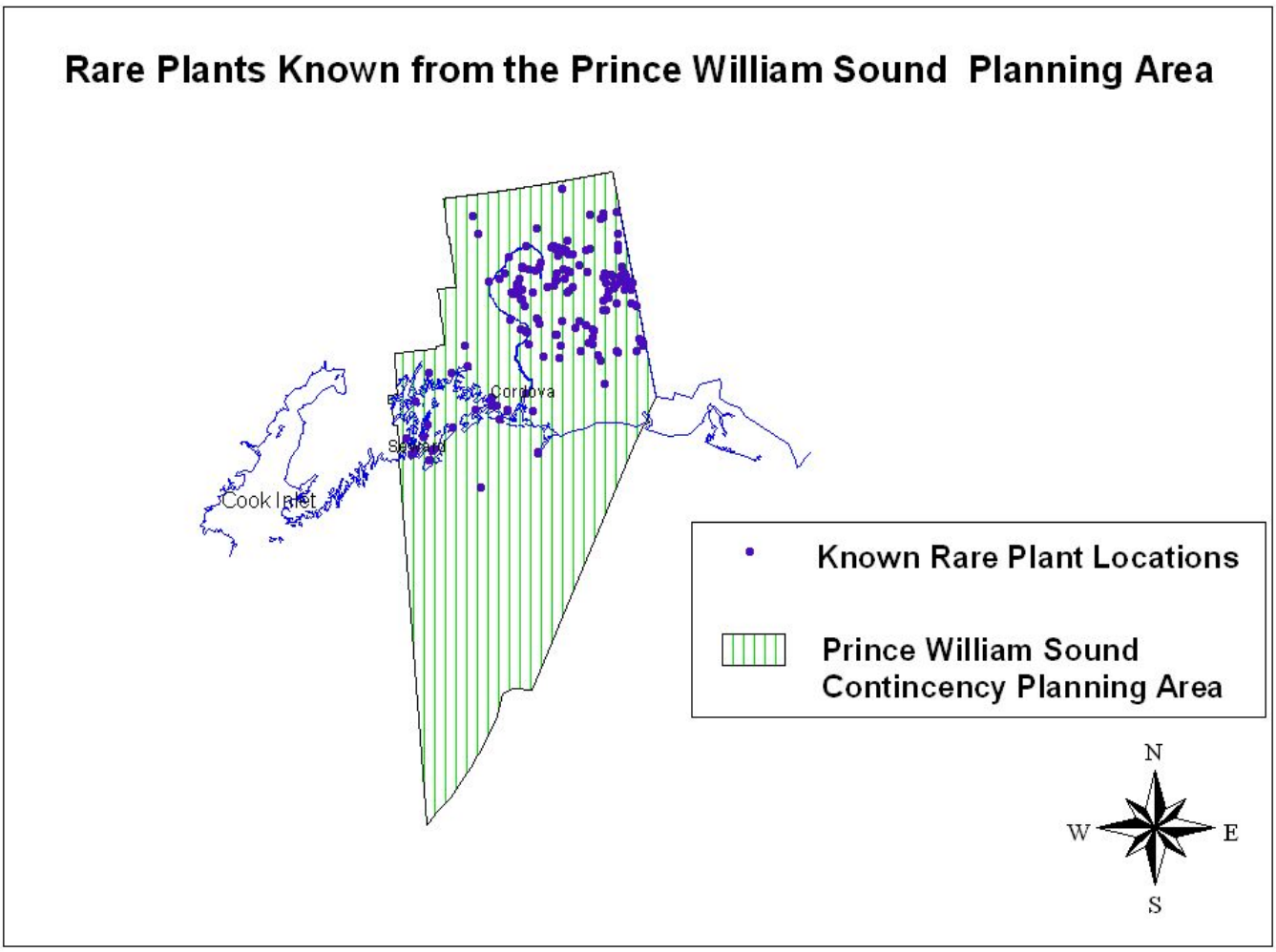
Species Ranks used by the Alaska Natural Heritage Program

Species Global Rankings

G1: Critically imperiled globally (5 or fewer occurrences)
G2: Imperiled globally (6-20 occurrences)
G3: Rare or Uncommon globally (20-100 occurrences)
G4: Apparently secure globally, but cause for long-term concern (>100 occurrences)
G5: Demonstrably secure globally
G#G# Rank of species uncertain, best described as a range between two ranks
G#Q Taxonomically questionable
G? Unranked
G#T# Global rank of species and global rank of the described variety or subspecies

Species State Rankings

S1: Critically imperiled in state (5 or fewer occurrences)
S2: Imperiled in state (6-20 occurrences)
S3: Rare or Uncommon in state (20-100 occurrences)
S4: Apparently secure in state, but cause for long-term concern (>100 occurrences)
S5: Demonstrably secure in state
S#S# Rank of species uncertain, best described as a range between two ranks



To view the map from the ARRT website, please go to the DNR Prevention and emergency Response Subarea Plan Maps website located at:

http://www.asgdc.state.ak.us/maps/cplans/subareas.html

3. Biologically Sensitive Areas

The Alaska Department of Fish and Game began a project in 1996 to map some of the most environmentally sensitive areas (MESAs) for wildlife along Alaska's coast. This information is for contingency planning purposes and does not cover the complete coastline or sensitive areas that other organizations may identify. Maps entitled "Most Environmentally Sensitive Areas along the Coast of Alaska" were published by the Alaska Department of Fish &Game (1997), and are available in hard copy and digital format from their Anchorage office at 267-2338.

These maps are also available at the DNR Prevention and Emergency Response Subarea Plan Maps website located at:

http://www.asgdc.state.ak.us/maps/cplans/subareas.html

Each of these sensitive areas is plotted on a 1:250,000 scale U.S. Geological Survey quadrangle map. A list of the sensitive areas in the subarea and map referencing their location is provided (see the following figure and table), followed by the MESA maps.

BIOLOGICAL HOTSPOTS MAP here

http://www.asgdc.state.ak.us/maps/cplans/base/mesa_vol2.pdf

Oil Spill Contingency Planning
Most Environmentally Sensitive Areas
along the Coast of the Prince William Sound Subarea

54. Patton Bay (Montague Island)/Wooded Island
- salmon concentrations
- waterfowl and shorebird spring staging
- seabird colonies (>16,000 birds)
- harbor seal haulouts
- sealion haulouts and rookeries (600 pups)
- sea otter concentrations
- deer feeding concentrations

55. Sheep Bay
- salmon concentrations
- herring spawning
- waterfowl and shorebird spring and fall staging
- seabird colony (100 birds)
- harbor seal haulouts
- sea otter concentrations

56. Seal Rocks (southwest of Hinchinbrook Island)
- seabird colony (>50 birds)
- sea lion haulouts and rookeries (657 pups)

57. Copper River Delta/Controller Bay
- salmon concentrations
- razor clam concentrations
- waterfowl and shorebird spring and fall staging and molting
- seabird colonies (>46,000 birds)
- harbor seal haulouts
- Copper River Delta State Critical Habitat Area
- Western Hemisphere Shorebird Preserve Network

Insert MESA map 1 of 6 here

http://www.asgdc.state.ak.us/maps/cplans/pws/mesa54.pdf

Insert MESA map 2 of 6 here

http://www.asgdc.state.ak.us/maps/cplans/pws/mesa55a.pdf

Insert MESA map 3 of 6 here

http://www.asgdc.state.ak.us/maps/cplans/pws/mesa55b.pdf

Insert MESA map 4 of 6 here

http://www.asgdc.state.ak.us/maps/cplans/pws/mesa56.pdf

Insert MESA map 5 of 6 here

http://www.asgdc.state.ak.us/maps/cplans/pws/mesa57a.pdf

Insert MESA map 6 of 6 here

http://www.asgdc.state.ak.us/maps/cplans/pws/mesa57b.pdf