KACHEMAK BAY
AND
FOX RIVER FLATS
CRITICAL HABITAT AREAS
MANAGEMENT PLAN

DECEMBER 1993

Prepared by the Divisions of
Habitat and Restoration
and
Wildlife Conservation

Alaska Department of Fish and Game
333 Raspberry Road
Anchorage, AK 99518-1599

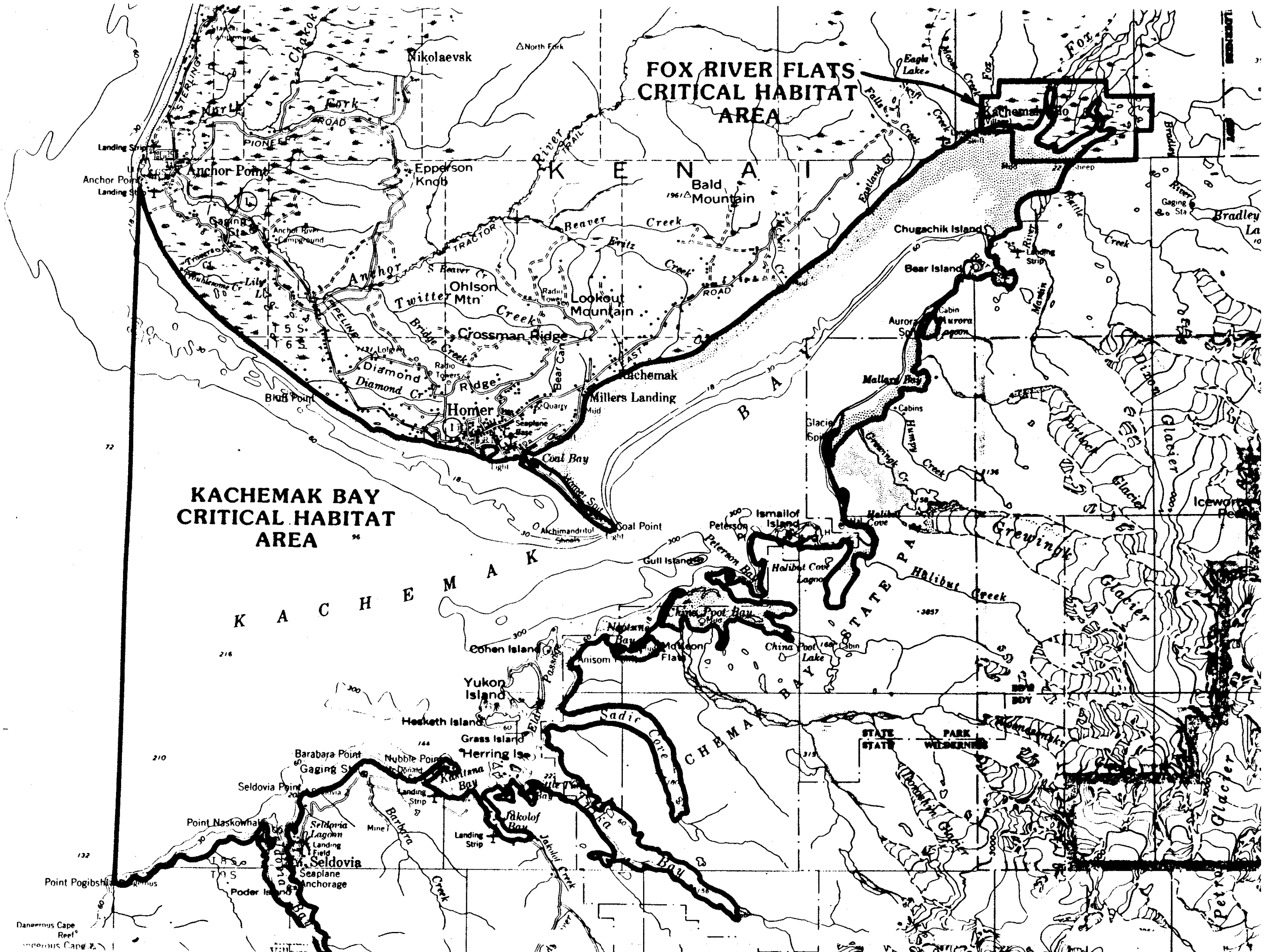
Carl L. Rosier, Commissioner

The Alaska Department of Fish and Game has published this document in accordance with AS 44.62 to assist in the management of Kachemak Bay and Fox River Flats Critical Habitat Areas at a cost of $13.05 per copy. This document was printed in Anchorage, Alaska.

ACKNOWLEDGEMENTS

The Kachemak Bay and Fox River Flats Critical Habitat Areas Management Plan has been prepared by the Alaska Department of Fish and Game (ADF&G) biologists Debra Clausen (Habitat and Restoration Division) and Rick Sinnott (Wildlife Conservation Division), with special assistance from clerical staff Gayle Tichenor and Susan Divens and cartographic support from Frances Inoue.

The plan has been developed with the aid of an interagency planning team composed of representatives from state, federal and local agencies with jurisdiction over the critical habitat areas. The planning team has participated in the plan's development from its inception. Planning team members who participated in development of the plan are as follows: Kathy Dugan, Department of Natural Resources; Roger McCampbell, Division of Parks and Outdoor Recreation; Pricilla Wohl, Department of Environmental Conservation; Pat Beckley, Department of Transportation and Public Facilities; Wes Bucher, Division of Commercial Fisheries, ADF&G; Nick Dudiak, F.R.E.D. Division, ADF&G; Dave Nelson, Sport Fisheries Division, ADF&G; Eileen Bechtol, City of Homer; Mary Pearsall, Kenai Peninsula Borough; Tom Arminski, Alaska Energy Authority; Phil North, Environmental Protection Agency; Barbara Mahoney, National Marine Fisheries Service; and Larry Dugan, U.S. Fish and Wildlife Service. Ivan Widom, City of Seldovia, participated in planning team meetings as well. Richard Preston, U.S. Coast Guard; Tim Dillon, City of Seldovia; and Ron Stanek, Division of Subsistence were also named to the planning team.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CRITICAL HABITAT
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K E N A I
K A C H E M A K
B A Y
Nikolaevsk
Anchor Point
Eppérson Knob
Bald Mountain
Ohlson Mtn
Lookout Mountain
Crossman Ridge
Diamond Ridge
Homer
Kachemak
Millers Landing
Bluff Point
Coal Bay
Homer Spit
Coal Point
Chugachik Island
Bear Island
Gull Island
Ismailof Island
China Poot Bay
Cohen Island
Yukon Island
Hesketh Island
Grass Island
Herring Isle
Sadie Cove
Barabara Point
Seldovia Point
Point Naskowhak
Seldovia
Seaplane Anchorage
Poder Island
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Dangerous Cape
Grewingk Glacier
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INTRODUCTION

The tide and submerged lands of Kachemak Bay were established as a critical habitat area by the Alaska Legislature in 1974 and the Fox River Flats was established by the Alaska Legislature as a critical habitat area in 1972 to protect and preserve habitat areas especially crucial to the perpetuation of fish and wildlife, and to restrict all other uses not compatible with that primary purpose.

The purpose of the Kachemak Bay and Fox River Flats Critical Habitat Areas Management plan is to provide consistent long-range guidance to the Alaska Department of Fish and Game and other agencies involved in managing the critical habitat areas.

The plan presents management goals for the critical habitat areas and resources and identifies policies to be used in determining whether proposed activities within the critical habitat areas are compatible with the protection of fish and wildlife, their habitats and public use of the critical habitat areas. The plan will be reviewed every five years and, if appropriate, updated as funding permits. Public participation will be solicited during the update process. The plan affects state and private lands within the critical habitat areas. The plan does not apply to federal or municipal lands within the critical habitat areas. The plan does not address hunting or fishing regulations which are the authority of the Boards of Fish and Game.

This document is the result of a public planning process led by the Alaska Department of Fish and Game. The plan has been developed by the planning team representing state, federal and municipal agencies including: The Alaska Departments of Fish and Game, Natural Resources, Environmental Conservation, Transportation and Public Facilities, Alaska Energy Authority, and Division of Parks and Outdoor Recreation; the United States Fish and Wildlife Service, Coast Guard, National Marine Fisheries Service and Environmental Protection Agency; the City of Homer, the City of Seldovia, and the Kenai Peninsula Borough.

At the beginning of the public planning process, public meetings were held in Homer, Seldovia, and Anchorage to explain the planning process and solicit citizens' opinions regarding the issues, interests and concerns pertinent to critical habitat area management. The meeting results and written comments received were used by the planning team to identify a list of issues to be addressed in the plan. At the same time, resource information on critical habitats and their fish and wildlife populations, other natural resources, existing land use, and land ownership was being collected and synthesized. This information, presented in both map and narrative form, comprises the plan's resource inventory.

Management goals and policies for the critical habitat areas were developed by the planning team to address the identified issues. All policies were developed with consideration of their ability to meet the plan's management goals. In addition, other applicable laws and the Public Trust Doctrine were considered.

The draft plan was distributed for public review, and comments received during the public review process were used to develop the final plan. The goals and policies were then adopted by the Commissioner of Fish and Game.

The plan is implemented by the Alaska Department of Fish and Game in several ways. A Special Area Permit is required for any habitat altering activity, including any construction work, in a designated State Critical Habitat Area (5 AAC 95). A Special Area Permit application form can be obtained from any Alaska Department of Fish and Game office and should be submitted to the Habitat and Restoration Division Regional Office in Anchorage. The Habitat and Restoration Division will review all proposed activities for consistency with the goals and policies outlined in this plan. Activities will be approved, conditioned, or denied based on the direction provided in this plan as well as state laws and regulations.

Future Kachemak Bay Critical Habitat Area and Fox River Flats Critical Habitat Area management activities of the Alaska Department of Fish and Game will also be directed by this plan. Research programs, public use facilities, and other department projects will be consistent with the goals and policies presented in this plan.

Other state, federal, and local agencies have management responsibilities within the critical habitat areas as well. Any use, lease, or disposal of resources on state land in the critical habitat areas requires Alaska Department of Natural Resources (ADNR) authorization. The ADNR Division of Parks and Outdoor Recreation manages Kachemak Bay State Park, established by the legislature in 1971. Kachemak Bay State Park overlaps Kachemak Bay Critical Habitat Area along most of the south shore of Kachemak Bay from Tutka Bay north to Aurora Lagoon and Chugachik Island. Activities within the state park require authorization from the Division of Parks and Outdoor Recreation. Activities affecting air or water quality require authorization from the Alaska Department of Environmental Conservation. The United States Army Corps of Engineers (COE) evaluates applications for discharging dredged and fill material in waters of the United States including wetlands. Federal and state agencies, including the United States Fish and Wildlife Service, National Marine Fisheries Services, and Environmental Protection Agency, along with local governments, review proposals for COE permits, pursuant to the Fish and Wildlife Coordination Act (16 USC 661-666 et.seq.). United States Coast Guard approval is required for certain kinds of work in navigable waters. The Kenai Peninsula Borough reviews and comments on all permit proposals within the coastal zone, including the Kachemak Bay and Fox River Flats Critical Habitat Areas.

STATUTES

Alaska Statutes which pertain specifically to the establishment and management of Kachemak Bay Critical Habitat Area and Fox River Flats Critical Habitat Area are as follows:

AS 16.20.500. Purpose. The purpose of AS 16.20.500 - 16.20.690 is to protect and preserve habitat areas especially crucial to the perpetuation of fish and wildlife, and to restrict all other uses not compatible with that primary purpose.

AS 16.20.580. Fox River Flats Critical Habitat Areas established. The following described area is established as the Fox River Flats Critical Habitat Area:

(1) Township 4 South, Range 10 West, Seward Meridian
Section 20 SE1/4 (not tide or submerged land)
Section 21 S1/2 (not tide or submerged land)
Section 22 S1/2
Section 23 S1/2 (not tide or submerged land)
Sections 25 - 29
Sections 33 - 36
(2) Township 4 South, Range 9 West, Seward Meridian
Section 30 W1/2 (not tide or submerged land)

AS 16.20.590. Kachemak Bay Critical Habitat Area established. The following described area is established as the Kachemak Bay Critical Habitat Area:

(1) Township 4 South, Range 10 West, Seward Meridian (only tide and submerged land and waters)
(2) Township 5 South, Range 10 West, Seward Meridian (only tide and submerged land and waters)
(3) Township 5 South, Range 11, West, Seward Meridian (only tide and submerged land and waters)
(4) Township 5 South, Range 12 West, Seward Meridian (only tide and submerged land and waters)
(5) Township 6 South, Range 11 West, Seward Meridian (only tide and submerged land and waters)
(6) Township 6 South, Range 12 West, Seward Meridian (only tide and submerged land and waters)
(7) Township 6 South, Range 13 West, Seward Meridian (only tide and submerged land and waters)
(8) Township 6 South, Range 14 West, Seward Meridian (only tide and submerged land and waters)
(9) Township 7 South, Range 11 West, Seward Meridian (only tide and submerged land and waters)
(10) Township 7 South, Range 12 West, Seward Meridian (only tide and submerged land and waters)
(11) Township 7 South, Range 13 West, Seward Meridian (only tide and submerged land and

waters)
(12) Township 7 South, Range 14 West, Seward Meridian (only tide and submerged land and waters)
(13) Township 8 South, Range 12 West, Seward Meridian (only tide and submerged land and waters)
(14) Township 8 South, Range 13 West, Seward Meridian (only tide and submerged land and waters)
(15) Township 8 South, Range 14 West, Seward Meridian (only tide and submerged land and waters)
(16) Township 9 South, Range 14 West, Seward Meridian (only tide and submerged land and waters)
(17) Township 9 South, Range 15 West, Seward Meridian (including all tide and submerged land and waters east of a line from Anchor Point to Point Pogibshi)
(18) Township 5 South, Range 15 West, Seward Meridian (including all tide and submerged land and waters east of a line from Anchor Point to Point Pogibshi)
(19) Township 6 South, Range 15 West, Seward Meridian (including all tide and submerged land and waters east of a line from Anchor Point to Point Pogibshi)
(20) Township 7 South, Range 15 West, Seward Meridian (including all tide and submerged land and waters east of a line from Anchor Point to Point Pogibshi)
(21) Township 8 South, Range 15 West, Seward Meridian (including all tide and submerged land and waters east of a line from Anchor Point to Point Pogibshi)
(22) Township 9 South, Range 12 West, Seward Meridian (only tide and submerged land and waters)

GOALS

Activities that occur within the Kachemak Bay and Fox River Flats critical habitat areas will reflect the following goals in accordance with the purpose for which the areas were established (AS 16.20.500). All department management decisions in the Kachemak Bay and Fox River Flats critical habitat areas, whether affecting activities undertaken by the department, other agencies or the public, will be in accordance with these goals.

I. **Fish and Wildlife Populations and Their Habitat** - Manage the critical habitat areas to maintain and enhance fish and wildlife populations and their habitat. Minimize the degradation and loss of habitat values due to habitat fragmentation. Recognize cumulative impacts when considering effects of small incremental developments and action affecting critical habitat area resources.

A. **Wildlife**

1. Protect important wildlife habitat including water quality.

2. Minimize harmful disturbance to wildlife, especially to marine mammals and nesting, rearing, staging and wintering waterfowl, shorebirds, and seabirds.

3. Maintain, protect, and if appropriate, enhance the quality and quantity of nesting, rearing, feeding, staging and wintering habitat for resident and migrant waterfowl, shorebirds, and seabirds.

4. Protect bald eagle nesting, perching, roosting, and feeding habitat.

B. **Fish**

1. Protect natural substrate, aquatic vegetation, water quality and circulation patterns to maintain aquatic habitats.

2. Maintain water quality sufficient for the growth and propagation of fish, shellfish, and other aquatic life in fresh, estuarine and marine waters.

3. Maintain water quality at a level that would allow for harvest of raw mollusks or other raw aquatic life for human consumption.

II. **Public Use** - Manage the critical habitat areas to maintain and enhance public use of fish, wildlife and critical habitat area lands and water consistent with the other goals of this management plan.

A. Maintain or improve public access to and within the critical habitat areas.

B. Maintain or improve opportunities for hunting and fishing within the critical habitat

areas.

C. Maintain or improve opportunities to recreate in the critical habitat areas.

D. Maintain or improve opportunities for viewing, photography, education, and study of fish and wildlife.

E. Provide information about the critical habitat areas to the public.

Explanation of Terms

Minimize: To reduce harmful effects to a level which does not have a significant adverse impact on fish or wildlife populations or their habitats within the critical habitat areas or significantly reduce public opportunity for successful harvest or non-consumptive use of fish and wildlife.

Harmful Disturbance: Activities which displace animals from their natural habitat or interrupt their seasonal activities at a frequency or duration which causes significant impact to fish and wildlife populations. Harmful disturbance does not refer to the legal harvest of fish and wildlife.

POLICIES

ACCESS - Maintain existing public access into Kachemak Bay and Fox River Flats critical habitat areas. Improve public access within Kachemak Bay Critical Habitat Area consistent with the goals of the management plan. Fox River Flats Trail should continue to be used as an all weather trail with appropriate terms and conditions, including weight restrictions, placed on use of motorized vehicles.

OFF-ROAD USE OF MOTORIZED VEHICLES - To ensure the protection of important habitat, avoid harmful disturbance of fish and wildlife, and accommodate a variety of critical habitat area users, the department will, as appropriate, establish motorized vehicle use corridors and seasonal and vehicle use restrictions under a general permit for individual personal and recreational transportation. Organized group events involving 20 or more individuals or use of industrial or construction type vehicles may, in the commissioner's discretion, be authorized under an individual Special Area Permit under 5 AAC 95.420(a)(7) if the use is consistent with the goals and policies of this management plan. Traversing areas with rooted vegetation in airboats or hovercraft is prohibited.

INFORMATION AND EDUCATION - Inform the public about resource values, recreational opportunities (including high value viewing areas) and rules in Kachemak Bay and Fox River Flats critical habitat areas. Encourage compatible educational programs and research and monitoring of fish, wildlife, and habitat resources and their uses.

FISH AND WILDLIFE HABITAT AND POPULATION ENHANCEMENT AND REHABILITATION - As appropriate, allow enhancement and rehabilitation of habitat of indigenous wildlife or fish species and enhancement of fish and wildlife populations where it furthers the management goals of Kachemak Bay and Fox River Flats critical habitat areas, is not at the expense of existing resource values (including diversity and abundance) and doesn't interfere with public use and enjoyment. Priority should be given to encouraging rehabilitation of depleted indigenous fish and wildlife populations.

WATER QUALITY - Water quality standards applied to estuarine, marine, and freshwater environments in the critical habitat areas shall be state water quality standards set out in 18 AAC 70 (as amended as of January 7, 1987). Cumulative effects of waste discharge shall be a primary concern when determining appropriate activities in the critical habitat areas and must meet the above specified standards. Discharge of treated waste products may only be allowed within the critical habitat areas when there is a demonstrable need for which there is no feasible alternative.

MOORING BUOYS, RUNNING LINES, AND NAVIGATIONAL AIDS - Mooring buoys and running lines will be allowed under the terms of a general permit where adjacent upland landowners require public or private access to their property. Public mooring buoys may also be allowed under the terms of a general permit. Mooring buoys and running lines will be sited, designed, and used in a manner which does not interfere with navigation for the purpose of public use and enjoyment of the critical habitat areas, existing fisheries, or other authorized uses. In areas where a proliferation of buoys would have the potential to interfere with navigation for the purpose of public use and enjoyment of the critical habitat areas, or public uses of the critical habitat area, an area or areas may

be identified for the location of public and private mooring facilities. Navigational aids will be allowed by general permit.

HARBORS, DOCKS, PIERS, BOAT RAMPS, AND PILING SUPPORTED STRUCTURES - Harbors, docks, piers, boat ramps, and associated structures may be allowed for the purpose of maintaining or improving public access to Kachemak Bay, or where adjacent upland landowners require access to their property in a manner consistent with critical habitat area statutes and regulations and the goals and policies of this management plan. Siting, design, construction, and maintenance of these facilities will to the maximum extent possible avoid impacts to habitat, fish, wildlife, navigation for the purpose of public use and enjoyment of the critical habitat areas and existing fisheries. Community dock development, seasonal docks, mooring buoys, and running lines will be encouraged over individual private permanent docks whenever possible. Solid fill docks will be avoided to the maximum extent possible if the facility will impact productive habitat; interfere with natural coastal processes including tidal action, circulation, erosion, and deposition patterns; or interfere with public use of one or both of the critical habitat areas. Piling or floating docks will be used whenever possible. The size of a structure will be kept to the minimum necessary to accommodate the proposed activity.

LONGTERM ANCHORAGE, FLOATSTRUCTURES, BOAT MAINTENANCE, AND DERELICT OR ABANDONED BOATS - Anchorage or placement of a vessel or structure for longer than 14 days in the Fox River Flats or Kachemak Bay critical habitat areas requires authorization under a Special Area Permit and may be allowed if consistent with the purpose for which the critical habitat area was established and the goals and policies of this management plan. A general permit may be issued under appropriate terms and conditions for the anchoring of vessels in the vicinity of the Homer and Seldovia small boat harbors. Floatstructures, except when specifically allowed by other policies in this plan, will not be allowed on public lands and waters in the critical habitat areas. Derelict or abandoned boats may not be left on public lands or waters in the critical habitat areas outside of the Homer or Seldovia small boat harbors. Intertidal boat maintenance outside of established community boat harbors may be authorized on private tidelands, or on public tidelands when there is no feasible alternative, under terms and conditions consistent with the goals and policies of this management plan and the purposes for which the critical habitat areas were established. The sinking of derelict boats in Kachemak Bay may be allowed only for the purpose of artificial reef enhancement undertaken by a local, state, or federal agency if it will not impact fish and wildlife habitat, fish and wildlife populations, or public use of the critical habitat areas.

SHORELINE ALTERATION - Except as provided in the Harbors, Docks, Piers, Boat Ramps, and Piling Supported Structures policy, no alteration will be allowed of the natural shoreline of Kachemak Bay except when it will provide an overwhelming public benefit and there is no feasible upland alternative, or in the case where the proposed project is entirely on privately owned tidelands for the purpose of private property protection. Shoreline alteration of public tidelands to protect private property will not be allowed. Shoreline alteration will, to the maximum extent practicable, follow the natural configuration of the shoreline and avoid impact to fish and wildlife populations, their habitat, and public use and enjoyment of the critical habitat areas. Maintenance and clean-up of shore retention structures will be required of any shoreline alteration project.

LAND ACQUISITION - The department may acquire private or municipal uplands, tidelands, or conservation easements within the critical habitat areas from willing sellers as time and funding permit through purchase or trade. Donation of lands for addition to the critical habitat areas will also be considered.

POT AND GEAR STORAGE - The storage of fishing pots or other fishing gear within Kachemak Bay or Fox River Flats critical habitat areas requires a Special Area Permit. A Special Area Permit may be issued for the storage of fishing pots and other gear where storage will not impact fish and wildlife habitat, fish and wildlife populations, public use of the critical habitat areas, or navigation for the purpose of public use and enjoyment of one or both of the critical habitat areas. Whenever possible, upland storage is preferred.

SHORE FISHERY LEASES - Use of shore fishery leases may be authorized under the terms of a general permit if the leases are consistent with the goals and policies of this management plan, the purpose for which the critical habitat area was established, salmon harvest regulations, and if the leases are not in conflict with use of pre-existing shore fishery leases, aquatic farm permits or leases, or other disposals of interest in state property.

AQUATIC FARMING - In a manner compatible with the maintenance of high water quality in Kachemak Bay, aquatic farming activities, including floatstructures essential to the farm operation, may be permitted in Kachemak Bay on a case by case basis under terms and conditions consistent with the protection of fish and wildlife populations and their habitats, continued use of fish and wildlife, and public use and enjoyment of the critical habitat areas if compatible with other existing uses. Within the constraints provided by law, Jakolof Bay is recognized as a physically suitable area for aquatic farming activity because of good site conditions and an absence of use conflicts with fisheries. Aquatic farming will not be authorized in China Poot Bay due to its shallow character and conflict with existing navigational channels and fisheries. Additional aquatic farms of any configuration in Peterson Bay or additional floating aquatic farms in Kasitsna Bay will not be authorized due to an absence of suitable sites free from conflict with existing fisheries and public use. In order to avoid conflict with existing setnet fisheries, aquatic farms will not be sited within a 1000 foot radius offshore (from mean low water) of commercial set gillnet sites in Seldovia Bay, Kasitsna Bay and McDonald Spit, and Halibut Cove. In order to provide time for observation of the effect of existing aquatic farms, a moratorium on both the authorization of the expansion of the boundaries of existing farms and the authorization of new aquatic farms (excluding aquatic farms applied for prior to December 31, 1992 and experimental projects conducted in cooperation with the department) in Kachemak Bay will extend through December 31, 1995. Authorization of aquatic

farms after that date may occur if authorization is not specifically prohibited by this policy or other state law. The effects of existing aquatic farms will be utilized to determine, in part, decisions to permit, deny, or modify new aquatic farm proposals submitted after the expiration of the moratorium.

GRAZING - A new grazing lease or permit, or renewal of an existing grazing lease may be allowed only for cattle or horses in Fox River Flats Critical Habitat Area under terms and conditions compatible with critical habitat area statutes and the goals and policies of this management plan using guidelines established in consultation with other involved parties during the development of a range management plan. Introduction of species other than cattle and horses will not be allowed. Terms and conditions under which grazing may be allowed will include seasonal restrictions necessary to avoid impact to critical waterfowl and moose habitat, riparian buffers necessary to avoid damage to fish streams, limits on number of animals, requirements for marking animals, responsibility for removing feral animals, application of active management techniques including movable fences where appropriate, and requirements to maintain public access on public lands.

INWATER LOG STORAGE AND TRANSFER FACILITIES - To prevent the destruction of benthic marine habitats and interference with public use, including navigation for the purpose of public use and enjoyment of the critical habitat areas and fishing, the in-water storage or transfer of logs is not allowed in Kachemak Bay, except that logs intended for personal use may be transported in Kachemak Bay under the terms of an individual Special Area Permit under which in-water time does not exceed 14 days. It is not the intent of this policy to preclude logging on the south side of Kachemak Bay.

PIPELINES AND UTILITY LINES - A new utility or pipeline may be allowed to cross Kachemak Bay Critical Habitat Area if there is no feasible alternative, using an existing corridor whenever possible, consistent with critical habitat area statutes and the goals and policies of this management plan, and will avoid impacts to critical habitat area values to the maximum extent possible. Utility lines and pipelines will not be allowed in wetlands in the Fox River Flats Critical Habitat Area. Any easement issued within the critical habitat areas will be non-exclusive use only. Easements for sewer outfalls may only be allowed within Kachemak Bay Critical Habitat Area when there is a demonstrable need for which there is no feasible alternative and must be consistent with the goals and policies of this management plan. Except for authorized fuel docks, fuel lines and oil pipelines will not be allowed to cross either Kachemak Bay or Fox River Flats critical habitat areas.

MINING - Mineral or coal leasing will not be allowed in the critical habitat areas. Close the critical habitat areas to new locatable mineral entry and close tide and submerged lands within the critical habitat areas to issuance of offshore prospecting permits. Incidental gathering of loose coal for personal use on Kachemak Bay beaches will continue to be allowed.

MATERIAL EXTRACTION - Material extraction on public lands will not be allowed within the critical habitat areas unless for purposes of maintenance, enhancement, or restoration of critical habitat area habitat. All material extraction activities within the critical habitat areas, including activities on private lands, must be consistent with critical habitat area statutes and the goals and policies of this management plan.

OIL AND GAS - To avoid damage to fish and wildlife habitats, disturbance to fish and wildlife populations, and displacement of public use, surface entry for oil and gas exploration or development will not be allowed on Kachemak Bay or Fox River Flats critical habitat areas, except that geophysical surveys may be permitted if there is no surface impact and appropriate stipulations, including seasonal restrictions, preclude impact to fish and wildlife habitat, fish and wildlife populations, and public use of the critical habitat areas.

OIL DRILLING RIG STORAGE - To avoid damage to fish and wildlife habitats, disturbance to fish and wildlife populations, and displacement of public use of Kachemak Bay Critical Habitat Area, drilling rig storage will not be allowed in the Kachemak Bay Critical Habitat Area.

HAZARDOUS MATERIALS - Hazardous materials may not be stored or deposited in the critical habitat areas.

OTHER USES - To protect fish and wildlife populations and their habitats in the critical habitat areas, the department may allow by permit only those activities compatible with the purposes for which the critical habitat areas were established, terms and standards of 5 AAC 95, and the goals and policies of the plan. Any activity that is not compatible with the purposes for which the critical habitat areas were established, terms and standards of 5 AAC 95, and the goals and policies of this plan will not be allowed.

REGULATION

5 AAC 95.610 KACHEMAK BAY AND FOX RIVER FLATS CRITICAL HABITAT AREAS MANAGEMENT PLAN. The goals and policies of the Kachemak Bay and Fox River Flats Critical Habitat Areas Management Plan dated December 1993 are adopted by reference. The plan presents management goals and policies for the critical habitat areas and their resources which the department will use in determining whether proposed activities in the critical habitat areas are compatible with the protection of fish and wildlife, their habitats, and public use of the critical habitat areas. Under 5 AAC 95.420, a special area permit is required for certain activities occurring in a designated state critical habitat area. The department will review each special area permit application for consistency with the goals and policies of the management plan adopted by reference in this section. A special area permit for the Kachemak Bay Critical Habitat Area or the Fox River Flats Critical Habitat Area will be approved, conditioned, or denied based on the criteria set out in the goals and policies in the Kachemak Bay and Fox River Flats Critical Habitat Areas Management Plan, and on the standards contained elsewhere in 5 AAC 95. (Eff. 4/9/94, Register 130).

Authority:	AS 16.05.020	AS 16.20.520
	AS 16.05.050	AS 16.20.530
	AS 16.05.251	AS 16.20.580
	AS 16.05.255	AS 16.20.590
	AS 16.20.500	

Editor's Notes - A copy of the Kachemak Bay and Fox River Flats Critical Habitat Areas Management Plan dated December 1993 is available at the Alaska Department of Fish and Game, Habitat and Restoration Division, 333 Raspberry Road, Anchorage, AK 99518-1599. Included in this management plan is a copy of the state water quality standards, 18 AAC 70, as amended as of 1/7/87.

IMPLEMENTATION

The Kachemak Bay and Fox River Flats Critical Habitat Areas Management Plan will be implemented by the Alaska Department of Fish and Game through its day to day on-the-ground management activities, through its annual budgeting process, and through Special Area Permits issued for land use activities within the critical habitat areas.

Special Area Permits. A Special Area Permit is required for any habitat altering activity, including construction work, in the Kachemak Bay or Fox River Flats Critical Habitat Areas. A Special Area Permit application form can be obtained from any Alaska Department of Fish and Game office and should be submitted to the Habitat and Restoration Division's regional office in Anchorage (5 AAC 95).

Kachemak Bay State Park. Continue to coordinate management of portions of the Kachemak Bay Critical Habitat Area which are also established as Kachemak Bay State Park with Division of Parks and Outdoor Recreation (DPOR) through cooperative agreement. Work with DPOR to acquire key upland access points as time and funding permit.

Information/Education. Department staff should seek assistance from both public and private groups to develop an information/ education program for the critical habitat areas which will inform the public about resource values, rules and recreational opportunities.

Mooring Buoys, Running Lines. Maintain a list and map of mooring buoys and running lines in Kachemak Bay, as sent in by owners for reference when authorizing other uses in the bay.

Water Quality Monitoring. Work with federal, state and local agencies to establish water quality monitoring programs at strategic points around Kachemak Bay to determine if there is a water quality problem. If water quality problems are discovered, work with the appropriate parties to resolve the concerns.

Historical/Archaeological Sites. Avoid conflicts with historical and archaeological sites when approving new uses and activities in the critical habitat areas by contacting the State Historic Preservation Office when reviewing proposals for new projects.

Range Management Plans for Grazing Leases. Work with the Soil Conservation Service and Department of Natural Resources to develop range management plans for grazing leases which will maintain critical habitat area values on Fox River Flats.

Aquatic Farm Monitoring. Work with representatives from other permitting agencies to develop criteria for evaluating effects of existing aquatic farms on fish and wildlife habitat, fish and wildlife populations, and public use of the Kachemak Bay Critical Habitat Area for use in conducting an evaluation of existing aquatic farms as outlined in the aquatic farming policy and for consideration of the option of establishing acreage and farm number limits in Kachemak Bay in the future.

Other Agencies' Actions. This document will also be used by other state, federal and local decision

makers in making management decisions for the critical habitat areas under their respective statutory authority.

APPENDIX

KACHEMAK BAY AND FOX RIVER FLATS
CRITICAL HABITAT AREAS
RESOURCE INVENTORY

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INTRODUCTION

Kachemak Bay Critical Habitat Area was established in 1974 and Fox River Flats Critical Habitat Area was established in 1972 by the Alaska Legislature to protect and preserve habitat areas especially crucial to the perpetuation of fish and wildlife and to restrict all other uses not compatible with that primary purpose.

AREA DESCRIPTION

Kachemak Bay Critical Habitat Area includes the tide and submerged lands of Kachemak Bay east of a line drawn from Anchor Point to Point Pogibshi and is approximately 222,000 acres in size. Fox River Flats Critical Habitat Area encompasses approximately 7100 acres of wetlands and tideflats at the head of the bay. There is overlap between the two areas. Both state land and private land are included in the critical habitat areas but municipal (City of Homer and City of Seldovia tidelands) and federal lands are not under critical habitat area authority.

Kachemak Bay is an elongated embayment about 39 miles long and about 24 miles wide at its entrance between Anchor Point and Point Pogibshi. Midway, the Homer Spit projects four miles out into the bay, dividing it into an "inner" and "outer" bay. Kachemak Bay is bordered on the north by the rolling hills and bluffs of the Kenai lowlands and on the south by the Kenai Mountains.

The northern shore consists of shallow mud flats, interspersed with rocks and boulders, backed by cliffs of sand and clay. The maximum elevation is at Bluff Point (759 feet). The southern shoreline, bordering the deeper side of the Bay, consists of mountainous glacially eroded hardrock indented by many sheltered passages and deep bays.

Several islands, including Herring Island, Hesketh Island, Yukon Island, Cohen Island, Sixty foot rock, Gull Island, Bear Island, and Chugachik Island, are found along the south shore. The head of Kachemak Bay is characterized by the extensive tidal flats, braided drainages and marshlands of Fox River Flats.

Eleven major glacier rivers and streams and ten minor nonglacial streams discharge into Kachemak Bay along the southern shore, whereas the northern coast has only eight small nonglacial streams of limited drainage discharging into the inner Bay. (Trasky et al. 1977).

HISTORY

Over time, the bay and its shorelands have provided a productive home to several different peoples. The archaeological record indicates Pacific Eskimos as original residents followed by coast Denaina. Russian and Aleut influence arrived in the mid-1800s and American explorers and investors quickly followed in the 1880s and 1890s.

"A History of Kachemak Bay the Country, the Communities" published by the Homer Society of

Natural History (Klein 1987) provides an excellent history of the bay, the flats and the people and their activities. Also provided in the book is a history of place names of the area.

PHYSICAL ENVIRONMENT

Climate

The climate of Kachemak Bay and its shorelands, is moderated by the maritime influence of the North Gulf waters. Average winter temperatures in Homer range from 11°F to 42°F while summer temperatures average 42°F to 59°F. The relatively low annual precipitation in Homer, (28 inches including 101 inches of snow), is the result of the Kenai Mountains' rain shadow effect.

Geology

Kachemak Bay and its sub-bays, including Tutka Bay and Sadie Cove, are the product of repeated glaciation. Remnants of those glaciers are still present in the form of Grewingk, Dixon, and Portlock glaciers as well as Wosnesenski and Doroghin glaciers and the Harding Icefield. The most notable seismic event in recent history was the 1964 Earthquake, as a result of which the entire area including Homer Spit, Fox River Flats, and the Seldovia waterfront subsided. Volcanoes on the west side of Cook Inlet have periodically erupted, depositing layers of ash over the area as well.

One of the most unusual geologic features of Kachemak Bay is the Homer Spit, extending over four miles into the bay. Whether created as a result of longshore currents depositing sands and gravels, representing the remains of a terminal moraine, or the product of a combination of both of these forces, it is by far the largest spit in the bay. Other smaller spits can be found along the south side of the bay. At the head of the bay, Fox River Flats is a typical deltaic plain built by sedimentary deposition from the Fox, Sheep and Bradley rivers.

Oceanography (excerpted from Trasky et al. 1977)

Kachemak Bay is comparatively shallow, averaging only 25 fathoms in depth. The bottom of the Bay is gently sloping and relatively flat with the exception of a 30-40 fathom trench which runs along the south-central side. The deepest part of the Bay is a 96 fathom depression located north of Cohen Island at the entrance to the inner Bay.

The dominant water movement in Kachemak Bay is the oscillatory flood and ebb of the tide. The net circulation (independent of, but largely driven by, the tidal currents) in the outer bay is characterized by an influx of clear ocean water from the Gulf of Alaska on the south side of the bay and a corresponding outflow of water on the north side of the bay. This general northward flow is interrupted in the central region of the outer bay by two semipermanent gyres.

Inner Kachemak Bay is a positive estuary wherein precipitation and runoff exceed evaporation. There is a net outflow of low salinity surface water from the inner bay past the tip of Homer Spit

and into the outer bay.

Tides in Kachemak Bay and Lower Cook Inlet are semi-diurnal with a significant inequality between successive low waters. This means there are two high tides within a lunar (24 hour 50 minute) day, one of which will generally exceed the other by several feet. The same is true for low tides. The mean diurnal range in Kachemak Bay is 15.4 feet at Seldovia. Highest tides exceed 22.5 feet and the lowest tides are about -6.0 feet.

Although fast ice has extended up to three miles off the northern shore of inner Kachemak Bay in severe winters, ice seldom forms in the outer Bay because of the moderating influence of the Gulf of Alaska. During severe winters, icing problems occur in the Homer Spit area.

Although fed in part by glacial streams, outer Kachemak Bay waters are generally quite clear with only a very low suspended sediment load. Suspended sediment concentrations in inner Kachemak Bay are normally higher than in the outer bay, particularly in spring and summer, due to glacial and river runoff near the head of the bay. The relatively fresh, silt-laden waters are carried out of the inner bay along the northwest shore, are then discharged into the outer bay, and are subsequently carried northwest along the northern shore of the outer bay. Eroding bluffs along the north side of the inner and outer bay contribute additional sediments.

Surface water temperatures in the bay range between a high of 55°F in the summer and an extreme low of 28°F in the winter. In April, bottom temperatures (at 33 fathoms) ranging from 37°F to 39°F have been observed.

Available data indicate salinities in outer and inner Kachemak Bay average approximately 30-32 ppt during spring, summer and fall. Seasonal freshwater runoff reduces salinities, particularly surface salinities in the inner bay and northern bay. Oxygen levels measured in the bay were 8.06 ppm at the surface and 6.7 ppm at the bottom.

Circulation (excerpted from Trasky et al. 1977)

Circulation in outer Kachemak Bay is dominated by two large gyres, a counterclockwise (CCW) rotating gyre in the eastern half and a clockwise (CW) rotating gyre in the western half. The two-gyre system appears relatively stable unless altered by strong winds. Net transport in outer Kachemak Bay is generally northward whether or not the gyres are present (Figure 1).

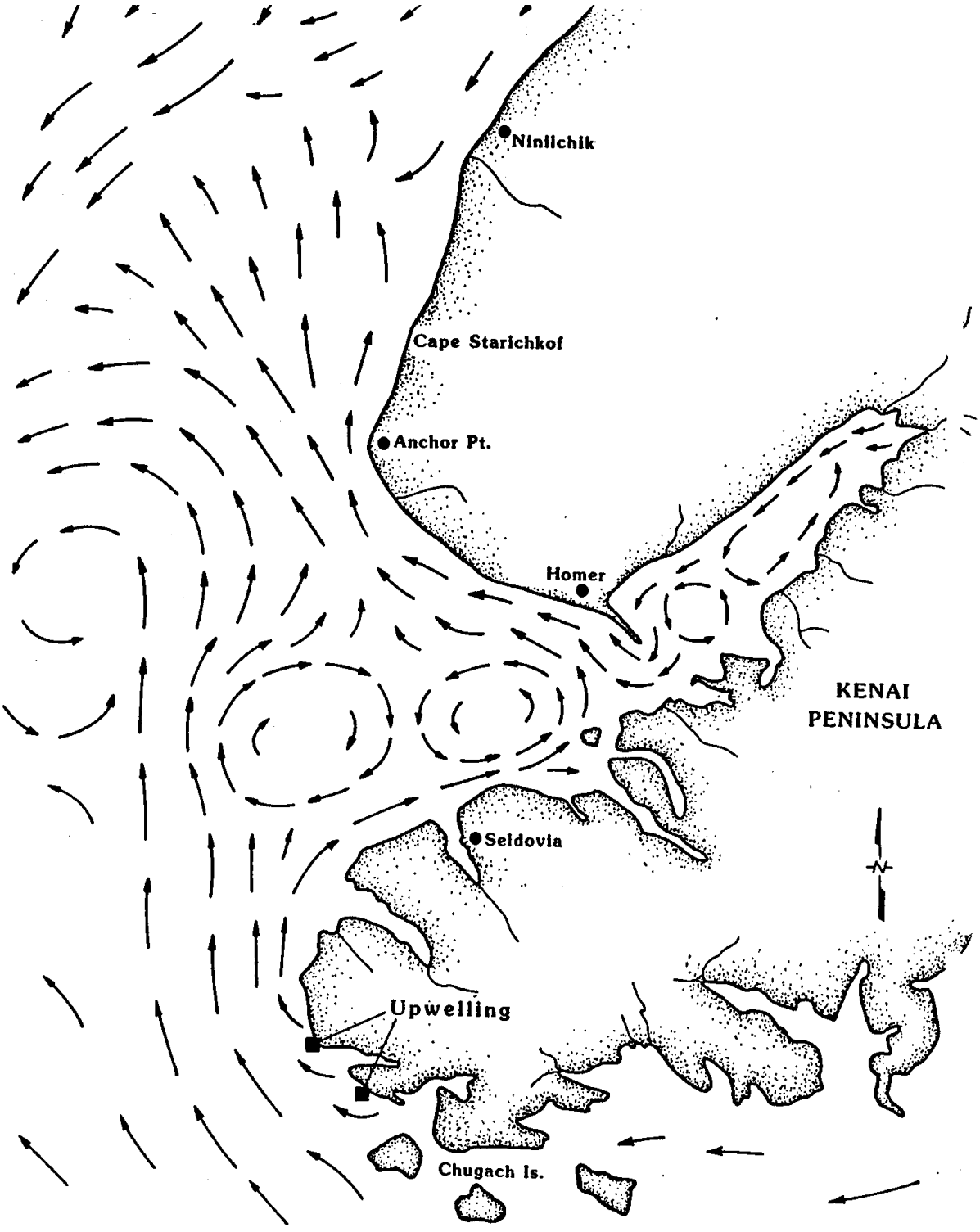

Figure 1. Circulation Patterns of Kachemak Bay. Taken from: Trasky et al., 1977. "Environmental Studies of Kachemak Bay and Lower Cook Inlet" Vol. III Circulation Studies in Kachemak Bay and Lower Cook Inlet.

Variation in the tidal range causes a variation in the size and shape of the two-gyre system, and extreme tidal ranges may cause enlargement of the CW gyre with concomitant diminution or destruction of the CCW gyre. Increase in the tidal range, accompanied by increasing tidal current velocities, tends to increase net northward transport of surface waters throughout the outer bay.

Surface waters in outer Kachemak Bay are apparently derived largely from coastal upwelling (divergence) northwest of the Chugach Islands. This may significantly increase available nutrient concentrations and greatly enhance biological productivity in outer Kachemak Bay.

Water in the gyres has a typical residence time of roughly 1-2 weeks, although longer residence times are possible. Northward flowing seawater is incorporated into the gyres along their southern periphery while a loss of water is incurred along the northern periphery of the gyres.

Intrusion of seawater into Kachemak Bay occurs primarily along the southeastern shore. Near the entrance to the inner bay the flow turns north, normally (during periods of high freshwater runoff) bypassing the inner bay. Strong surface outflow from the inner bay (during spring and summer) also turns north and flows along the northeast shore of the outer bay.

Major changes in the Kachemak Bay circulation pattern are comparatively infrequent during the more quiescent spring and summer months, specifically May to August. Beginning in late summer (September) and continuing through winter, strong seasonal storms tend to frequently alter this circulation. Indirect evidence suggests that east or southeastward surface transport from central Lower Cook Inlet into outer Kachemak Bay can occur, however, the oceanographic or meteorologic conditions required to induce such transport are not known.

Surface and subsurface (100 feet depth) circulation is generally similar unless the surface currents are altered by persistent strong winds in either Kachemak Bay or Lower Cook Inlet. In such cases, subsurface compensatory currents which differ markedly from the surface currents have developed.

Inner Kachemak Bay is a positive, partially mixed estuary wherein freshwater input (from rivers and precipitation) is greater than evaporation, and tidal currents cause considerable vertical mixing. The horizontal circulation is characterized by CCW rotating gyres. The northeastern gyre is elongated whereas the southwestern gyre is fairly symmetrical.

Fresh water, introduced primarily by the Fox, Bradley, and Martin rivers and Sheep Creek at the head of the bay, flows out of the bay along the northwest shore. A significant amount of this outflow is diverted offshore in the region where the two gyres meet. The gyre movements and horizontal mixing processes tend to distribute the fresh water layer throughout the inner bay.

Vertical and horizontal mixing processes increase the salinity of the surface water outflow near the mouth of the bay and greatly increase the volume of the surface water outflow from the inner bay. Surface outflow into the outer bay occurs across the entire entrance to the inner bay; subsequent transport is northwest along the northeast shore of the outer bay. The intensity of the surface

outflow from the inner bay is probably greatly diminished during fall and winter when river runoff is low.

Seawater intrusion into the inner bay apparently occurs primarily below 100 feet in the vicinity of the entrance. Vertical mixing occurs throughout the water column within the inner bay.

BIOLOGICAL RESOURCES

Freshwater Wetlands and Upland Vegetation

Coastal wetlands are scarce in Kachemak Bay, as they are throughout much of southcentral Alaska. Much of the coastline is dominated by mountainous fjords or steep, eroding bluffs. The high tidal ranges of this region provide little wetland habitat except near the mouths of large rivers. Fox River Flats is the largest coastal wetland in Kachemak Bay.

Wetlands vegetation has been identified in several salt marshes in Kachemak Bay. The vegetation of Fox River Flats and adjacent areas was mapped by ENTRIX and Stone & Webster (1985) (Figure 2). Batten et al. (1978) and Krasnow and Halpin (1981) also described the wetland vegetation of the Flats. Most of the Fox River Flats CHA is saltwater herbaceous sedges and unvegetated mud flats (Map 1). In the upper intertidal zone the dominant plant is Ramenski sedge (Carex ramenskii), with Lyngbye sedge (C. lyngbyaei) abundant around the marsh fringes, sloughs, and shallow drainageways. Puccinellia grandis is dominant in more seaward sites. Large and small ponds are numerous near the upper edge of the intertidal zone. Pond water is silty and fresh, although salinities up to 5% have been measured (Batten et al. 1978). Aquatic vegetation in the ponds is primarily Potamogeton spp., Zannichellia, and Hippuris. The coastal marsh grades into a grassland dominated by Calamagrostis canadensis or an inner marsh in which Carex pluriflora and other sedges, grasses, and forbs are common (Batten et al. 1978).

China Poot Bay is the second largest salt marsh in Kachemak Bay, with over 600 acres (Crow and Koppen 1977). Twenty-one species of flowering plants have been identified in the bay, a relatively low diversity compared to other salt marshes (Crow 1977). An alkali grass (Puccinellia hultenii), along with several succulent species (Fucus spp., Plantago maritima, arrowgrass (Triglochin maritimum), Spergularia canadensis, and Suaeda depressa), dominate plant communities in most of the marsh. These communities depend on frequent, if not daily, tidal inundation. Freshwater influence in the back of the marsh allow sedges such as Carex lyngbyaei and C. pluriflora to dominate. A strip of dead trees, killed when the marsh subsided during the 1964 earthquake, forms an approximate boundary between the Puccinellia complexes and sedge meadows. Well-drained sites in the marsh support Elymus mollis and Potentilla anserina. The Elymus/Potentilla community has the highest productivity in China Poot Bay (661 g/m^2 dry weight). In comparison, the Puccinellia communities with moderate to high plant cover ranged from 239-388 g/m^2 dry weight and those with low plant cover ranged from 48-108 g/m^2. Productivity values over 200 g/m^2 are considered high, and much of the litter and detritus

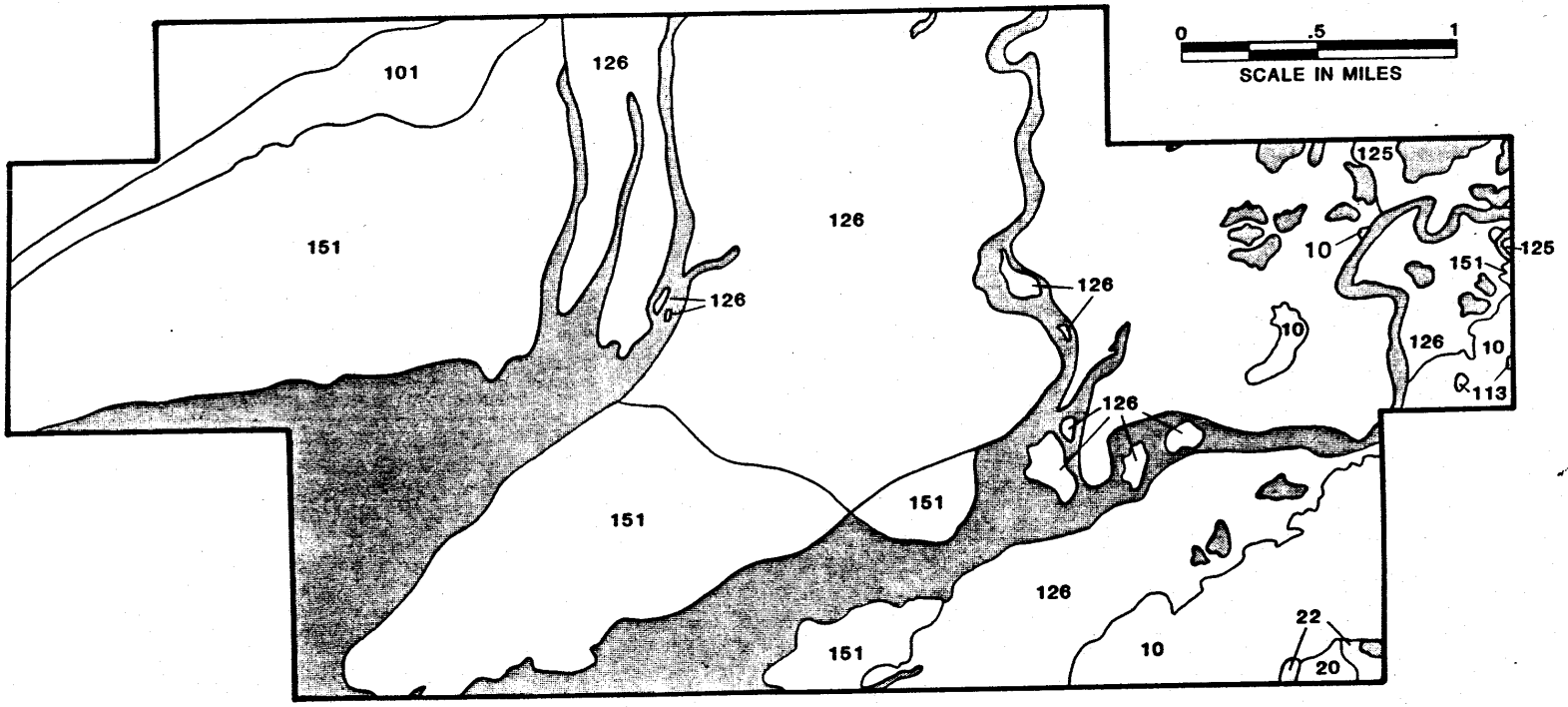

FIG. 2. FOX RIVER FLATS VEGETATION MAP

CODE	VEGETATION TYPE
10	Closed Coniferous Forest
20	Open Coniferous Forest
22	Open Coniferous Forest/Tall Alder
113	Low Shrub Bog

CODE	VEGETATION TYPE
125	Fresh Water Herbaceous Sedge Grass
126	Saltwater Herbaceous Sedge Grass
151	Tidal River or Stream/Floodplain

Taken from: ENTRIX, Inc. and Stone and Webster, 1985, "Bradley Lake Hydroelectric Project Terrestrial Impact Assessment Report".

from these marsh communities is flushed into the bay, which contributes to the productivity of the marine environment.

Vegetation of the small salt marshes at the base of Homer Spit is mainly Lyngbye sedge and arrowgrass (Triglochin maritimum), with alkali grass at the lower tidal levels (Lees et al. 1981, Jorgenson and Berg 1987).

Upland vegetation of the lower Fox River valley is described in detail in the Bradley Lake Hydroelectric Project habitat evaluation procedures report (Rappaport et al.). There is no upland vegetation in the Kachemak Bay Critical Habitat Area and only a limited acreage of shrubs and other upland vegetation is found within the Fox River Flats Critical Habitat Area.

Marine Plants and Invertebrates

Kachemak Bay is the most productive marine ecosystem in Cook Inlet. Total primary productivity (including that of phytoplankton) appears to be three times higher than elsewhere in lower Cook Inlet (Lees et al. 1980). Turbidity limits growth of macrophytes in the upper inlet, while a combination of low temperatures and scouring ice inhibits and kills marine plant and animal life along most of the west side of the inlet (Lees et al. 1980).

Sanger and Jones (1984) summarized the ecological value of marine macrophytes as the base of many of the food webs in Kachemak Bay as follows:

1. Stocks of kelp in Kachemak Bay and around the southern end of the Kenai Peninsula grow intensively in spring and summer, when phytoplankton in the area also blooms intensively.

2. Fecal pellets from zooplankton (Larrance and Chester 1979) and the abrasion and seasonal die-off of kelp both produce organic detritus.

3. Currents carry the kelp detritus from the southern end of the Kenai Peninsula into Kachemak Bay.

4. Bacteria colonize the detritus at some point.

5. The microbially-enriched detritus supports a rich community of deposit- and filter-feeding demersel and benthic fauna, probably by means of one or two trophic links (micro-and meiofauna).

6. The deposit- and filter-feeding animals, in turn, support marine birds and other apex predators.

Species composition and community structure in Kachemak Bay are determined largely by three

prevalent seabottom types: rocks, sand, and mud. Species composition, zonation, seasonal patterns, trophic structure, production rates, and energy pathways have been described in detail by Rosenthal and Lees (1976) and Lees et al. (1980). Scientific names for many of the plants and animals mentioned below are in Lees et al. (1980).

Rocky Substrates - Rocky habitats support the most diverse plant and animal communities. Algae are well-developed and moderately productive from the mid-intertidal zone to a depth of about 66 feet. Rockweed (Fucus gardneri) is most abundant at upper intertidal levels. Red algae (Rhodymenia spp., Palmeri spp.) is most abundant in disturbed or stressed areas, usually from medium to low intertidal levels. Kelps, such as Laminaria and Alaria predominate at low intertidal levels, with Nereocystis and Agarum at subtidal levels. The largest and most conspicuous kelp bed in the Kachemak Bay CHA lies between Seldovia Point and Barabara Point (Lees et al. 1980). Subtidal organisms of the northern shelf of outer Kachemak Bay are described by Lees (1977).

In rocky habitats, invertebrates are most abundant and diverse where currents are high (e.g., Jakolof Bay and along the northern shelf of Kachemak Bay) and least abundant and diverse in slow currents (e.g. large kelp beds). Invertebrates were most abundant and diverse below the seaweed zone. Macrophyte and invertebrate biomass peak in summer. The most abundant grazing invertebrates are a periwinkle (Littorina sitkana) and pulmonate snail (Siphonaria thersites) in the upper intertidal zone, chitons (Katharina tunicata and Schizoplax insignis) in the mid-intertidal zone, and chitons (Mopalia spp. and Tonicella lineata) and a sea urchin (Strongylocentrotus droebachiensis) in the low intertidal zone (Lees et al. 1980). Limpets are abundant at all intertidal levels. The most abundant suspension-feeding invertebrates are barnacles (Balanus glandula and Semibalanus balanoides) and the blue mussel (Mytilus edulis) in the upper intertidal zone and the thatched barnacle (B. cariosus) and a sponge (Halichondria panicea) in the mid and lower intertidal zone. The most abundant predatory invertebrates on barnacles and mussels in the upper intertidal zone is a snail (Nucella emarginata). A related snail (N. lamellosa) and a sea star (Leptasterias hexactis) are common predators in the mid-intertidal zone, and other sea stars (Evasterias troschelii and L. polaris) are common in the lower intertidal zone. Jakolof Bay supports the most robust subtidal macroinvertebrate communities known in southcentral Alaska (Lees et al. 1980). The main herbivore is a sea urchin (S. droebachiensis) whose density in shallow water under a surface canopy of kelp often exceeds $19/ft^2$. The subtidal macroinvertebrate communities on the rocky shelf from Anchor Point to Archimandritof Shoals also have very high diversity and density. Most of the macroinvertebrates are sedentary filter feeders, such as clams. Grazers, such as Tonicella and the sea urchin (S. droebachiensis), are abundant. Overgrazing by sea urchins may contribute to the poorly developed algal stocks in this area. Abundant predatory macroinvertebrates on this shelf are mostly sea stars, snails, crabs, and hermit crabs (Pagurus).

Sand and Mud Substrates - Macrophytes are uncommon or absent on sand and mud substrates. Detritus, mostly plant material carried by currents from rocky habitats in Kennedy Entrance and southern Kachemak Bay, forms the base of the food web in outer Kachemak Bay (Lees et al. 1980). Invertebrate predators are scarce, so much of the invertebrate biomass is consumed by fish, birds, and marine mammals.

Invertebrate abundance in sand and mud substrates is strongly influenced by seasonal conditions, and dominance patterns are influenced by tidal exposure. Polychaete worms and amphipods are most abundant in summer, and clams in spring. Most invertebrates in sand and mud substrates are deposit or suspension feeders. Most abundant in sand beaches are gammarid amphipods and polychaete worms. On Homer Spit, polychaetes (dominated by Scolelepis) comprise 81.5-98% of the total infauna biomass (Lees et al. 1980). Lees et al. (1981) and Lees (1977) provide detailed species lists of invertebrates of Mud Bay, both sides of Homer Spit, Bishops Beach in Homer, and Bluff Point. In lower Cook Inlet mud flats, clams (e.g., Mya spp. and Macoma balthica) and an echiurid worm (Echiurus) are most abundant. In Mud Bay, at the base of Homer Spit, are large numbers of Macoma balthica, numerous small crustaceans (e.g., harpacticoid copepods and mysids), and numerous marine worms (Lees et al. 1981). Many species are more abundant at lower tidal levels; however, species composition does not appear to be affected by tide stage (Dames & Moore 1978).

Mud flats have greater species richness, biomass, and numbers of perennial species than sand beaches and, consequently, attract the most shorebirds and ducks (Dames & Moore 1978). Eelgrass (Zostera) is also an important habitat for birds. Eelgrass beds occur in Seldovia, Jakolof, Kasitsna, and Mud bays (Lees 1977). Patches of eelgrass occur along the northern shoreline between Mud Bay and McNeil Canyon (Dave Erikson, pers. commun.).

The lower intertidal and subtidal plant and animal communities of upper Kachemak Bay north of Martin River seem to be low in diversity. High turbidity of freshwater flowing out of the delta is a limiting factor. Near Chugachik Island the bay becomes less turbid and diversity increases (USACE 1982).

Fish and Shellfish

The historical abundance and diversity of fish and shellfish in Kachemak Bay are the product of a nutrient rich environment which provides critical habitat for numerous species during various life phases.

Salmon - There are twenty-five documented anadromous fish streams flowing into Kachemak Bay. Eight of these are considered to be major salmon producers. Five species of Pacific salmon are found in the marine environment. They are king salmon (Onchorhynchus tshawytcha); sockeye salmon (O. nerka); coho salmon (O. kisutch); pink salmon (O. gorbuscha); and chum salmon (O. keta). Adult salmon are found in marine waters from late April to late September and in fresh waters from late May to late November. Pink salmon are the most abundant followed by chum, sockeye, silver, and king salmon. Escapement estimates of pink salmon in the five top-producing streams flowing into Kachemak Bay range from a low of 1,000 in Barabara Creek in 1984 to a high of 115,000 in Humpy Creek in 1981. Estimated chum salmon escapement in the two top-producing streams in Kachemak Bay, Tutka Creek and Seldovia River, are much smaller, ranging from 300 in Seldovia River in 1980 to 1,300 in Tutka Creek in 1982. There are few naturally occurring runs of sockeye salmon in Kachemak Bay. Adult sockeye salmon from Leisure and Hazel lakes' planted stocks return to the China Poot Bay area annually, and planted cohoes, pinks, and kings return to Homer Spit.

Salmon enhancement activities in Kachemak Bay have also included stocking of coho salmon in Seldovia Lake and release of kings in Seldovia harbor, release of king salmon in Halibut Cove Lagoon by F.R.E.D. Division and now release of pinks by Cook Inlet Aquaculture Association from the Tutka Bay Hatchery. The Tutka Bay Hatchery has pinks returning to it as well. F.R.E.D. Division plants coho salmon in Caribou Lake at the head of the bay, creating a dip net fishery in Fox Creek. Bear Cove is a possible future salmon release site.

Nearshore waters in Seldovia Bay serve as a rearing area for pink, coho and king juvenile salmon. Pink and chum fry rear in Tutka Bay for most of the summer. Pink fry and sockeye smolt rear in China Poot Bay in late spring and summer. Pink fry rear in Halibut Cove Lagoon in early summer.

Many areas of Kachemak Bay support "feeder" king salmon populations. These immature salmon utilize Kachemak Bay waters for rearing areas, feeding on Pacific sand lance, herring, smelt, and shrimp throughout the entire year.

Eulachon - Eulachon (Thaleichtys pacificus), more commonly called "hooligan," are found in the waters of Cook Inlet where they are an important prey species for larger marine fish, salmon, and marine mammals.

Marine fish - Adult Pacific herring (Clupea harengus) are known to winter in offshore feeding grounds and in the spring move in to sheltered bays to spawn. Great schools of Pacific herring were once very abundant and supported a large industry, returning to Kachemak Bay each spring to

spawn along rocky coasts. Halibut Cove once supported large herring populations and many of their predators such as seal and sea lion. Pacific herring are still observed to spawn in Mallard Bay, Tutka Bay, Bear Cove, along the Homer Spit and along Glacier Spit in reduced numbers. Major herring spawning areas in the bay are Mud Bay, Bear Cove, Mallard Bay and Tutka Bay. Herring spawn in the intertidal zone in late April through early June. Larvae hatch two weeks later and feed in the bay throughout the summer. In mid-September they metamorphose into juvenile herring.

Pacific halibut (Hippoglossus stenolepis) are found throughout the bay, moving into shallower waters towards the end of summer to feed. In the winter adult halibut move offshore to spawn.

Capelin (Mallotus villosus) spawn in the intertidal zone from late May through mid-July. Eggs are deposited in sand and small gravel. They hatch two weeks later and remain larval through the winter.

Flounders, walleye pollack (Theragra chalcogramma) and Pacific cod (Gadus macrocephalus) are found in the Bay but their distributions are not well documented. Small Pacific cod have been frequently caught in the bay, leading to speculation that Kachemak Bay is a rearing area for cod.

Kelp beds along the outer southern shores of Kachemak Bay near Seldovia are home to significant numbers of rockfish (Sebastes).

Crab - Dungeness crab (Cancer magister) inhabit the bay from the intertidal zone to depths of 45 fathoms. Preferred substrate is sand or mud bottom and younger, smaller crabs are usually associated with stands of eelgrass or attached algae. Dungeness crab are found throughout Kachemak Bay south of Anchor Point with adults found in the shallow, nearshore waters along the north shore of both inner and outer Kachemak Bay. Younger, smaller crabs are more abundant in inner Kachemak Bay especially in some of the shallower intertidal areas along the southern shore. China Poot Bay is known to be an important rearing area for juvenile dungeness crab. Tag data are inconclusive; however, migration of Dungeness crabs within Kachemak Bay appears to be somewhat limited (ADF&G 1985).

Although population numbers are currently depressed, king crab (Paralithodes camtschatica) have historically been common south of Anchor Point and appear to favor mud or sand bottom with accumulations of organic debris out to depths of 180 fathoms (ADF&G 1985).

The inshore migration of Kachemak Bay king crab begins in late December, peaks in early March, and extends through May. Migration of females may be slightly later (February to May). Mating and release of larvae occur in the nearshore areas (ADF&G 1985).

Historically, large numbers of king crab spawned in outer Kachemak Bay. In Kachemak Bay, spawning begins in February, peaks in April, and continues through May. Offshore winter migration begins in August and continues through November.

King crab larvae are abundant in outer Kachemak Bay. The larvae, after being released by the female, remain planktonic, drifting with the tides and currents for 40 to 60 days before settling to the bottom. A distribution study of king crab larvae in Kachemak Bay indicated that outer Kachemak Bay was a major release area because of the high abundance of larvae in this area (Haynes 1983). Larvae appeared in other parts of Kachemak Bay, but they were less abundant. After two months in the planktonic stage, the larvae settle.

Outer Kachemak Bay between Anchor Point and Bluff Point is a major spawning and settling area for king crab (ADF&G 1985). Studies have shown concentrations of newly settled crabs between Diamond Gulch and Mutnaia Gulch and to a lesser extent Peterson Point, Glacier Spit and Eldred Passage (Trasky et al. 1977). These same studies indicate post larval king crab live on hard substrate coarser than gravel and may be associated with certain types of epifaunal cover. Juvenile king crab have, in the past, been quite abundant in shallow water. However, populations of king crab in the bay have declined precipitously since 1975. Juvenile king crab pods have also been observed in Halibut Cove.

Young crab that have settled to the seabed begin their existence as solitary individuals living under rocks and debris. In their second and third year of life, king crab begin to congregate and move actively. After reaching maturity in five to seven years, crab are believed to extend their range and begin an annual cycle of movements typical of the adult.

Tanner crab (Chionocetes bairdi) can be found anywhere between the intertidal zone and 225 fathoms depth but usually are found in deeper water in the fall and winter and in shallower water for mating and spawning in spring and summer. Tanner crab larvae are abundant in outer Kachemak Bay from late May through mid June between Anchor Point and Homer Spit (ADF&G 1985). Tanner crab are known to rear in Kachemak Bay waters east of Homer Spit (Al Kimker, pers. commun.).

Shrimp - Pandalid shrimp including pink (Pandalus borealis); humpy (P. goniurus); coonstripe (P. hypsinotus); spot (P. platyceros); and sidestripe (Pandalopsis dispar); have historically occurred in major concentrations in Kachemak Bay. Although shrimp are distributed throughout the bay they are mainly found in waters deeper than 9 fathoms. A migrational movement within Kachemak Bay has been documented with shrimp moving into a deep gut which runs irregularly from east of Homer Spit to Seldovia, and they have been found in the "deep hole" off Yukon Island in February and March where they remain until March and April. At that time, females drop their eggs and disperse through the bay. The most abundant species is the pink shrimp. Sidestripe shrimp also inhabit portions of the gut throughout the year (Al Kimker, pers. commun.). Humpy shrimp appear to be periodically present in the bay in larger numbers in the fall and spot shrimp are found in nearshore waters along rocky substrate. Shrimp populations in the bay have greatly declined in recent years (ADF&G 1985).

Clams and Mussels - Razor clams (Siliqua patula and alta), redneck or surf clams (Spisula polynyma), soft-shelled clams (Mya spp), littleneck clams (Protothaca staminea), butter clams

(Saxidomus gigantus), gaper clams (Tresus capax), blue mussels (Mytilis edulis), and cockles (Clinocardium nuttallii) are found in abundance in Kachemak Bay. Razor clams (first described in 1788 from specimens found near Mud Bay) are found intertidally from four feet above mean low water level down to several fathoms depth on surf swept and somewhat protected beaches of the open ocean. Minor razor clam concentrations are found from Anchor Point to Homer Spit and on McDonald Spit in Kasitsna Bay. Razor clams spawn when water temperatures reach 55°F, usually in July. Free swimming larvae settle out on beaches after five to sixteen weeks. Butter clams favor a mixed gravel-sand-mud beach, spawning occurs at 68°F. Larvae settle out after 20-30 days. Littleneck clams can be found in the lower intertidal region on protected gravel beaches. Cockles are found both in intertidal areas and deeper waters, prefer a mixed sand-mud bottom, and are often found in eelgrass beds. Surf clams are found on more exposed high energy portions of the coast. Kachemak Bay has a substantial population of soft-shelled clams. Soft-shelled clams are usually found in areas of mixed sand and mud or mud and gravel where salinity is reduced by an influx of fresh water. Blue mussels are found attached to rocky substrate on both exposed and protected coasts from the upper intertidal area down to as deep as 90 fathoms, but are usually found in intertidal and subtidal nearshore waters. Horse mussels (Modiolus modiolus) occur in thick beds subtidally along Archimandritof Shoals.

Birds

Two hundred thirty-one species of birds have been identified on and around Kachemak Bay (Erickson and West 1992) (Table 1).

Kachemak Bay is the most important marine bird habitat in lower Cook Inlet (Erikson 1977), and there are no comparable areas in upper Cook Inlet. During winter months over 90% of the marine birds in lower Cook Inlet are found in Kachemak Bay (Erikson 1977). Few birds inhabit the offshore waters of lower Cook Inlet in winter, and the extensive inshore ice in the upper inlet and along the western shore is avoided by most marine birds. Kachemak Bay is also important for its productive intertidal areas and nearshore, subtidal waters. The bay is also important for feeding, nesting, rearing, and migratory staging throughout the year. The inner Kachemak Bay coastline has an estimated total year-round density of 679 birds/mile^2 (Arneson 1980).

Bird distribution and abundance is summarized by Erikson (1977, 1989, and Table 1). In addition, West (1991a) recently compiled an annotated checklist of birds and suggested birding areas in the vicinity of Kachemak Bay.

The birds of Kachemak Bay and Fox River Flats have been studied more than in most parts of Alaska due to concerns over oil and gas development and the Bradley Lake Hydroelectric Project. These studies are summarized below.

Waterfowl - Sea ducks are the most abundant group of birds in Kachemak Bay (Tables 2 and 3). Dabbling ducks, geese, and swans are the most common waterfowl on the Fox River Flats. The most common ducks on the Fox River Flats are mallards and common mergansers (Krasnow and

Halpin 1981). Canada geese are the most numerous geese (Tables 4 and 5). Snow geese, white-fronted geese, and brant have also been sited in the spring.

Fox River Flats is the major spring staging area for geese and ducks in Kachemak Bay (Erikson 1977). Geese feed primarily along the southern boundary of the Fox River Flats Critical Habitat Area and on the Martin River delta (Erikson 1977). Krasnow and Halpin (1981) found geese primarily in the intertidal marsh between Swift Creek and Bradley River. Mallards congregate on the southern edge of the Martin River delta as soon as ice melts (Krasnow and Halpin 1980). At high tide in both spring and fall, up to several thousand mallards, pintails, scoters, and mergansers congregate offshore between Swift Creek and Fox River. China Poot Bay is another important staging area for ducks (Erikson 1977). Beluga Slough is one of the first areas available to early migrants (Erikson 1977). Mud Bay also attracts early spring migrants. However, neither Beluga Slough nor Mud Bay are main staging areas for migrating waterfowl.

Scoters are one of the most numerous ducks in spring and this is reflected in their predominance in prehistoric middens on Chugachik Island. Goose and swan remains were not found on Chugachik Island although they were "very plentiful" in a midden on Yukon Island (de Laguna 1975: 31, cited in Yesner 1977). Arneson (pers. commun. in Yesner 1977) hypothesized that geese avoided the inner bay in winter due to slush ice and poor food availability.

Fox River Flats is also the major waterfowl breeding area in Kachemak Bay (Erikson 1977), primarily because nesting habitat is scarce along the fjords and eroding bluffs which border most of the bay. Waterfowl production on the Flats is poor probably because much of the available nesting habitat is flooded by monthly tides of 21 or 22 feet (Timm 1977). Of all the large coastal marshes in Cook Inlet, only Chickaloon Flats has a lower density of breeding waterfowl (Timm 1977). Few, if any, Canada geese nest in the critical habitat area (Krasnow and Halpin 1981). Fox River Flats has the greatest proportion of diving to dabbling ducks among Cook Inlet marshes, probably due to the proximity of Kachemak Bay's productive marine environment (Table 6). In 1976, the density of dabbling (mostly northern pintail and green-winged teal) and diving ducks on Fox River Flats was about 26 and 20 ducks/mi^2, respectively (Timm 1976). Wigeon and green-winged teal are probably the most common nesting species in Fox River Valley (Dave Erikson, pers. commun.). Nonbreeding scoters are concentrated throughout inner Kachemak Bay in summer (Erikson 1977). Common eiders are known to nest in the China Poot Bay and Herring Island/Yukon Island areas and are found throughout the summer in the vicinity of Lancashire Rock. Common eiders used to be common nesters on spits in Kachemak Bay, but the 1964 earthquake flooded much of their nesting areas and human activity, driftwood gathering, and an increasing bald eagle population have contributed to the decline in nesting eiders (West 1992a).

During fall migration, large numbers of dabbling ducks begin arriving in Kachemak Bay in late July and early August (Erikson 1977, Lensink 1980). The primary fall staging areas are Fox River Flats (Table 7), China Poot Bay and, to a lesser extent, Mallard Bay and behind Glacier Spit. In fall, the most abundant bird species in Mud Bay are dabbling ducks (mostly mallards and pintails), surf scoters, and gulls (Lees et al. 1981)). Pintails are the most abundant fall migrants (Erikson

1977); typically by the end of August, most pintails have departed (Lensink 1980). Most sea ducks begin migrating slightly later than the dabblers. Major sea duck habitat in Kachemak Bay includes the entire shallow shelf from Homer Spit to Fox River Flats, the offshore area from Glacier Spit to Mallard Bay, between Seldovia Bay and Kasitsna Bay, and protected coves such as Halibut Cove and outer China Poot Bay. Approximately 11,000 scoters were observed along the north shore of the bay in mid-August 1976 (Erikson 1977). In fall, geese stage primarily within the Fox River Flats CHA (see map). Most white-fronted geese arrive and depart in August (Lensink 1980). The maximum number seen at any one time was 900 on the saltwater-influenced sedge flats between Sheep and Fox rivers. These wetlands contained preferred foods, such as Puccinellia phryganodes, P. hultenii, and Carex ramenskii. Canada geese arrive one or two weeks later than white-fronted geese and remain on the Flats through September (Lensink 1980).

Dabbling and sea ducks have different diets in Kachemak Bay in fall (Crow 1978). An alkali grass (Puccinellia hultenii) is important for dabbling ducks such as the mallard, northern pintail, and green-winged teal. Forbs and snails (probably Littorina) are also important for pintails, and euphausids are important for mallards. In other Cook Inlet marshes, Carex, Scirpus, Potamogeton, and Hippuris comprise most of the vegetative matter eaten by mallards and pintails in summer and fall (Timm and Sellers 1979). On the other hand, the blue mussel (Mytilus edulis) is the most important fall food for the three scoter species. Other bivalves (probably Tellina or Macoma) and euphausids are important for buffleheads. Harlequins eat blue mussels, nestling clams, snails, euphausids, and algae.

In winter, the open water and abundant food sources of Kachemak Bay become even more important to waterfowl. The upper end of Kachemak Bay supports 100,000 wintering waterfowl (Lensink 1980). A large flock of white-winged scoters, estimated to be 10,000 in 1976, is believed to overwinter in the outer bay (Erikson 1977). Large numbers of scoters and eiders, including Steller's, king, and common eiders, congregate along the coast between Anchor Point and Homer Spit, especially in the vicinity of Bluff Point in winter (G. West, pers. commun.). The most important winter foods for marine waterfowl as a group in the Gulf of Alaska include blue mussels, clams (Protothaca staminea, Spisula polynyma, Macoma spp., and Mya spp.) (Sanger 1983). During a period of heavy ice conditions, only Fox River Flats and China Poot Bay provided nearshore waterfowl habitat (Havens 1972). Over 5,000 mallards and 7,000 black, surf and white winged scoters overwinter in China Poot Bay. Flocks of Steller's eiders, mallards, and scoters traditionally use the mouth of China Poot Bay in winter. Resident mallards, large numbers of greater scaup, mew gulls, and glaucous-winged gulls are the most abundant birds wintering in Mud Bay. Almost twice as many mallards use Mud Bay in winter than in fall (Lees et al. 1981).

Oldsquaw ducks and white-winged scoters are common overwintering diving ducks in Kachemak Bay. Oldsquaws are found mainly in the northern inner bay over mud-sand substrates, feeding even in moderate amounts of pan and brash ice that build up behind Homer Spit. They have extremely diverse diets (minimum of 61 prey species). The single-most dominant prey item is Pacific sandlance; about 40% of the total prey volume, including sandlances, is buried in the substrate (Sanger and Jones 1984). White-winged scoters feed almost exclusively in areas with

shell debris and boulder-cobble substrates, found along the northern outer bay. Their diets are also diverse. The two major prey species are common Pacific littleneck clams (Protothaca staminea) and blue mussels (Sanger and Jones 1984).

Trumpeter swans are common on the Fox River Flats, primarily near the confluence of Bradley River and Sheep Creek, during spring and fall migration (ENTRIX and Stone & Webster 1985). Swans begin to stage in the Fox River Valley in mid-August. Densities during spring and fall average 2.6 swans/mi^2. Swans are only occasionally observed in summer and winter. The only area where nesting has been observed is on a pond near Clearwater Slough (Lensink 1980, Krasnow 1981).

Shorebirds - A brief pulse of millions of migrating shorebirds each spring provides Kachemak Bay with its largest influx of shorebirds. Several sites in Kachemak Bay provide critical rest stops for migrating shorebirds. Fox River Flats attracts the most migrating shorebirds; over 600,000 (mostly western sandpipers) were counted on May 6, 1977 (Senner et al. 1981). Krasnow and Halpin (1981) estimated an average daily density of 10,207 western sandpipers/$mile^2$ in the Fox Farm area between May 1-15. An estimated 1-2 million small shorebirds were observed on an aerial survey of the Fox River Flats on May 11, 1976 (Table 4). Ten of fifteen western sandpipers collected at Fox River Flats had eaten Macoma balthica; total numbers of this clam accounted for 30% of the birds' diet (Senner and West 1978). Similar large numbers of shorebirds have not been reported in recent years, although survey data is lacking.

Mud Bay, at the base of Homer Spit, appears to be the second-most used shorebird habitat in Kachemak Bay, primarily by western sandpipers, during late spring and fall (Table 8). Shorebird numbers peak from late April through May (Erikson 1977). Over 25,000 were counted in Mud Bay on May 6, 1977 (Senner et al. 1981). In late April-early May 1991, over 96% of the 53,700-74,338 shorebirds observed in Mud Bay were western sandpipers (North 1991). This is a significant proportion of the world population (Senner et al. 1981).

Thirty-one species of shorebirds have been seen in Kachemak Bay including significant numbers of bristle-thighed curlew and sharp-tailed sandpiper. Thousands of red-necked phalarope can be seen in Kachemak Bay each spring, early summer, and fall (G. West, pers. commun.).

Extensive mudflats in Kachemak Bay are oases for small shorebirds migrating over extensive ocean and mountainous terrain, particularly in early May when, in most years, terrestrial and aquatic habitats are still snow covered or frozen. Western sandpipers probably fly non-stop from Puget Sound to the Copper River Delta, depleting their energy reserves. Senner and West (1978) and Senner et al. (1981) hypothesized that small shorebirds, enroute from their Copper River Delta stopover to western Alaska breeding grounds, cannot store enough energy to fly all the way and, therefore, must make intermediary stops on the mudflats of Kachemak Bay.

Shorebirds concentrated in these areas may be adversely affected by some human activities. Krasnow (1981) recommended limiting construction activities and low-level helicopter flights over

Fox River Flats from April 30 to May 11. North (1991) believes there are no alternative shorebird staging areas along Homer Spit to replace habitat that might be lost in Mud Bay and that it merits consideration as a shorebird preserve.

Some shorebird species (e.g., surfbirds, ruddy turnstones, black turnstones) prefer rocky beaches for migration stopovers or overwintering. These species are never as abundant in Kachemak Bay as those which concentrate on mudflats. Nevertheless, surfbirds counted on the Homer Spit during the first three weeks of May 1990 represented about one-third of the total estimated world population (West 1991b). The rock sandpiper is the only shorebird which overwinters on Homer Spit (Lees et al. 1981). A flock of about 1,000 arrives in late October and departs in mid-March. The gravel beaches and rocky outcrops along the outer shore of Neptune Bay are used by surfbirds and black turnstones as they migrate through Kachemak Bay in the spring.

Gulls and Terns - Gulls are the most second most abundant bird group in Kachemak Bay (Tables 2 and 3). Gulls are most abundant along the northern shoreline of outer Kachemak Bay near Bluff Point and at the end of Homer Spit, where they feed on cannery waste (Erikson 1977). Concentrations of feeding gulls, kittiwakes, terns, and seabirds are attracted to the Bradley River-Sheep Creek estuary and mouth of the Martin River by runs of sandlance and smelt (USACE 1982). Parasitic, pomarine, and long-tailed jaegers are also present.

The black-legged kittiwake colony on Gull Island (Table 9) appears to be the most productive in the Gulf of Alaska, where other colonies have experienced widespread reproductive failure in recent years (Nishimoto et al. 1987; Nishimoto and Thomas 1991).

Arctic terns are known to nest in small numbers on Glacier Spit, at the base of Grewingk Glacier, on Fox River Flats, and at Lampert Lake. In late July, arctic terns begin to congregate in Kachemak Bay. These terns presumably come from other areas in Cook Inlet as well as the Kachemak Bay area. They are joined by a few Aleutian terns, some probably from the breeding colony near Lampert Lake. Tern numbers begin to decrease after mid-August and by late August few are left in the bay (Erikson 1977).

Seabirds - Seabirds (e.g., tubenoses, cormorants, alcids) are not as abundant in Kachemak Bay (Tables 2 and 3) as nearby areas, such as the Barren Islands and outer coast of the Kenai Peninsula, probably because cliffs and islands suitable for nesting colonies are scarce. Species diversity is highest in the outer bay. Only five seabird colonies are known (Table 9), among which Gull Island is the largest.

Pelagic seabirds as a group consume a wide variety of fishes, crustaceans, cephalopods, and other prey. However, only two small fishes are eaten by more than half and have the highest cumulative importance in terms of frequency of occurrence, volume, and numbers eaten: Pacific sandlance and capelin (Sanger 1983). Other important prey are cephalopods and a euphausiid (Thysanoessa inermis). Nereids are probably also very important (Sanger 1983).

Marbled and Kittlitz's murrelets feed primarily along the southern shore of outer Kachemak Bay, within four miles of the shore (Erikson 1977). In summer, along the shores of Kachemak Bay, marbled murrelets comprise 96-100% of identified murrelets until July (K. Kuletz, pers. commun.). Along the south shore of the inner bay, Kittlitz's murrelets comprised up to 92% of identified murrelets near areas of glacial runoff. The highest densities of murrelets were between Glacier Spit and Bear Cove, with mean densities of 87 Kittlitz's and 51 marbled murrelets/mile^2. These species most likely nest in the old growth spruce-hemlock forest and alpine slopes along the south shore.

In recent summers, a flock of 100+ fork-tailed storm petrels has been observed in the Bay in the vicinity of Lands End (G. West, pers. commun.).

The most common seabirds in winter are common murres, marbled murrelets, and pigeon guillemots, in that order (Sanger 1987). Murrelets and most murres overwinter in the southern part of Kachemak Bay, where the water is deep and ice-free. The dominant food of murres in winter and spring is a mysid (Neomysis rayii). The dominant food of murrelets is capelin.

Raptors - The most visible and best known raptor in Kachemak Bay is the bald eagle. Eagles nest all around the bay; however, highest densities of active and inactive nests occur along the southern shore. An eagle nest survey conducted by the U.S. Fish and Wildlife Service in June 1992 counted 55 active nests and 84 inactive nests around Kachemak Bay (L. Dugan, pers. commun.). This is a minimum number of nests, because the survey did not cover the entire shoreline and some documented nests were skipped.

Many bald eagles roost on the Homer Spit. They congregate at river mouths on Fox River Flats in April and May when eulachon return to streams and commonly roost on the Fox River tide flats (Krasnow and Halpin 1981, Krasnow 1981).

Lees et al. (1981) believed Homer Spit may be a major feeding area for wintering bald eagles in Kachemak Bay. Some eagles may have been attracted to the Spit by the processing effluent at the Seward Fisheries outfall. However, the main reason bald eagles are attracted to the Spit is the large quantities of food scraps provided by a local resident, Jean Keene, and she has been feeding them since 1979 (Bain 1990). The wintering population of eagles increases steadily in early winter; in 1990 it reached a peak of 643 eagles on February 14. February is typically the month when eagle abundance peaks on the Homer Spit due to scarcity of natural foods in Kachemak Bay. About 60% the wintering eagles are adults (Bain 1991). Eagles are attracted to the Spit from as far away as Kodiak, Kenai, and Prince William Sound (Bain 1990).

Peregrine falcon, Northern Harrier, and short-eared owl can also be sighted about Kachemak Bay and Fox River Flats.

Other birds - The only known surveys of passerines and other birds were at Fox River Flats (Krasnow and Halpin 1981) and the Homer Spit (Bain 1990, 1991; North 1991).

Terrestrial Mammals

At least 21 species of terrestrial mammals inhabit Fox River Flats and the intertidal zone of Kachemak Bay (Table 10). The Bradley Lake Hydroelectric Project prompted several detailed censuses and summaries of wildlife and habitat between Fox River Flats and Bear Cove (Krasnow 1981, Krasnow and Halpin 1981, Rappoport et al. 1981, USACE 1982, Holderman 1982, ENTRIX and Stone & Webster 1985). Consequently, numbers of big game species are relatively well-known.

Moose - The Fox River Flats is the only major moose calving area on the southern Kenai Peninsula and is also a critical wintering area for migratory moose populations which summer in the Caribou Hills, Eagle Lake, and lower Bradley Lake regions (Bailey et al. 1978).

Estimates of moose abundance differ, in part because the density and visibility of moose on the Flats depends on winter conditions. Bailey et al. (1978) cited previous estimates of 150 to 350 animals on Fox River Flats. Holdermann (1982), summarizing ADF&G aerial surveys of the entire Fox River drainage from 1964-1974, found an average of 155 moose (range 57-310) in November and December. Woodward-Clyde Consultants (1984) estimated 18-25 moose are permanent residents of the Fox River Valley; they are joined by at least 70 moose from the Caribou Lake and Boxcar Hills area in late November-early December, but observability during most of their aerial surveys was hampered by poor survey conditions (incomplete snow cover). Most of the moose have been counted in the valley north of the critical habitat area.

Surveys conducted from October 1983 to June 1984 found Clearwater Slough and Sheep Creek to be heavily used during the fall rut, winter, and spring (Woodward-Clyde Consultants 1984). Throughout this period, the density of moose in the Fox River Flats Critical Habitat Area ranged from 1.41 moose/mi^2 on the bulk of the saltwater sedge flats to 1.86 moose/mi^2 on the edge of the freshwater sedge meadows and thickets. However, an intensive survey along Clearwater Slough in December, when observability was high, estimated a moose density of 40/mi^2. The migratory population has been observed entering the Fox River Valley from late November to early December and leaving from late February (Woodward-Clyde Consultants 1984) to mid-June (Bailey et al. 1978).

Black bear - Black bear are common at the head of Kachemak Bay (Rappoport et al. 1981). Most have been observed along the sedge flats between the Bradley and Martin Rivers (estimated at 8-12 bears) and in the Fox River Valley. Black bears are usually scarce in the saltwater sedge flats of the Fox River Flats Critical Habitat Area (0.05 bear/mi^2) (ENTRIX and Stone & Webster 1985). However, their use of this area appears to be highly seasonal (Lensink 1980); after emerging from dens in spring, bears are attracted to coastal flats to eat grass and early herbaceous plants. Bear numbers also increase from August to denning, when they appear to be attracted to lower elevations by berries. Major movement corridors along the lower Bradley River are along ridges bordering the tidal flats (Lensink 1980). Black bear can also be seen along the southern shores of Kachemak Bay.

Brown bear - Brown bear are uncommon on the Flats. D. Hardy (pers. commun., in Lensink [1980]) estimated five or more brown bears typically roamed the head of Kachemak Bay. Like black bears, they are attracted by the lush spring growth on the flats. As many as three adult brown bears have been observed on the flats at one time in early May (J. Brown and E. Wolf, pers. commun. in Lensink [1980]). Some brown bears are also attracted to the Fox River Valley by salmon and perhaps berries in fall. The high count for a single day is five brown bears on Bradley and Sheep rivers in October 1983 (Woodward-Clyde Consultants 1984). Brown bears do not occur south of Kachemak Bay (Calkins 1979).

Other species - Coyote tracks are often seen and calls have been heard in Fox River Valley (Batten et al. 1978, Lensink 1980). Wolves are seldom observed on the Flats; however, D. Hardy (pers. commun. in Lensink [1980]) believes wolves prey on moose on the Flats following heavy snow at higher elevations. Beaver are not currently abundant on the Fox River Flats; however, there is extensive evidence of high populations in the past along the wooded margins of the Flats (Lensink 1980). Heavy trapping pressure may have eliminated beaver from the Bradley and adjacent river systems (D. Hardy, pers. commun., in Lensink [1980]). River otter are relatively abundant along the lower Bradley River (Lensink 1980, USACE 1982), and densities are high along the south shore of Kachemak Bay (Calkins 1979) where otters may frequent intertidal areas. Northern red-backed voles appear to be the most numerous small mammal in the Sitka spruce forests and alder swamps (Lensink 1980). Tundra voles are also very common on the north side of Kachemak Bay (Dave Erikson, pers. commun.).

Marine Mammals

Eleven species of marine mammals are found in Kachemak Bay (Table 11). The greatest diversity occurs in the outer bay. Marine mammals present in the upper end of Kachemak Bay include a few sea lions and sea otters, belukha whales, Dall porpoises, harbor porpoises (Lensink 1980).

Sea otter - Probably the best known and most popular marine mammal in the bay is the sea otter. They were probably eliminated from the Kenai Peninsula by the early 1900s (Schneider 1977). In 1967, after a decade of occasional sightings, several hundred to over 1,000 otters appeared along the southern tip of the Peninsula. Sightings of sea otters in Kachemak Bay increased in the early 1970s; however, as late as 1977 there were no known groups of breeding animals (Schneider 1977). Another abrupt shift occurred in 1975, when as many as 400 males occupied the offshore area between Homer and Anchor Point. Increasing concentrations on the fringe of the population, followed by an abrupt dispersal of nonbreeding males into nearby habitat when food supplies are stressed, followed by breeding groups, is a typical pattern of colonizing sea otters.

The highest densities of sea otters along the Kenai Peninsula, and among the highest in southcentral Alaska, are near Seldovia and English Bay (DeGange et al. 1990). In these areas, up to 2.9 otters/mile of shoreline were counted in a helicopter survey shortly after the Exxon Valdez oil spill. Low numbers were counted in the inner bay (approximately 0.3 otters/mile). Intermediate

numbers were seen around the islands of Kasitsna Bay and Eldred Passage and along the north shore of the outer bay. These are minimal estimates, because they did not include otters in offshore areas, and an observer in a helicopter may only see as few as 1/4 of the sea otters overflown (Schneider 1977).

Kachemak Bay should eventually support relatively high numbers of sea otters, particularly on the south side. Sea otters can feed in waters over 330 feet deep, although most normally feed in water 200 feet deep or less. They tend to prefer (but not require) nearshore areas of shallow, rocky-bottomed habitat that is exposed to the open ocean, but broken by reefs, islets, and kelp beds (Calkins 1979). Food supply is generally the limiting factor; for an area to support high densities, it must produce prey populations which can sustain a yield of up to 30,000 kg/km^2/yr. High water quality is also a requirement, because their dense fur rapidly loses its water-repellency when soiled or oiled. Kachemak Bay is likely to become the most accessible sea otter viewing area in Alaska (Schneider 1977).

As a result of the EXXON Valdez oil spill, a pre-release facility for oiled sea otters was built in Little Jakolof Cove. This facility eventually received 187 otters, of which 151 survived until release or transfer to another facility (Davis and Styers 1990).

Steller sea lion - There are no large traditional sea lion haulouts in Kachemak Bay, but sea lions are encountered throughout the bay and a few individuals do haul out on both Sixty-foot Rock and Gull Island in the summer. Sea lions are present feeding throughout the bay year-round. Large numbers of individuals have been observed to winter in bays along the south side of Kachemak Bay.

Harbor seal - Information on the distribution and abundance of harbor seals in Kachemak Bay is incomplete. Concentrations of harbor seals have been observed at only two haulouts in Kachemak Bay: Fox River Flats and Yukon Island. Harbor seals are very abundant at the head of Kachemak Bay (Lensink 1980). The tidal flats between the Bradley River-Sheep Creek estuary and the Fox River is an important haulout from May to October (USACE 1982). Over 140 seals have been observed at the mouth of the Bradley and Sheep rivers (Pichard, pers. commun. in Lensink [1980]). Arneson (in Calkins 1979) also saw up to 140 seals on the Flats. Harbor seals are found in the Bradley River at high and low tides. Seals ascend six miles up the Bradley River, to the base of the first falls, and are also found in some tributaries when salmon are present (Lensink 1980). Several hundred harbor seals regularly haul out on the north shore of Yukon Island in the summer. Up to 250 harbor seals were hauled out on a gravel beach on Yukon Island on September 30, 1976 (Calkins 1979). In the winter, ice floes in Mud Bay are regularly used by over one hundred harbor seals for hauling out (G. West, pers. commun.).

The major prey item of harbor seals in lower Cook Inlet in April and June is octopus (Octopus sp.), followed by shrimp, eulachon, and capelin (Mallotus villosus) (Calkins 1979). Harbor seals in lower Cook Inlet differ from those inhabiting the Gulf of Alaska. They are smaller. Also, invertebrate prey items comprise almost two-thirds of their summer diet, compared with one-quarter in Gulf populations, and walleye pollock, which are the main prey in the Gulf, was not an

observed prey.

Belukha - Belukha are common in lower Cook Inlet, but knowledge of their distribution and abundance in Kachemak Bay is limited. Concentrations of food organisms and ice distribution are probably major factors. The preferred foods in Cook Inlet appear to be smelt, salmon smolts, and herring in spring; salmon in summer; and smelt, bottom fishes, and invertebrates in fall and winter (Calkins 1979). In Kachemak Bay, possible foods include shrimp, crab, halibut, sole, and herring. Belukhas are present from July through September at the mouth of the Bradley River and a few have been sited at the mouth of Sheep Creek as well (Dave Erikson, pers. commun.). Belukhas have been observed at Fox River Flats in fall (Lensink 1980) and in Mud Bay in late fall and early winter (G. West, pers. commun.).

Minke whale - Minkes are migratory and are found in Kachemak Bay only in summer, particularly August (Calkins 1979). They feed on small schooling fish such as sandlance and herring, euphausiids, and other invertebrates.

Killer whale - Migratory pods of killer whales are occasionally sighted in the outer portions of Kachemak Bay. Killer whales are known to feed on fish as well as other marine mammals.

Harbor porpoise - Harbor porpoises are common in bays, estuaries, tidal channels, and harbors. They tend to stay in water less than 60 feet deep. They are wary and easily disturbed by boat traffic. Foods include small fish, such as herring, and cephalopods, such as squid (Calkins 1979).

Dall porpoise - These porpoises are not as common in Kachemak Bay as in the Gulf of Alaska. They appear to prefer channels between islands and wide straits where ocean currents meet (Calkins 1979).

LAND OWNERSHIP

In general, tide and submerged lands in Kachemak Bay are state owned. The City of Homer has title to tidelands extending roughly from Bidarki Creek to the tip of Homer Spit and from Miller's Landing to the tip of Homer Spit. The City of Seldovia has title to some tidelands in Seldovia Bay. However, the water column of Kachemak Bay is entirely state owned. The U.S. Coast Guard owns the submerged lands under the Homer Small Boat Harbor. At the head of the Bay, Fox River Flats is primarily state land. Portions of Fox River Flats Critical Habitat Area, on which the Bradley Lake Hydro Project is located, are on federal lands. Two private inholdings are found on Fox River Flats and eleven privately owned tidelands parcels are found around the bay. A list of inholdings and leases in the critical habitat areas is found in Table 12. The Alaska Department of Transportation and Public Facilities has several management agreements and a tidelands lease for avigational corridors near the Homer and Seldovia airports. The University of Alaska has an Interagency Land Management Transfer for tidelands at the Kasitsna Bay marine lab. Kachemak Bay State Park boundaries extend out into Kachemak Bay along portions of the southern shore, overlapping with the critical habitat area. The U.S. Coast Guard maintains navigational aids throughout the Bay (Figure 3).

PUBLIC ACCESS

Kachemak Bay Critical Habitat Area and Fox River Flats Critical Habitat Area are accessible via Kachemak Bay. Homer Spit is the main access point to the bay. Access is also gained through Seldovia Harbor. There are approximately forty boat ramps, launches and vehicle access points around the bay. Along the Sterling Highway and East End Road, several major public access points can be found. Public access to the beach off the Sterling Highway is available at Anchor River State Recreation Area (Anchor Point) and Bishop's Beach. Public access is also available on Homer Spit and by the Homer Airport. Off of East End Road, access can be found at East End Trail at the end of the road where a switchback trail leads down to the beach. That trail is authorized by the state for pedestrian, horse, and ATV access only. Foot trail access will probably be developed at Cottonwood Creek and/or Eastland Creek through state park lands in the future. Fox River Flats trail runs from the head of the bay up the valley on the west side of Fox River Flats, providing the main access to the flats. Public docks are located on the Homer Spit, Seldovia Harbor, Jakolof Bay, and Halibut Cove. A barge dock located at the Bradley Lake Hydropower Project also provides public access. A state park dock is found at the head of Halibut Cove Lagoon and the Division of Parks and Outdoor Recreation maintains two mooring buoys, one off Glacier Spit and one in Halibut Cove. Five state park trail heads are found in Halibut Cove and Halibut Cove Lagoon and public campsites are found in Halibut Cove and Tutka Bay Lagoon. A trail from Tutka Lagoon accesses the Rocky River Road. (Commercial operators providing access to Kachemak Bay State Park need a commercial activities permit from the state Division of Parks and Outdoor Recreation.) The road from Seldovia to Jakolof Bay also provides access to Kachemak Bay at Outside Beach and at Jakolof Bay.

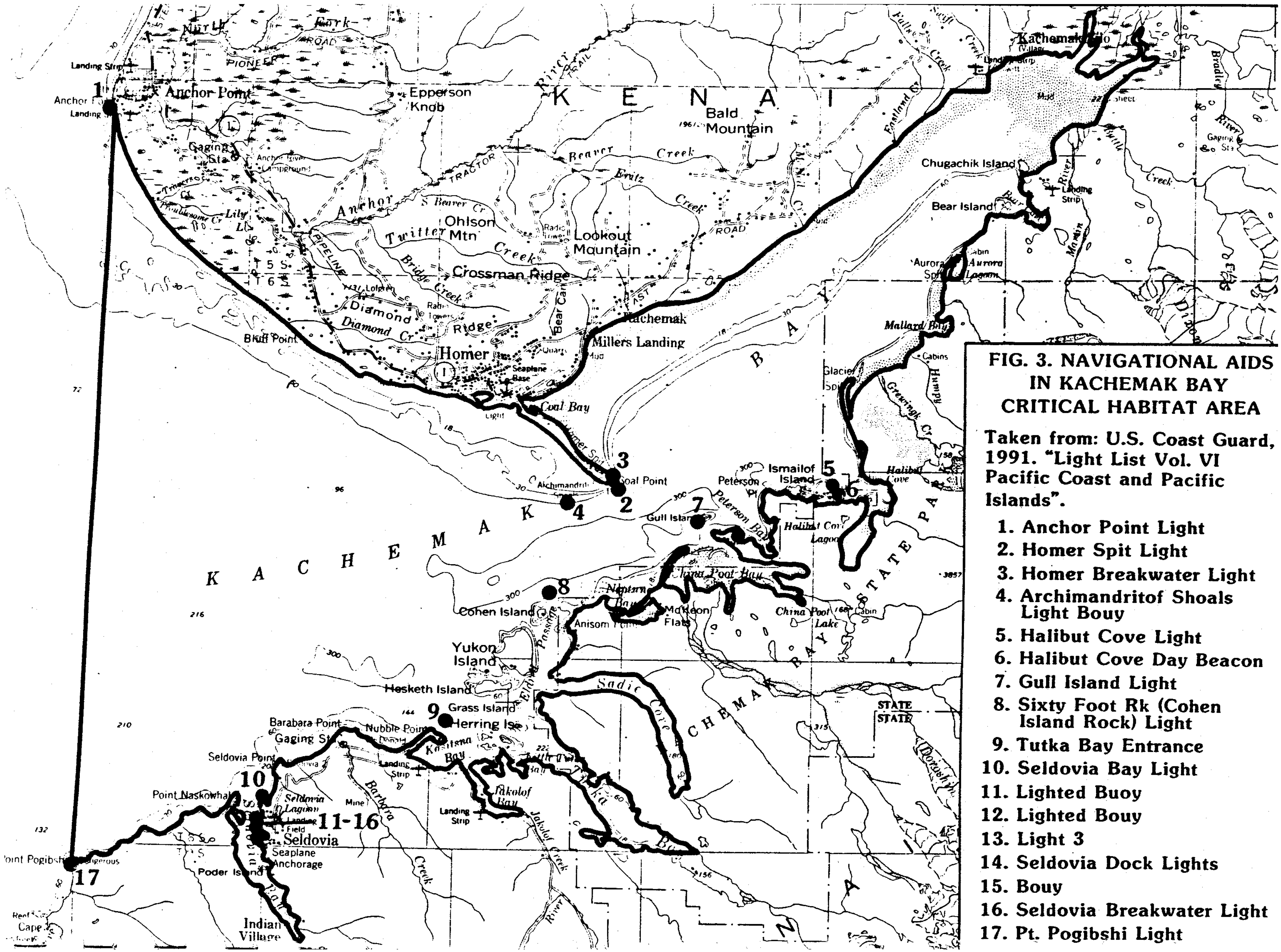

FIG. 3. NAVIGATIONAL AIDS IN KACHEMAK BAY CRITICAL HABITAT AREA

Taken from: U.S. Coast Guard, 1991. "Light List Vol. VI Pacific Coast and Pacific Islands".

1. Anchor Point Light
2. Homer Spit Light
3. Homer Breakwater Light
4. Archimandritof Shoals Light Bouy
5. Halibut Cove Light
6. Halibut Cove Day Beacon
7. Gull Island Light
8. Sixty Foot Rk (Cohen Island Rock) Light
9. Tutka Bay Entrance
10. Seldovia Bay Light
11. Lighted Buoy
12. Lighted Bouy
13. Light 3
14. Seldovia Dock Lights
15. Bouy
16. Seldovia Breakwater Light
17. Pt. Pogibshi Light

EXISTING HUMAN USES

Commercial Fishing

Both set gillnets and purse seines are used to commercially harvest salmon in Kachemak Bay. There are only five beach areas along the southern shore of Kachemak Bay where set gillnets are allowed (see map). The limited area provides only enough productive fishing sites to accommodate approximately 25 permits. Commercial set gillnet fishing in the Southern District of Lower Cook Inlet (Kachemak Bay and waters south to Elizabeth Island) averaged an annual catch of 51,850 fish from 1960-1989. The purse seine fishery in the Southern District harvests approximately eight times more salmon than does the set gillnet fishery. Purse seine fishing sites in Kachemak Bay are divided into eight major subdistricts (Figure 4). The Tutka Bay, China Poot and Halibut Cove Subdistricts produce the highest catches. In 1991, 436,962 salmon of all species were caught in the Southern District commercial salmon fishery. Value of the fishery is shown in Table 13.

A herring fishery (processed as salted herring) was strong in the early part of the century. Sac roe herring have historically been harvested in Kachemak Bay in the spring, however, in 1979 that fishery was terminated due to poor stock conditions. A commercial harvest was once again allowed in 1989 during which 10 vessels harvested 171 short tons in one 2.5 hour opening in Mallard Bay. Since that time, herring abundance has not been sufficient to allow a commercial harvest.

Pacific cod, halibut, sablefish, pollock, rockfish, and lingcod are commercially caught using jigs, longlines, and some limited use of pot gear. In Cook Inlet, Pacific cod are the primary ground fish harvested (over 98% of the catch since 1990) (Bill Bechtol, pers. commun.) with halibut a far distant second.

The harvest of octopus in the Southern District has historically occurred incidental to other directed fisheries such as the commercial Tanner crab fishery. An increased amount of interest in directing effort specifically towards octopus has occurred in recent years, but actual effort has been minimal and resultant harvest negligible. In 1991, both the incidental and directed harvest of octopus for the Southern District was 1,497 pounds for 5 vessels.

Historically, Kachemak Bay supported large commercial pot fisheries for king, Tanner and Dungeness crabs. Currently, due to a steep decline in crab populations, the fisheries have either been closed or are a fraction of their former size. In 1991, the commercial Tanner crab harvest for the Lower Cook Inlet Southern District totaled 271,379 lbs. and was taken by 68 vessels during two

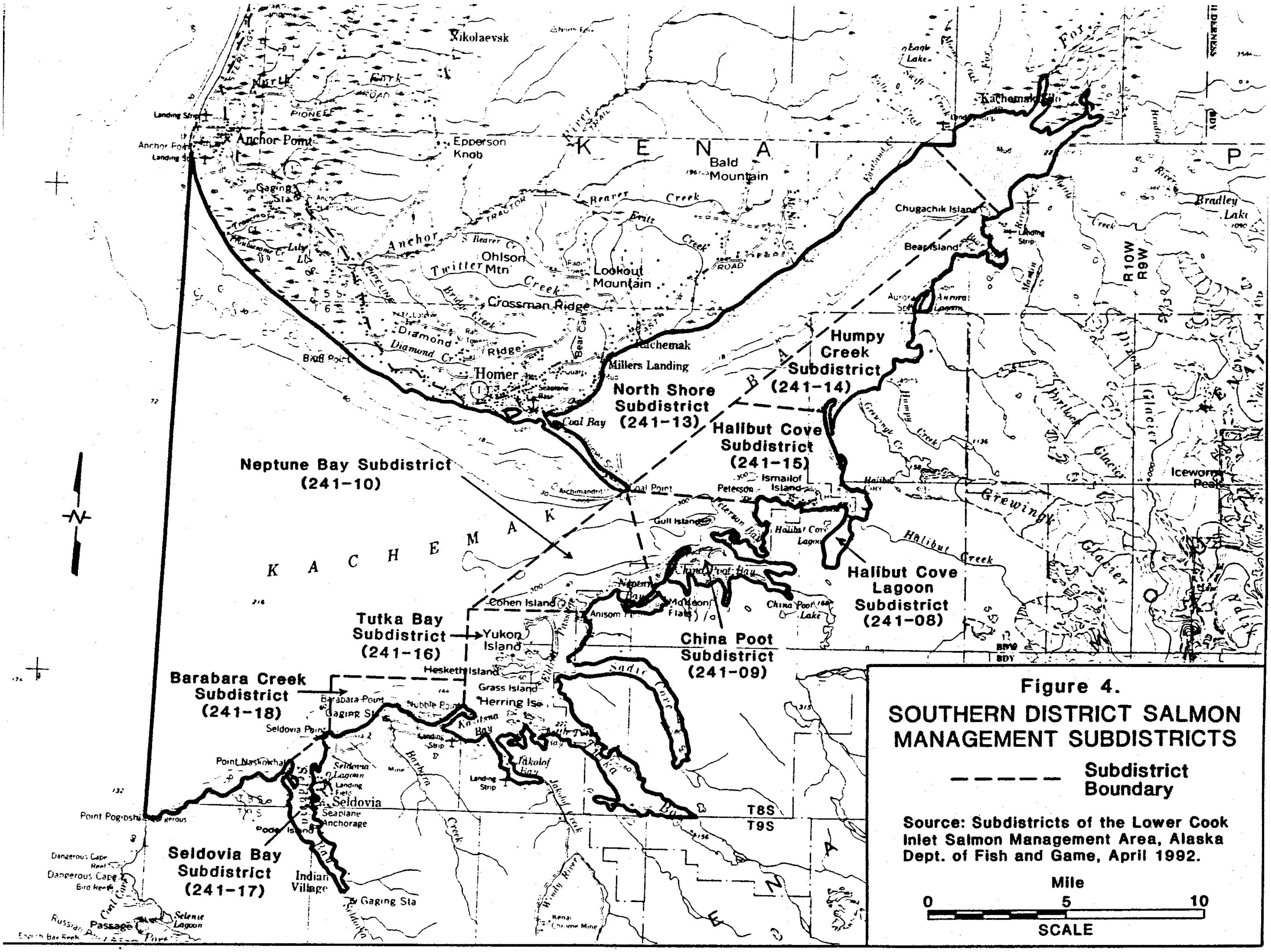

Figure 4.
SOUTHERN DISTRICT SALMON MANAGEMENT SUBDISTRICTS

- - - - - Subdistrict Boundary

Source: Subdistricts of the Lower Cook Inlet Salmon Management Area, Alaska Dept. of Fish and Game, April 1992.

Mile
0 5 10
SCALE

12 hour openings a ten fold decline from its historic high (Table 14). There is no longer a king crab fishery in the Southern District (Table 15). Department research indicates that the number of catchable crabs is at an historical low and it will be at least several years before the population could be expected to increase enough to allow any kind of fishery. The commercial Dungeness crab fishery was also recently closed due to a depressed crab population. Historically, the annual Dungeness crab fishery in the Southern District was as large as 2.1 million pounds (1979) and as many as 108 mostly local vessels (1982) have participated. In 1990, the last year the commercial fishery was open, a total of 28,938 lbs. was harvested by less than 23 vessels (Table 16).

Historically, the commercial trawl shrimp fishery in Kachemak Bay has harvested primarily pink shrimp with sidestripe shrimp making up a significant portion of the catch (Table 17). Humpy shrimp periodically comprised up to half of the harvest. Coonstripe shrimp made up less than 5% of the catch. Two areas have regularly closed to the commercial shrimp trawl fishery, the area in the bay north of a line drawn between the end of Homer Spit and Glacier Spit and the waters south of a line connecting the end of McDonald Spit to the north side of Yukon Island and Anisim Point. Historically, the fishery harvested as much as 6 million pounds annually, but by the mid 1980s was producing a million pounds or less. Due to depressed stocks, the commercial trawl shrimp fishery was closed in 1990-91.

Commercial pot shrimp fishing in Kachemak Bay is primarily undertaken by small vessel fisherman. The target species is coonstripe shrimp, the most abundant pot shrimp species in Kachemak Bay. Spot shrimp are also taken. This fishery is currently closed due to severely depressed stocks but hit an historical high of 800,000 lbs. (1973-74) and 600,000 lbs. (1977-78) before falling off to less than 100,000 lbs. in the mid to late 1980s.

Commercial harvest of hardshell clams and mussels was not well documented prior to 1986. Since 1986 Chugachik Island, Halibut Cove Lagoon, Kasitsna Bay, Jakolof Bay, and Tutka Bay have been certified for commercial harvest. Initially, the majority of the harvest came from the Chugachik Island area, but the Jakolof/Kasitsna Bay area has subsequently became equally important. Prior to 1989 only 102 lbs. of blue mussels were taken. However, in 1989 over 167,000 lbs. were harvested primarily for otter food for the rehabilitation of the Exxon Valdez oil spill damaged sea otters. Blue mussel harvest data is not available for 1990 or 1991. However, available harvest data indicates that in 1990 seven permit holders took 18,956 pounds of Pacific littleneck clams from Chugachik Island area, and in 1991 five permit holders took 15,349 pounds of Pacific littleneck clams from the same area. In Kasitsna Bay, Jakolof Bay and Tutka Bay, twelve permit holders took 16,738 pounds of Pacific littleneck clams in 1990, and sixteen permit holders took 32,137 pounds of Pacific littleneck clams in 1991 (Richard Gustafson, pers. commun.).

Sport Fishing

All five species of Pacific salmon are caught by sport fishermen in Kachemak Bay (Table 18). From mid-May to early July local anglers often troll for king salmon along the southern shore of Kachemak Bay, with particular focus on kings returning to Halibut Cove Lagoon. The "Fishing Hole", located on the east side of the Homer Spit, is also a popular king salmon sport fishing spot. Both the Halibut Cove Lagoon and the Homer Spit king salmon fisheries are the result of recent annual department enhancement efforts (Tables 19 & 20). In addition, recently developed king salmon enhancement in Seldovia Bay has resulted in a significant sport fishery.

A year-round "feeder" king salmon fishery has been developing in the Kachemak Bay area in recent years. These rearing immature salmon are caught by sport fishermen using mid-deepwater trolling techniques. Although these fish are consistently caught during the winter months, they can be taken throughout the entire year.

From late June to mid-August pink salmon are caught in Tutka Lagoon and also on Homer Spit, both the result of department enhancement efforts. Approximately 2,000 pink salmon each year are estimated to have been harvested in both Tutka Lagoon and Homer Spit by sport fishermen in the 1990s.

From early July to mid-August, sockeye (red) salmon are caught in China Poot Bay prior to entering China Poot Creek, also the result of a department enhancement project. During July, a personal use sockeye salmon dip net fishery occurs in China Poot Creek. This fishery provided an estimated 5,000 fish to sport and personal use fishermen in 1991 (Table 21).

Good coho (silver) salmon fishing can be found in Seldovia Bay from early August to mid-September; the result of a department stocking project in Seldovia Lake. An enhanced coho run returns to Fox Creek at the head of the bay. There were 578 personal use permits issued in 1990 to fish this run.

From March through late September, Pacific halibut support the most popular sport fishery in Kachemak Bay, with most fishing occurring between Anchor Point and the end of Homer Spit in depths of 50 to 200 feet. Harvest has increased ten-fold in the past 15 years and now approaches 100,000 fish taken annually (Table 22). Nearly 65% of the catch is now taken by sport fishing charter boats (Dave Nelson, pers. commun.). Dolly Varden fishing is best from mid-May to mid-July for both shore fishermen and trollers. Rockfish and lingcod are caught in rocky kelp bed coasts especially west of Seldovia Bay. Creel surveys of vessels operating out of Homer estimated over 1,900 lingcod were harvested in 1991 (Meyer 1992).

Clams can be found on beaches throughout Kachemak Bay. Homer Spit is one of the more accessible beaches on the bay. Cockles are available in the Mud Bay area on the east side of Homer Spit. The west side of the spit supports a small population of razor clams.

Dungeness crab and shrimp are caught in pots along the south shore of the bay (Table 23).

Personal Use Fishing

Historically, personal use fisheries in Kachemak Bay have targeted coho salmon, with returning fish a mixture or natural stocks bound primarily for the Fox River drainage at the head of the bay, and enhanced runs bound for the Homer Spit fishing lagoon and Fox Creek at the head of the bay (ADF&G 1992). There are three personal use fisheries in Kachemak Bay. The fall personal use set gill net fishery is concentrated on the north side of the Bay and targets coho salmon; the China Poot dip net fishery, occurring in July, targets sockeye. The Fox Creek dip net fishery first occurred in 1991 and harvests stocked coho salmon which originate in Caribou Lake (Dave Nelson, pers. commun.).

Sport Hunting

Most sport hunting in the two critical habitat areas occurs on the Fox River Flats and in several bays along the south shore. Existing public use of the Fox River Flats is dispersed and undeveloped. The main activities are sport and subsistence hunting and trapping. Waterfowl, black bear, and moose are the most popular game species.

Mallards comprised one-third of the average annual harvest of all waterfowl species in Kachemak Bay during the last decade Table 24). Scoters, goldeneyes, and buffleheads are also frequently harvested. Diving ducks are taken almost as often as dabbling ducks. Not many geese are harvested in Kachemak Bay.

Waterfowl hunting is the most popular recreational activity on Fox River Flats and it follows the pattern of many Cook Inlet refuges. Hunting pressure is heaviest on opening day, with noticeable increases in hunting activity on subsequent weekends and light, but relatively constant use, on weekdays (Krasnow and Halpin 1981). Motor boats are the major means of transportation used by waterfowl hunters. Unlike refuges further north, however, the Fox River Flats provides excellent duck and goose hunting late in the season (Havens 1970). Waterfowl hunting pressure is weather-dependent, because boat access and migration patterns are.

China Poot Bay is another popular waterfowl hunting area (Table 25). Ducks overwinter in China Poot, and it is the closest saltwater marsh to Homer Spit in which hunting is allowed. In 1988, China Poot Bay hosted almost half of the hunter-days in Kachemak Bay, and hunters tended to have greater duck-hunting success there. Other popular areas in Kachemak Bay are Bear Cove, Mallard Bay, and McKeon Flats (G. Del Frate, pers. commun.). Sea ducks are hunted from late October through December along the coast from layout boats and promontories.

Before construction of Bradley Lake hydroelectric project on one side of Fox River Flats Critical Habitat Area and the nearby village of Kachemak Selo on the other, moose hunters were attracted to the area by its remote and undeveloped setting and relatively high chance of encountering a trophy bull (Holdermann 1982). Hunting pressure is now heavy near Kachemak Selo and moderate

on the east side of the critical habitat area. All-terrain vehicles are the primary means of transportation; access into the critical habitat area is facilitated by the Fox River Flats trail.

Residents of the lower Kenai Peninsula consider the Fox River Flats a good place to hunt black bears. Residents of Kachemak Selo apparently hunt few bears. Most bear hunters reach the flats by boat (Holdermann 1982). Hunting is concentrated around the head of Kachemak Bay and along the major tributaries of the Fox River.

Levels of use by sport hunters are not well documented. Sport and subsistence hunting are probably the predominant public uses of Fox River Flats. The northwest side of the Fox River valley can be reached by off-road vehicles, horseback, and boats. The south side of the valley is generally accessible only by boats, because the rivers are difficult to cross and, before the hydroelectric project, there were no landing strips near the critical habitat area on the southeast side (Stone & Webster 1987).

Subsistence Hunting

Villagers from Port Graham, English Bay, and Seldovia utilize the area around Yukon Island and Tutka Bay for the harvest of seals, sea lions, and sea otter; occasionally harvesting seals at the head of the bay near the mouth of Fox River or where encountered when fishing (Stanek 1985, Reed 1985). All species of ducks and geese are taken by hunters from the three villages, primarily in the vicinity of Seldovia Bay, China Poot Bay and McKeon Flats, Tutka Bay and Fox River Flats. Several species of marine birds, including gulls and puffins, and their eggs are harvested. McKeon and China Poot Flats are often used for harvesting eggs. Black bear, moose, and mountain goats are commonly hunted along the shoreline. Prehistoric middens on Chugachik Island contain at least as many avian remains as mammal remains (Yesner 1977). Waterfowl remains comprise over one-half of the avian remains with seabirds comprising most of the remainder.

Trapping

Some residents of Kachemak Selo trap intensively on the Fox River Flats Critical Habitat Area for beaver, wolverine, wolf, coyote, and river otter (G. Del Frate, pers. commun.). Red fox and lynx have also been taken by trappers in the area (Lensink 1980), but few if any recently (G. Del Frate, pers. commun.). Snowmobiles are the primary means of transportation. From 1922 to 1932, fox farming was an important industry in the Kachemak Bay area (Klein 1987). In 1929, the Cook Inlet area contained 87 licensed fur farmers, most of them near Kachemak Bay. Fox farming ceased to be profitable in the early 1940s. Relict buildings often still mark sites of mainland fox farms. One farm was located on the lower Bradley River. Caged silver and blue foxes were fed local foods such as salmon, marine mammals, clams, and mussels, as well as cooked grain. Blue foxes were also released on islands in Kachemak Bay, including Yukon, Hesketh, Cohen, McKeon, and the Herring Islands (Klein 1987). An island of 40-50 acres could support 150 or more feral foxes. These foxes ate nesting birds and their eggs, kelp, mollusks, carrion, and berries. Although they probably decimated the islands' bird populations, as they did throughout the Aleutian Islands,

the foxes required supplemental feeding to survive.

Livestock Grazing

Grazing is currently allowed on a large portion of Fox River Flats under two grazing leases originally issued in the 1950s. A 16,406-acre lease, including much of the upland acreage within the Fox River Flats Critical Habitat Area, allows up to 500 cattle/year. This lease expires in 1994. The smaller lease, 675 acres, of which only 80 acres are in the Fox River Flats Critical Habitat Area, allows not more than 8 to 10 animal units over a five-month use season. This lease expires in 1998. These grazing leases are administered by the Department of Natural Resources.

The Fox River Flats Cattlemen's Association estimates they released about 220 cattle on the Fox River Flats and adjacent lands in 1992. They believe that 40 head of livestock, mostly horses, were on the flats in addition to those owned by leaseholders. Aerial estimates of cattle and horses on the flats in spring 1992 ranged from 125-201 cattle and 6 to 29 horses (Table 5); however, many individual animals and small groups were likely overlooked in brushy or wooded areas.

Cattle do not reside on the flats year-round. Members of the cattlemen's association move their cattle off the leases in the fall, usually by mid-October, and feed them in enclosures during the winter. In late spring, generally in late April, before the snow and ice melt off major portions of the flats, the cattle are moved back to the leases. At first, cattle tend to graze on and along the base of the steep ridge that bisects the northwest corner of the critical habitat area, because grass returns to that south-facing slope sooner than most areas. Depending on the snow melt and weather conditions, however, they soon move onto the flats. Most of the cattle forage on the west side of the Fox River, with moderate numbers between Fox River and Sheep Creek, low to moderate numbers between Sheep Creek and Bradley River, and few or none east of Bradley River (Del Frate 1992, LaPlant 1992, Sinnott 1992). Windy conditions force the cattle off the flats and into the brush line.

The zone between the brushline and the tideline is most heavily grazed (Swanson and LaPlant 1992). Incoming tides force cattle into this area daily (LaPlant 1992). The stubble height of bluegrasses, Bering hairgrass, and fescue in portions of this zone appear to be less than that recommended in the Soil Conservation Service grazing specification (Swanson and LaPlant 1992). Grass in brushy areas adjacent to the steep ridge in the northwest corner of the critical habitat area is also heavily grazed (Sinnott 1992), perhaps because they green up early or because cattle spend a substantial amount of time in these areas when it is windy.

The cattle appear to be contributing to erosion of the flats, but to what extent is unknown. Receding tides allow the cattle to move well out onto the flats to graze on sedges. The daily movements of cattle have resulted in many trails on the flats. Many of the trails parallel the watercourses, which has damaged some streambanks. One of the worst-trampled areas is on both sides of the Fox River; however, as this is a sparsely vegetated mudflat, erosion may not be significantly worse than it would be without livestock (LaPlant 1992). On the other hand, some large gullies have been

created by ebb tides eroding cattle trails (LaPlant 1992).

Livestock trampling and grazing may also affect use of the flats by waterfowl and other birds. The heavily trampled and grazed zone between the brushline and the mean high tide is where waterfowl and shorebird nesting is most likely to be concentrated (LaPlant 1992). Livestock may also affect the distribution and abundance of geese on the flats. Cattle may enhance use of wetlands by geese by cropping the vegetation so that visibility is increased and more palatable plant sprouts are available (Pehrsson 1988). On the other hand, cattle and geese may compete for the same foods. Furthermore, cattle movements and associated human activities may force geese out of an area. This may have happened in 1992. An aerial survey flown the day after cattle were released on the flats on April 26 found most of the cattle west and most geese east of the Fox River; however, many cattle and geese were located less than one mile from one another (Del Frate 1992). Eight days later, on May 5, the cattle had dispersed throughout the central part of the flats, and the geese had move east of Sheep Creek and to the Martin River Delta. The relationship between livestock and waterfowl on the Fox River Flats needs additional study before firm conclusions can be drawn.

Unlike cattle, horses appear to be left on the flats year-round LaPlant 1992). Because horses browse on twigs and bark in the winter, they may compete for available browse with moose.

Marine Invertebrate Gathering

Local residents collect clams (littleneck, cockle, razor, horse, surf, macoma, mya, and butter), limpets, blue and horse mussels, scallops, blackkaty and giant chiton, octopus, nucella and hairy triton snails, and sea urchins (Stanek 1985, Reed 1985).

Plant Gathering

A variety of plants are taken from the shoreline and intertidal areas of Kachemak Bay, particularly by residents of Seldovia, Port Graham, and English Bay (Stanek 1985, Reed 1985, Russell 1991). Bull kelp, rockweed, and brown sea weeds are harvested from intertidal areas. On shoreline areas, seaside plantain, rye grass, beach pea, wild parsley, and cow parsnip are collected.

Wildlife Watching and Education

Kachemak Bay is a major recreational destination for both resident and nonresident visitors. Most of these visitors pass through or end up in Homer; therefore, statistics on Homer visitors is indicative of visits to Kachemak Bay. Of the estimated 180,549 Anchorage residents who visited the Kenai Peninsula in 1990, 78% had visited Homer previously, and 25% (approximately 45,000) considered Homer their most frequent destination on the peninsula (Fox Practical Marketing and Management 1991). Most visitors are from Anchorage; about 73% of the road traffic enroute to the Kenai Peninsula is comprised of Anchorage residents. Anchorage residents average over four trips each year; 84% visit Homer most frequently in June, July, and August; 92% drive; fishing is the main reason, but two-thirds of visitor-days are not spent fishing; and they spend about $98/person/trip.

Kachemak Bay is a more attractive destination in summer than winter. Surveys have estimated Homer was visited by 99,000 (19% of state total) nonresidents in summer 1989 (McDowell Group 1989) and 15,600 (7% of state total) from fall 1989 to spring 1990 (McDowell Group 1990). With a total of 114,600 out-of-state visitors, Homer was the 12th most visited community destination in Alaska (McDowell Group 1990). Similarly, Kachemak Bay was visited by an estimated 46,300 (9% of state total) nonresidents in summer 1989 (McDowell Group 1989) and 7,700 (3% of state total) from fall 1989 to spring 1990 (McDowell Group 1990).

Numbers of nonresident visitors were considerably higher in 1989-1990 than in 1985 (Data Decisions Group 1986). In summer 1985, Kachemak Bay was visited by 35,600 and Homer by 76,100 nonresidents. However, the proportion of statewide visitors and relative ranking with other communities and attractions remained nearly the same as in the earlier survey.

Probably the most heavily visited area in Kachemak Bay other than the Homer Spit is Halibut Cove (ADPOR 1989). Tour boats and water taxis bring many visitors to the community. China Poot Bay, Sadie Cove, Tutka Bay, and the area off Glacier Spit are also heavily used by wildlife watchers, kayakers, pleasure boaters, sightseers, photographers, beachcombers, scuba divers, and day hikers along beaches, in addition to the most common recreational pursuit, sport fishing.

Most Homer residents (85%) have crossed Kachemak Bay to recreate along the south side (Wieland 1991). However, most of the demand for recreational use is from Anchorage or other areas. For example, of 495 private landowners on the south shore of Kachemak Bay, 46% are Anchorage residents, 19% are Homer residents, 26% are other Alaskans, and 10% are nonresidents (Wieland

1991). Over 700 boats are moored in the Homer small boat harbor. Of these, 50% are owned by Homer residents and 22% by Anchorage residents. Of 414 people on the waiting list for a moorage slip in the small boat harbor, 35% have Homer addresses, 28% Anchorage, 9% Soldotna, 8% Kenai, 4% Matanuska-Susitna Borough, 3% Fairbanks, and 13% other Alaskan towns and other states (Wieland 1991).

Wieland (1991) surveyed 74 tourism-related businesses (i.e., tours and outfitters, wilderness lodges, other lodging, and education programs), which she believed represented only a fraction of those using Kachemak Bay. Forty businesses (54%) responded to the survey. Most of their clients were out-of-towners; only 8% were Homer residents. Over 200 jobs (mostly seasonal) are estimated to be provided by the 74 businesses contacted. These businesses provided lodging to an estimated one-half million people in the peak season. Estimated total annual income from the 74 businesses in the last two years is over $8.8 million (wilderness lodges $650,000, other lodging $7,000,000, tours and outfitters $1,026,000, and education programs $150,000). These figures are very conservative as the halibut charter industry alone grossed $9 million in 1985 (Wieland 1991).

More than 20 local guides, charter, air and water taxi services operate on Kachemak Bay State Park lands and waters, which overlap with the CHA (ADPOR 1989).

Guided horse trips occasionally traverse the northwest shore of upper Kachemak Bay in summer and a few sightseers reach the Fox River valley (Stone & Webster 1987).

Gull Island is the third largest and most accessible seabird colony in Cook Inlet (Erikson 1977, Nishimoto et al. 1987). Despite the island's small size, it has a large and diverse seabird population. Nine seabird species breed on the island (Nishimoto et al. 1987). The colony is a popular destination for birdwatchers and sightseeing tours. Tour boats come within 6 feet of the island every day in summer (Nishimoto and Thomas 1991). It is also very vulnerable to disturbance from nearby human activities (Erikson 1977). Both Gull Island and nearby Sixty Foot Rock were in the Alaska Maritime National Wildlife Refuge until 1987, when Gull Island was conveyed to the Seldovia Native Association (Nishimoto and Thomas 1991).

A recently updated, comprehensive, bird checklist (Erikson 1989) is available for Kachemak Bay and vicinity, and the area is one of few in Alaska with a specific bird-finding guide (West 1991a).

The Center for Alaska Coastal Studies in Peterson Bay, which is operated by the China Poot Bay Society, conducts field trips to China Poot.

Aquatic Farming

In 1983, the first permit for aquatic farming in Kachemak Bay was issued for a blue mussel raft in Halibut Cove Lagoon. A total of nine permits for blue mussels are currently in effect in Halibut Cove Lagoon. Because shellfish mariculture operations in Halibut Cove Lagoon are also located within the Kachemak Bay State Park waters, they are addressed in a special and temporary act of the legislature which allows for shellfish mariculturalists permitted in Halibut Cove Lagoon as of June 22, 1990 to continue in a 20 acre area. There are now aquatic farm operations approved or pending approval in Halibut Cove, Peterson Bay, Jakolof Bay, Little Jakolof Bay, Kasitsna Bay, and near Herring and Cronin islands. Depending upon the terms of each permit, species authorized to be grown on these farms are blue mussels, Pacific oysters, scallops, clams, sea urchins, sea cucumbers, and kelp. Currently, all ADNR aquatic farm permits outside the state park can convert to leases after three years if the terms of the permits are met. Suitable sites for aquatic farming are limited by wind, waves, water depths, ice conditions, water quality, and technological constraints.

Harbors, Docks, Piers, Boat Ramps, and Piling Supported Structures

At present there are two major harbors in Kachemak Bay; the Homer Small Boat Harbor and the Seldovia Small Boat Harbor. Those facilities serve both commercial and recreational needs and are composed of solid fill breakwaters and piling with floating docks. There are also public docks (piling with floating docks) at Jakolof Bay and Halibut Cove. State Parks maintains a floating dock at the head of Halibut Cove Lagoon. Scattered through the bay are over 300 floats or docks that are privately owned. Most of these are located in the vicinity of Homer Spit or between Bear Cove and Seldovia Bay. A barge docking facility is located at the Bradley Lake Hydropower Project site.

Log Storage/Transfer Facilities

In the late 60's, the State of Alaska sold a large tract of timber in the Rocky River area for Japanese export. All of these logs were transported to a cant mill located in Jakolof Bay for milling. The logs were bundled, rafted, stored in water, then towed to Kasitsna Bay where they were loaded on the Japanese vessel. The timber in the sale area was harvested through the 70's and the land eventually turned over to the Seldovia Native Association. By 1983, lumber hauling ships were no longer scheduled for Kasitsna and the Jakolof sawmill was converted to a dimension lumber mill.

The other major logging operation occurred in Seldovia Bay on native owned land. About 2 million board feet of logs were harvested, bundled, and stored on dry land adjacent to upper Seldovia Bay while a market was located.

Prior to the pending purchase of timber rights on the south side of Kachemak Bay by the State of Alaska in 1993, construction of a 1,200 ft. solid fill jetty/ramp into the bay at McKeon Flats and a second ramp near the mouth of Peterson Bay for the purpose of storing logs in water had been discussed. It had been proposed that the logs would be towed across Peterson Bay to a 10-acre in-water storage area from which the logs were proposed to be loaded on a ship for export.

Pipelines and Utility Lines

Major wastewater sewage disposal sites are located in Kachemak Bay waters near Homer and Seldovia. The system serving the City of Homer and Kachemak City has a secondary treatment plant for sewage. The outfall is located at minus 10.18 foot tide level MLLW near the outlet of Beluga Lake and extends 2200 feet offshore. Sewage in Seldovia is collected and discharged directly into outer Seldovia Bay just north of Wade Point with primary treatment achieved through a community septic tank. The outfall pipeline extends 700 feet from shore to minus 11 MLLW. Seafood waste processing outfalls are found in the Homer small boat harbor.

There are numerous individual wastewater-sewage disposal systems around the perimeter of Kachemak Bay. Present Alaska Department of Environmental Conservation regulations permit the discharge of treated sewage wastewater into the marine environment from DEC approved systems.

An underwater electrical transmission line crosses Seldovia Bay and one crosses Kachemak Bay between Homer Spit and China Poot Bay. Overhead electrical transmission lines cross Halibut Cove, China Poot Bay, Tutka Bay and Jakolof Bay. Several private water lines are found on the south side of the bay.

Mineral Resource Extraction

Currently there are no mining claims or mining leases within the critical habitat areas. However, some tide and submerged lands within Kachemak Bay Critical Habitat Area have been staked and applied for under the offshore prospecting permit program (OPP).

Soft sub-bituminous coal is found in seams along the north shore of Kachemak Bay and in Mud Bay. Historically, the bluffs along the north shore of Kachemak Bay have been explored for coal with shafts sunk at McNeil and Eastland Canyons. Coal Bay was given its name because of its underlain coal beds and in the 1890's was claimed then abandoned by the Alaska Coal Company. No recent interest has been expressed in commercially mining coal in Kachemak Bay although residents regularly pick up loose coal on the beaches for home use. In the past, the mouth of Anchor River has been mined for gold.

Gravel and riprap rock are in constant demand in the Kachemak Bay area for maintenance of highways, driveways, development projects, and erosion control. Materials source sites are particularly scarce in this area. In the past, use of beach areas as a material source for small projects has taken place on a regular basis without the required permits. In the past, material (sand and gravel) has also been "borrowed" off of Homer Spit. After the subsidence of Homer Spit as a result of the 1964 earthquake, gravel removal was discontinued.

The Sadie Cove quarry on the south side of the bay is no longer in use but once included tidelands as well as uplands and provided one of the few sites where riprap was available. Because the site is

now within Kachemak Bay State Park and has been reclaimed, its use is no longer an option.

Over 1,200,000 cubic yards of gravel was removed from the Martin River Delta for use in the Bradley Lake Hydro project. This site was then reclaimed to provide for enhanced habitat of fish and wildlife.

No material extraction is currently occurring or proposed for either Kachemak Bay or Fox River Flats Critical Habitat Areas. Tide and submerged lands within Kachemak Bay State Park have been withdrawn from the public domain and are not available for material extraction.

Shoreline Alteration

In all, there are over seventy shoreline stabilization projects evident around the perimeter of Kachemak Bay. Homer Spit and McDonald Spit have experienced shoreline erosion in the wake of subsidence caused by the 1964 earthquake. An artificial reef to enhance fish habitat has been proposed for Archimandritof Shoals (Herbert, 1991).

Oil and Gas

Due to the extraordinary abundance and diversity of marine life in Kachemak Bay and the hazard posed by oil spills in the marine environment, leases for the purposes of oil and gas exploration or development are not allowed in Kachemak Bay as per AS 38.05.184. Although Fox River Flats has never been leased for oil and gas exploration and development, there is no statutory prohibition on issuance of oil and gas leases on Fox River Flats.

Oil Drilling Rig Storage

Two oil drilling rigs have been stored in Kachemak Bay in the past. The George Ferris was stored off the Homer Spit in 1976, became stuck in the mud, and the legs had to be freed with explosives. The Rowan Middleton was stored in Peterson Bay during the winter of 1984/1985 without similar incident.

Hazardous Materials

In the past, small scale experiments have been conducted on the effect of oil in the marine environment in Kachemak Bay. The Department has from time to time received reports of old car batteries and other potentially hazardous junk being discarded in the critical habitat areas.

INFORMATION NEEDS

Baseline Clam and Mussel Surveys

Although abundant clam populations make Kachemak Bay a popular commercial as well as sport/personal use clam and mussel harvest area, there are no comprehensive surveys of clam or blue mussel distribution and abundance along the shores of Kachemak Bay. As pressure on the clam resources of the bay increases, adequate baseline data with which management decisions can be made becomes ever more essential.

Baseline Water Quality Data

Water quality monitoring at strategic points around the bay is needed to determine if and when there is a water quality problem. A water quality monitoring program would not only help manage critical fish and wildlife habitats, it would also help maintain water quality for industries such as mariculture and fishing which depend upon clean water.

Crab and Shrimp Surveys

Habitat use patterns of three species of crab (king, Tanner, and Dungeness) and five species of Pandalid shrimp in Kachemak Bay are not well documented. Because of the depressed numbers of these populations in the bay, all habitats may not currently be fully utilized. Never-the-less, surveys are needed to better document use of various portions of the bay during various seasons.

Livestock Grazing on Fox River Flats

The compatibility of grazing livestock and wildlife populations, primarily waterfowl, should be examined, including construction of small livestock exclosures, to determine the effects of livestock grazing on vegetation. Work with the Soil Conservation Service and Department of Natural Resources to develop range management which will maintain critical habitat area values should continue.

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Table 1. Birds of Kachemak Bay, Alaska (Point Pogibshi to Anchor River) (Erikson 1989).

Species	Spring	Summer	Fall	Winter	Status
Red-throated Loon	C	U	C	U	r/m b
Pacific Loon	C	U	C	C	wr/m
Common Loon	C	C	C	C	r B
Yellow-billed Loon	R	R	R	R	wr
Horned Grebe	C	U	C	C	r/m b
Red-necked Grebe	C	C	C	C	r/m B
Northern Fulmar	U	C	C		sr
Pink-footed Shearwater		R			v
Flesh-footed Shearwater			R		v
Sooty Shearwater	U	C	C		v
Short-tailed Shearwater	C	AC	C		v
Forked-tailed Storm-petrel	R	U	U		sr
Leach's Storm-petrel			R		sr
Double-crested Cormorant	U	U	U	R	r b
Brandt's Cormorant		R			v
Pelagic Cormorant	C	C	C	C	r B
Red-faced Cormorant	C	C	C	R	r B
Great Blue Heron	R	R	R	R	v
Tundra Swan	U		U		m
Trumpeter Swan	U	R	U		sr/m B
Greater White-fronted Goose	U	U	U		m
Snow Goose	R		U		m
Emperor Goose				AC	v
Brant	U		R		m
Canada Goose	C	U	C		m
Green-winged Teal	C	C	C	R	sr B
Mallard	C	C	C	C	r/m B
Northern Pintail	C	U	C		sr/m B
Blue-winged Teal	R		R		m
Northern Shoveler	C	U	U	R	m
Gadwall	U	R	R		m
Eurasian Wigeon	U				v
American Wigeon	C	C	C		sr/m B
Common Pochard	AC				v
Canvasback	U		AC		m
Redhead	U		R		m

Species	Spring	Summer	Fall	Winter	Status
Ring-necked Duck	R				m
Tufted Duck	AC				v
Greater Scaup	C	C	C	C	r/m B
Lesser Scaup	R				m
Common Eider	C	C	C	C	r B
King Eider	U		R	R	wr
Steller's Eider	R		C	C	wr
Spectacled Eider				AC	v
Harlequin Duck	C	C	C	C	r B
Oldsquaw	C	R	C	C	wr
Black Scoter	C	C	C	C	r/m B
Surf Scoter	C	C	C	C	r/m
White-winged Scoter	C	C	C	A	r/m
Common Goldeneye	C	C	C	C	r B
Barrow's Goldeneye	C	C	C	C	r/m B
Bufflehead	C	R	C	C	r/m b
Common Merganser	C	C	C	C	r B
Red-breasted Merganser	U	U	U	U	r B
Osprey	R	R	R		m
Bald Eagle	C	C	C	A	r B
Northern Harrier	U	U	U	R	sr B
Sharp-shinned Hawk	C	C	C	C	r B
Northern Goshawk	C	C	C	C	r B
Swainson's Hawk	R		R		m
Red-tailed Hawk	U	U	U		sr B
Rough-legged Hawk	U	U	U		sr B
Golden Eagle	R	R	R		sr b
American Kestrel	R	R	R		m
Merlin	R	R	R	R	m
Peregrin Falcon	U	R	R	R	m
Gyrfalcon	R	R	R	R	wr
Ring-necked Pheasant	R	R	R	R	r B
Spruce Grouse	C	C	C	C	r B
Willow Ptarmigan	C	C	C	C	r B
Rock Ptarmigan	C	C	C	C	r B
White-tailed Ptarmigan	U	U	U	U	r b
American Coot			AC		v
Sandhill Crane	C	C	C		sr/m B
Black-bellied Plover	C	C	C		m
Lesser Golden Plover	C	C	C		m
Semipalmated Plover	C	C	C		sr/m B

Species	Spring	Summer	Fall	Winter	Status
Killdeer		R	R		v
Black Oystercatcher	R				sr
Greater Yellowlegs	C	C	C		sr B
Lesser Yellowlegs	U	U	U		sr b
Solitary Sandpiper	R	R	R		m
Wandering Tattler	C	C	C		sr
Spotted Sandpiper	C	C	C		sr B
Whimbrel	C	C	C		sr/m
Bristle-thighed Curlew	R	R			v
Hudsonian Godwit	R				m
Bar-tailed Godwit	U				m
Marbled Godwit	AC				m
Ruddy Turnstone	C	R	R		m
Black Turnstone	C	U	U		m
Surfbird	C	C	C		sr/m
Red Knot	R	R	R		m
Sanderling	U	U	U	AC	m
Semipalmated Sandpiper	C	C	C		m
Western Sandpiper	A	A	C		m
Rufous-necked Stint		AC			v
Least Sandpiper	C	U	U		sr/m b
Baird's Sandpiper	R	R	R		m
Pectoral Sandpiper	U	U	C		m
Sharp-tailed Sandpiper			U		m
Rock Sandpiper	U		U	C	wr
Dunlin	C	U	U	R	m
Stilt Sandpiper			AC		m
Short-billed Dowitcher	U	U	U		m
Long-billed Dowitcher	C	C	C		sr/m
Common Snipe	C	C	C	R	sr B
Red-necked Phalarope	C	C	C		sr B
Red Phalarope	R	R	R		v
Pomarine Jaeger	U	U	R		m
Parasitic Jaeger	R	R	R		m
Long-tailed Jaeger	R	R	R		v
Common Black-headed Gull		AC			v
Bonaparte's Gull	C	C	C		sr b
Mew Gull	C	C	C		r B
Ring-billed Gull	R	R	R	R	v
Herring Gull	C	U	C	C	r
Thayer's Gull			AC	AC	v
Slaty-backed Gull				AC	v
Western Gull			AC		v
Glaucous-winged Gull	A	A	A	A	r B

Species	Spring	Summer	Fall	Winter	Status
Glaucous Gull	U	R	U	C	wr
Black-legged Kittiwake	C	C	C	U	sr B
Red-legged Kittiwake		AC			v
Ross' Gull		AC			v
Sabine's Gull			R		v
Ivory Gull				AC	v
Caspian Tern		AC			v
Royal Tern		AC			v
Arctic Tern	C	C	R		sr B
Aleutian Tern	C	C	R		sr B
White-winged Tern			AC		v
Common Murre	A	A	C	C	r B
Thick-billed Murre			AC	R	wr
Pigeon Guillemot	C	C	C	C	r B
Marbled Murrelet	C	C	C	C	r b
Kittlitz's Murrelet	C	C	C	R	r b
Ancient Murrelet	R	R	R	R	sr b
Cassin's Auklet		R	R		v
Parakeet Auklet		R			v
Crested Auklet			R	R	v
Rhinoceros Auklet		R			v
Tufted Puffin	C	C	C		sr B
Horned Puffin	C	C	C	R	sr B
Morning Dove			AC	AC	v
Great Horned Owl	C	C	C	C	r B
Snowy Owl				R	wr
Northern Hawk-Owl	R	R	R	R	sr b
Great Grey Owl	R	R	R	R	r b
Short-eared Owl	U	U	R	R	sr B
Boreal Owl	U	U	U	U	r b
Northern Saw-whet Owl	U	U	U	R	r B
Common Nighthawk	R	R			v
Rufous Hummingbird		R	U		v
Belted Kingfisher	C	C	C	C	r B
Red-breasted Sapsucker				R	v
Downy Woodpecker	U	U	U	U	r B
Hairy Woodpecker	R	R	R	R	r b
Three-toed Woodpecker	U	U	U	U	r b

Species	Spring	Summer	Fall	Winter	Status
Black-backed Woodpecker				R	r
Northern Flicker	R	R	U	U	r
Olive-sided Flycather	R	U	U		sr B
Alder Flycather	U	C	C		sr B
Say's Phoebe	R	R	R		m
Horned Lark	R	U	U	R	sr b
Tree Swallow	C	C	C		sr B
Violet-green Swallow	C	C	C		sr B
Bank Swallow	C	C	C		sr B
Cliff Swallow	C	C	C		sr B
Gray Jay	C	C	C	C	sr B
Steller's Jay	C	C	C	C	r B
Black-billed Magpie	C	C	C	C	r B
Northwestern Crow	C	C	C	C	r B
Common Raven	C	C	C	C	r B
Black-capped Chickadee	C	C	C	C	r B
Boreal Chickadee	C	C	C	C	r B
Chestnut-backed Chickadee				R	v
Red-breasted Nuthatch	C	C	C	C	r b
Brown Creeper	C	C	C	C	r b
Winter Wren	C	C	C	C	r B
American Dipper	C	C	C	C	r B
Golden-crowned Kinglet	C	C	C	C	r B
Ruby-crowned Kinglet	C	C	C	R	r B
Northern Wheatear	R	R	R		m
Gray-cheeked Thrush	U	U	U		sr B
Swainson's Thrush	C	C	C		sr B
Hermit Thrush	C	C	C		sr B
American Robin	C	A	A	U	sr B
Varied Thrush	C	A	C	U	sr B
Yellow Wagtail		R			v
Water Pipit	C	C	C	R	sr b
Bohemian Waxwing		R	C	C	m
Northern Shrike	U	U	U	U	r B
European Starling				R	v
Orange-crowned Warbler	C	C	C		sr B
Yellow Warbler	C	C	C		sr B
Yellow-rumped Warbler	C	C	C		sr B
Townsend's Warbler	C	C	C		sr B
Blackpoll Warbler	U	U	U		sr b
Northern Waterthrush	U	U	U		sr b
Wilson's Warbler	C	C	U	R	sr B
Western Tanager	AC				v
American Tree Sparrow	U	R	U	U	wr

Species	Spring	Summer	Fall	Winter	Status
Savannah Sparrow	A	A	C		sr B
Fox Sparrow	C	C	C	R	sr B
Song Sparrow	C	C	C	C	r B
Lincoln's Sparrow	C	C	C	R	sr B
White-throated Sparrow				AC	v
Golden-crowned Sparrow	C	C	C	C	r/m B
White-crowned Sparrow	C	C	C	C	r/m B
Harris' Sparrow				AC	v
Dark-eyed Junco	C	C	C	C	r/m B
Lapland Longspur	C	R	C	R	m
Rustic Bunting	AC				v
Snow Bunting	U			U	wr
McKay's Bunting				AC	v
Red-winged Blackbird	R	R			v
Rusty Blackbird	C	C	C	R	sr B
Brown-headed Cowbird				R	v
Rosy Finch	C		C	C	wr
Pine Grosbeak	C	C	C	C	r B
Purple Finch	R			R	v
Cassin's Finch	AC				v
Red Crossbill	R	R	R	R	n b
White-winged Crossbill	C	C	C	C-A	n b
Common Redpoll	C-A	C	C	C-A	r/n B
Hoary Redpoll	R	R	R	R	wr
Pine Siskin	C	C	C	C-A	r/n B

Legend

AAbundant-species occurs consistently in proper habitat, with available habitat densely occupied, and/or the region regularly hosts great numbers of the species.

CCommon-species occurs in all or nearly all proper habitats, but some areas of presumed suitable habitat are occupied sparsely or not at all, and/or the region regularly hosts large numbers of the species.

UUncommon-species occurs regularly, but utilizes only some or very little of the suitable habitat, and/or the region regularly hosts relatively small numbers; species not observed regularly, even in proper habitat.

RRare-species occurs, or probably occurs, regularly in the region, but in very small numbers.

AC Accidental-species has been recorded no more than a few times, but irregular observations are likely over a period of years.

Status

r - resident
sr - summer resident
wr - winter resident
m - migrant
B - confirmed breeder
n - nomadic
b - probable breeder
v - visitant: non-breeding species, also a species not directly en route between breeding and winter range.

Sp - spring: March - May
F - fall: September - November
Su - summer: June - August
W - winter: December - February

Table 2. Densities of birds along the Kachemak Bay coastline as determined by aerial surveys in 1976 and 1978 (Arneson 1980).

	Density (birds/km^2)															
	Outer Bay															
	North Shore						South Shore						Inner Bay			
Bird Group	Sp		Su		F	W	Sp		Su	F	W		Sp		Su	F	W	
Loons	1	P	1	P			P	P	P	1			P	P	0	P		
Grebes	P	0	P	P			P	0	P	0			P	P	P	0		
Tubenoses	0	0	0	0	0	0	0	0			0	0	0	0				
Cormorants	1	0	4	4	2	P	6	1			P	P	4	P				
Geese and swans	0	0	0	P	0	0	0	0					14	0	4	0		
Dabbling ducks	0	0	0	0	1	0	8	P			9	1	38	20				
Diving ducks	0	0	P	P	4	P	P	10			49	2	7	23				
Sea ducks	33	93	78	43	40	5	27	31			76	109	29	33				
Mergansers	P	0	0	0	2	P	P	1					5	1	P	1		
Raptors	0	0	P	P			P	P	P	P			P	P	P	P		
Shorebirds	0	1	0	4			5	0	P	2			71	2	1	12		
Gulls	12	35	19	29			19	14	33	1			33	111	66	1		
Terns	0	1	0	0			0	0	0	0			0	1	0	0		
Alcids	4	0	2	1			2	P	P	2					1	P	P	1
Corvids	0	0	0	P			P	P	2	2			1	P	3	5		
TOTAL[2]	51	130	105	82			78	20	70	52					262	229	152	99

[1] P = present.
[2] Includes other passerines and unidentified birds that were observed.

Table 3. Density of birds offshore in Kachemak Bay as determined by aerial surveys in 1976 and 1978 (Arneson 1980).

Bird Group	Density (birds/km^2)			
	Spring	Summer	Fall	Winter
Loons	P	P	P	P
Grebes	0	0	P	0
Tubenoses	0	0	0	0
Cormorants	P	0	P	P
Geese and swans	0	0	0	0
Dabbling ducks	0	0	P	0
Diving ducks	0	0	5	0
Sea ducks	24	P	13	7
Mergansers	0	0	0	0
Raptors	0	0	0	0
Shorebirds	0	0	P	0
Gulls	1	9	16	3
Terns	P	1	0	0
Alcids	7	2	9	8
TOTAL[2]	32	12	44	18

[1] P = present

[2] Includes passerines and other unidentified birds that were observed.

Table 4. Aerial surveys of birds on Fox River and Martin River flats, Alaska (from Erikson 1977 and Krasnow and Halpin 1981).

Species	4/9/76	4/16/76	4/30/76	5/3/76	5/15/76	9/30/79	10/13/79	11/3/79	11/12/79	12/17/79
Trumpeter Swan										
Swan spp.		1				46				
Canada goose	370	335	640	1,030	285	1,130	1,110	125		
Brant										
White-fronted goose										
Snow goose			5					1		
Unidentified duck				90						
Unidentified dabbler		161	74	76	15	1,406	235	25	590	
Mallard	2,000	207	20	36	82	357	2,253	2,450	3,032	7
Northern pintail	225	39	2	292		32	32		40	
Green-winged teal				12	10		30	17		
American wigeon				85		25	232			
Greater scaup				130	53					
Goldeneye spp.			12	49				33	69	5
Bufflehead			2	8				46	45	
Oldsquaw				2			2		28	1
White-winged scoter				155						
Surf scoter				60			7	10	20	
Black scoter							15			7
Merganser spp.				16	4					
Common merganser				80			4			
Red-breasted merganser				1	15	225	1,196	65	12	11
Bald eagle				2		2	5		4	
Large shorebird				5	45	2				
Small shorebird			8,000	4,058	1,022		1			100
Unidentified gull				100	32			130		
Glaucous-winged gull				595	182	6	30	10	175	3
Herring gull				27						
Mew gull				95	15	366	1,747	4,585	610	10
Bonaparte's gull				3	25					
Black-legged kittiwake										
Arctic tern										

Note: Thirty-eight sandhill cranes were seen on Fox River Flats on October 13, 1979.
An estimated 1-2 million small shorebirds were seen on Fox River Flats on May 11, 1976 (W. Ballard, pers. commun.).

Table 4 Continued. Aerial surveys of birds on Fox River and Martin River flats, Alaska (from Erikson 1977 and Krasnow and Halpin 1981).

Species	1/30/80	2/26/80	3/19/80	4/20/80	4/27/80	4/30/80	5/5/80	5/8/80	5/16/80	6/12/80
Trumpeter Swan							1			2
Swan spp.					12					
Canada goose										
Brant									125	
White-fronted goose										
Snow goose										
Unidentified duck										
Unidentified dabbler		16	69		150	118	40		4	26
Mallard		1,153	654	114	32	19	51	34	13	2
Northern pintail				78	56	4			10	
Green-winged teal									4	
American wigeon					2				10	
Greater scaup						97		121		
Goldeneye spp.	7	33	63							
Bufflehead			37							
Oldsquaw		183			24		1			
White-winged scoter										
Surf scoter		2				4	2		4	
Black scoter		18								
Merganser spp.								30		
Common merganser				5			3	2		4
Red-breasted merganser		4		66	36	40	12	10		4
Bald eagle					1		2	1	4	2
Large shorebird										
Small shorebird		75		20		83	1,081	271	4	21
Unidentified gull				42	50	242	224	326	367	20
Glaucous-winged gull		25	45	115	104	92	11	12	100	20
Herring gull									12	
Mew gull	3	1	13		85	46	50		4	
Bonaparte's gull									6	
Black-legged kittiwake								1	1	13
Arctic tern							15	24	1	12

Table 4 Continued. Aerial surveys of birds on Fox River and Martin River flats, Alaska (from Erikson 1977 and Krasnow and Halpin 1981).

Species	6/27/80	7/16/80	8/5/80	8/14/80	8/21/80	8/28/80	9/2/80	9/9/80	9/17/80	9/23/80
Trumpeter Swan				1		1				
Swan spp.							3	9	4	
Canada goose				348	120	796	200	300	127	1,080
Brant										
White-fronted goose					115					
Snow goose										
Unidentified duck			51	4	20	46		12		12
Unidentified dabbler	15		6	289	386	78	195	151	52	261
Mallard		8	195	61	882	355	218	130	1,918	2,906
Northern pintail					300	440	39		416	12
Green-winged teal			12		102	359	54	57	2	2
American wigeon					26	4	112	105	33	34
Greater scaup			2							
Goldeneye spp.										
Bufflehead										
Oldsquaw										
White-winged scoter			1	1						
Surf scoter		1,350	1,000	290	270	2	150	57	247	56
Black scoter		50	2,000		250		100	25		2
Merganser spp.										
Common merganser										
Red-breasted merganser			242		100			104	2	2
Bald eagle					1	1		1	2	
Large shorebird	2	196	18	22	33					1
Small shorebird	110	591	42	2	39	3	25	103		49
Unidentified gull	613	15	130		1,299	60	248	135	60	
Glaucous-winged gull		1,353	51	750	70	1,700	215	226	152	
Herring gull	4		3	2	2	2	592	422	642	2,475
Mew gull	202	1,509	824	452	1,023	2,551	465	258	330	625
Bonaparte's gull		30	6							
Black-legged kittiwake	1	1	220							
Arctic tern	8	196	1		20		2			

Table 5. Aerial surveys of birds and livestock on Fox River and Martin River flats, Alaska, Spring 1992 (Del Frate 1992, Sinnott 1992).

Species	April 27	May 5	May 8	May 14
Swan spp.	8		1	3
Canada goose	645	369	327	377
White-fronted goose	few	50	20+	
Snow goose	13			
Sandhill crane	26	6	10	
Unidentified duck				269
Unidentified dabbler		323+	600+	
Unidentified divers		136	149	
Mallard	345+			85
Northern shoveler	10+			11
Northern pintail	130+			713
Green-winged teal	10+			25
American wigeon	10+			22
Scaup spp.				443
Goldeneye spp.	75+			10
Merganser spp.	75+			16
Bald eagle				40
Shorebirds	?	22,000+	35,000+	7,900+
Cows and calves	201	125	153	164
Horses	12	6	22	29

Accuracy of each survey was affected to some degree by either poor visibility, inexperienced observers, or limited flight time.

Table 6. Calculated duck population at Fox River Flats, Alaska, on May 25, 1976 (from Timm 1976).

Species	Number	% of Total
Northern pintail	150	19.6
Green-winged teal	158	20.7
Mallard	69	9.0
TOTAL DABBLING DUCKS	438	57.3
Goldeneye spp.	183	23.9
Merganser spp.	144	18.8
TOTAL DIVING DUCKS	327	42.7

Table 7. Fall migration aerial survey of birds on Fox River and Martin River flats at the head of Kachemak Bay, Alaska, August 17 -October 2, 1976 (from Erikson 1977).

Species	Aug. 17	Aug. 27	Sep. 22	Oct. 2
Red-throated loon	1			
Grebe sp.				2
Swan sp.		1	15	
Canada goose	706	1,541	1,205	345
White-fronted goose			15	25
Unidentified duck	2			
Unidentified dabbling duck	571	63	620	1,159
Mallard	192	330		920
Northern pintail	1	13	775	30
Green-winged teal	164	23	151	
American wigeon	10	45	118	815
Greater scaup				28
Bufflehead				2
Scoter sp.	1,396	301		36
White-winged scoter		91		2
Surf scoter	14			
Red-breasted merganser				15
Bald eagle (adult)			1	
Bald eagle (immature)		1		
Large shorebird	1			
Whimbrel	2			
Medium shorebird			2	45
Small shorebird	82		420	
Unidentified gull	274	900		824
Glaucous-winged gull	91	440	13	119
Herring gull	1	27		
Gl.-winged x herring gull				1
Small gull				30
Mew gull	8	225	1	340
Black-legged kittiwake	899	50		2
Sabine's gull				1
Unidentified tern	1			
Northwestern crow				15

Table 8. Spring migration of shorebirds on Homer Spit and Mud Bay, Homer, Alaska (West 1992b).

Species	Total Number of Individuals Seen					
	1986	1989	1990	1991	1992	Ave.
Black-bellied plover	2,000	7	221	148	3,092	1,094
Lesser golden plover	0	30	24	48	72	35
Semipalmated plover	40	30	4	39	90	41
Wandering tattler	0	0	0	15	6	4
Whimbrel	2	9	3	15	82	22
Bristle-thighed curlew	0	0	0	7	0	1
Hudsonian godwit	0	0	0	0	1	<1
Bar-tailed godwit	0	0	0	5	5	2
Marbled godwit	0	4	0	3	3	2
Ruddy turnstone	5	3	5	13	36	12
Black turnstone	3,060	1,338	7,097	3,376	6,306	4,235
Surfbird	6,450	1,355	16,449	3,908	40,476	13,728
Red knot	0	0	0	8	0	2
Semipalmated sandpiper	0	0	0	0	3	1
Western sandpiper	72,325	58,000	29,745	74,971	94,154	65,839
Least sandpiper	164	80	0	23	78	69
Pectoral sandpiper	16	0	0	1	1	4
Baird's sandpiper	0	1	0	0	1	<1
Rock Sandpiper	0	0	0	0	42	8
Dunlin	2,325	7,275	1,820	4,097	12,649	5,633
Dowitcher spp.	3,100	2,605	327	728	7,712	2,894
TOTAL SPECIES	11	13	10	17	19	14
TOTAL INDIVIDUALS	89,487	70,737	55,695	87,405	164,811	93,627

Table 9. Species and numbers of seabirds at breeding colonies in Kachemak Bay, Alaska (Sowls et al. 1978; Nishimoto and Thomas, 1991).

Species	Gull Island 1976	1984	1985	1986	1987	1988	1989	1990
Pelagic cormorant	222		105	272	296			246
Red-faced cormorant	62		14	45	56			29
Common eider2								
Glaucous-winged gull	216	200	442				762	713
Black-legged Kittiwake	3,194		8,202					6,986
Common murre	3,200	2,652	1,994			5,500	5,176	5,075
Pigeon guillemot	12	5	13		42	27	24	19
Horned puffin	10							
Tufted puffin	530		8					28

	Sixty-foot Rock 1976	1984	1985	1986	1987	1988	1989	1990
Pelagic cormorant	0	30	28	13	9	2	29	62
Red-faced cormorant	0		0	0	0	0	0	1
Common eider								
Gluaucous-winged gull	64	21		113	86	96	95	80
Black-legged kittiwake	68			289	250	414	351	391
Common murre	350	234	91	99	221	155	232	190
Pigeon gullemot	0	0		2	3			3
Horned puffin								
Tufted puffin	52	17		13	5	1	5	1

	Hesketh Island 1976	Pt. Pogibshi 1976	Grass Island 1976
Pelagic cormorant			
Red-faced cormorant			
Common eider			
Glaucous-winged gull			
Black-legged Kittiwake			25
Common murre			
Pigeon guillemot	20		
Horned puffin	4		
Tufted puffin		20	

Table 10. Terrestrial mammals of the Fox River Flats Critical Habitat Area[1] (Lensink 1980, Woodward-Clyde Consultants 1984).

Common Name	Scientific Name
Masked shrew	Sorex cinereus
Pygmy shrew	Microsorex hoyi
Little brown bat	Myotis lucifugus
Black bear	Ursus americanus
Brown bear	U. arctos
Marten	Martes americana
Ermine	Mustela erminea
Mink	M. vison
River otter	Lutra canadensis
Wolverine	Gulo gulo
Coyote	Canis latrans
Grey wolf	C. lupus
Red fox	Vulpes vulpes
Lynx	Felix lynx
Red squirrel	Tamiasciurus hudsonicus
Beaver	Castor canadensis
Northern red-backed vole	Clethrionomys rutilus
Meadow vole	Microtus pennsylvanicus
Snowshoe hare	Lepus americanus
Moose	Alces alces

[1] Other probable species include northern flying squirrel (Glaucomys sabrinus), muskrat (Ondatra zibethicus), meadow jumping mouse (Zapus hudsonius), porcupine (Erethizon dorsatum)

Table 11. Marine mammals of Kachemak Bay Critical Habitat Area.

Common Name	Scientific Name
Harbor seal	Phoca vitulina
River otter	Lutra canadensis[1]
Sea otter	Enhydra lutris
Steller sea lion	Eumetopius jubatus
Gray whale	Eschrichtius robustus
Minke whale	Balaenoptera acutorostrata
Humpback whale	Magaptera novaeangliae
Belukha whale	Delphinapterus leucas
Killer whale (orca)	Orcinus orca
Harbor porpoise	Phocoena phocoena
Dall porpoise	Phocoenoides dalli

[1] River otters are not a marine mammal, but they forage in the intertidal zone and occasionally swim near shore.

Note: A Bering Sea beaked whale (Mesoplodon stejnegeri) carcass washed ashore on Homer Spit in 1977, but normal range is in deeper waters of the continental shelf.

Table 12. Kachemak Bay/Fox River Flats Critical Habitat Area Leases/Inholdings as shown on the Land Status map.

	Location	Type	ADL#	Party	Acreage
1.	T4S/R10W/S20+	Grazing Lease	24501	Fox R. Cattlemen Asc. ~400 in CHA	
2.	T4S/R10W/S20+	Grazing Lease	17484	Kachemak Selo	~80 in CHA
3.	T4S/R10W/S29	Private Land	USS3358	Kachemak Selo	
4.	T4S/R10W/S21	Private Land	USS3003	John Nazarian	
5.	T4S/R10W/S21-22	Private Land	USS4725	John Nazarian	
6.	T4S/R10W/S35	Tidelands Lease	222657	Alaska Power Authority	512
7.	T5S/R10W/S20	Tidelands Sale	17552	Douglas B. Baily	.1
8.	T5S/R10W/S29	Tidelands Sale	23985	Theodore Pedersen	5
9.	T5S/R15W/S8+	Offsh. Prosp. Pmt. Appln.	323349	Bob Moorman	
	T5S/R15W+	Offsh. Prosp. Pmt. Appln.	330480-330483	Aspen Exp. Corp.	
10.	T6S/R13W/S11	Tidelands Lease	32058	Lee A. Cole	10
11.	T6S/R13W/S11	Tidelands Lease	209326	Northern Enterprises	1
12.	T6S/R13W/S21&22	Management Right	220606/220607	ADOT/PF	15
13.	T6S/R13W/S36	Tdld. Lease (Exp. 7/2/44)	224560	Homer, City of	11.9
14.	T7S/R13W/S1	Class 1 Pref. Right	19361	Mary Jane Hillstrand	1.7
15.	T7S/R11W/S5	Tidelands Sale	18455	John Bingham Mitchell	.5
16.	T7S/R11W+	Public Easement	25909	Homer Elec. Assoc., Inc.	
17.	T7S/R11W/S6	Mngmnt. Agreement (ILMA)	32063	ADOT/PF	3
18.	T7S/R11W/S6&7	Shore Fishery Lease	201311	Alvin Taeschner	.1
19.	T7S/R11W/S6	Tidelands Lease Appln.	214964	Stephen H. Nathanson	.5
20.	T7S/R11W/S6	Tidelands Lease Appln.	218228	Theodore A. Richards	.3
21.	T7S/R11W/S6	Shore Fishery Lease Appln.	224059	D. L. Veerhusen-Shapiro	
22.	T7S/R11W/S6&7	Shore Fishery Lease Appln.	225022	Lynn D. Bennett	
23.	T7S/R11W/S6&7	Private Easement Appln.	225482	Lee M. Ricketts	
24.	T7S/R11W/S6	Tdlds. Dis./Pref. Rights	2461	Francis A. Panchott	1.1
25.	T7S/R12W/S11	Tidelands Permit Appln.	225516	Seldovia Native Assoc.	2.8
26.	T7S/R11W/S6	Tdlds. Dis./Pref. Rights	22648	Warren H. Sherwood	.4
27.	T7S/R11W/S6	Tdlds. Dis./Pref. Rights	3298	Alvin Taeschner	.9
28.	T7S/R11W/S6	Tdlds. Dis./Pref. Rights	18012	Ted Richards	.7
29.	T7S/R11W/S6	Tidelands Disposal	22466	D. K. & J. A. Rutzebeck	.5
30.	T7S/R11W/S6	Tidelands Disposal	21327	Lee M. Ricketts	.5
31.	T7S/R12W/S15	Private Easement Appln.	211154	Michael Peter McBride	.001
32.	T7S/R12W/S1	Public Easement Appln.	218554	Marian Beck	
33.	T7S/R12W/S1	Tidelands Lease Appln.	221470	Vivian MacInnes	
34.	T7S/R12W/S1	Tidelands Permit	224724	Gary P. Mandzik	1
35.	T7S/R12W/S1	Cl. 1 Pref. Right (4 lots)	17578	Clement Tillion	
36.	T7S/R13W+	Public Easement	43341	Homer Elec. Assoc., Inc. 3.1	
37.	T8S/R13W/S21	Tdlds Lease (Exp. 11/2/35)	73331	Luther L. Paine	.09
38.	T8S/R13W/S21	Tdlds Lease (Exp. 11/2/35)	73332	Robert P. Pfeil	.3
39.	T8S/R13W/S36	Mngmnt. Agreement (ILMA)	200098	ADF&G	6.8
40.	T8S/R13W/S22	Tidelands Lease Appln.	216321	Jon L. Osgood	.5
41.	T8S/R13W/S22	Tidelands Lease Appln.	224666	E. W. & R. E. Kianich	1
42.	T8S/R13W/S22	Tidelands Lease Appln.	224692	John P. Vaughan	1
43.	T8S/R13W/S33	Tidelands Lease Appln.	224702	Ernest & Janice Suoja	<1
44.	T8S/R13W/S20	Shore Fishery Lease Appln.	225083	Sera Baxter	
45.	T8S/R14W+	Public Easement	61867	Homer Elec. Assoc., Inc.	
46.	T8S/R14W/S29&32	Mngmnt. Agreement (ILMA)	63789	ADOT/PF	32.7
47.	T8S/R14W/S24	Public Easement	222315	Jack A. Hepworth	.23
48.	T8S/R14W/S31	Public Easement Appln.	224683	Seldovia, City of	2
49.	T8S/R14W/S1	Shore Fishery Lease Appl.	225141	Warren R. Brown	
50.	T9S/R14W/S6	Public Easement	65751	Homer Elec. Assoc., Inc. 1.1	
51.	T9S/R14W/S6	Cl. 1 Pref. Right	22406	Claire Pease, et. al.	1
52.	T9S/R15W/S1	Shore Fishery Lease Appln.	225420	Alexandra B. Chartier	

Table 13.Exvessel value of salmon caught in the Southern District commercial fishery (in dollars) by species, obtained by using the formula avg. wt. per fish X total number of fish caught. (Lee Hammarstrom, pers. commun.)

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1961	$192	$14,550	$1,413	$94,974	$1,820	$112,949
1962	$287	$24,158	$2,145	$270,744	$5,084	$302,417
1963	$433	$19,161	$4,281	$44,120	$4,333	$72,329
1964	$419	$25,199	$8,415	$93,244	$6,779	$134,056
1965	$49	$16,643	$814	$25,995	$1,711	$45,212
1966	$305	$17,264	$4,307	$70,307	$17,252	$109,436
1967	$985	$41,104	$2,569	$39,808	$15,174	$99,641
1968	$0	$29,478	$4,685	$83,178	$3,289	$120,630
1969	$0	$22,754	$781	$46,909	$2,467	$72,911
1970	$838	$18,980	$4,338	$97,375	$7,267	$128,797
1971	$563	$30,917	$4,764	$31,542	$2,828	$70,614
1972	$776	$69,962	$3,444	$7,118	$9,536	$90,836
1973	$2,883	$93,592	$2,952	$97,476	$7,700	$204,603
1974	$4,993	$278,885	$14,073	$96,186	$10,987	$405,125
1975	$2,876	$103,600	$13,104	$1,223,359	$17,739	$1,360,678
1976	$6,476	$173,860	$7,868	$151,422	$6,481	$346,106
1977	$5,862	$338,473	$4,072	$208,843	$27,879	$585,129
1978	$53,198	$1,367,707	$34,345	$264,349	$25,658	$1,745,257
1979	$34,898	$359,940	$59,848	$1,485,298	$40,447	$1,980,431
1980	$11,679	$207,776	$51,131	$642,458	$18,678	$931,721
1981	$17,280	$522,575	$50,847	$2,367,083	$83,031	$3,040,816
1982	$24,608	$273,628	$56,102	$218,265	$76,449	$649,052
1983	$19,562	$501,266	$17,302	$517,691	$38,102	$1,093,923
1984	$24,557	$792,827	$21,636	$306,301	$20,098	$1,165,420
1985	$45,114	$494,375	$35,469	$399,545	$14,014	$988,517
1986	$19,982	$221,765	$22,624	$479,589	$13,511	$757,471
1987	$26,200	$702,950	$17,737	$133,067	$19,205	$899,158
1988	$31,652	$1,263,624	$47,852	$2,045,717	$61,131	$3,449,975
1989	$33,294	$721,663	$32,668	$1,224,485	$10,805	$2,022,915
1990	$28,802	$523,728	$6,612	$149,593	$10,827	$719,562
1991	$19,273	$593,401	$18,020	$85,839	$3,973	$720,506
Total	$398,762	$9,272,404	$538,200	$12,916,042	$580,281	$23,705,689
30Yr.Avg.	$13,292	$309,080	$17,940	$430,535	$19,343	$790,190
1971-90Avg	$19,763	$452,156	$25,223	$602,469	$25,755	$1,125,366
1971-80Avg	$12,420	$302,471	$19,560	$420,805	$16,793	$772,050
981-90Avg	$27,105	$601,840	$30,885	$784,134	$34,717	$1,478,681
'91%of	2.67%	82.36%	2.50%	11.91%	0.55%	100.00%

Table 14. Historical commercial Tanner crab catch (pounds) and effort in the Southern District of the Cook Inlet Management Area, 1968-1992. (Dave Nelson, pers. commun.)

Season	Pounds	Number of Vessels
1968-69	1,388,282	
1969-70	1,147,154	
1970-71	1,046,803	
1971-72	2,462,956	
1972-73	2,935,662	
1973-74	1,387,535	
1974-75	967,762	
1975-76	1,339,245	
1976-77	2,009,633	35
1977-78	2,806,568	55
1978-79	2,323,420	75
1979-80	1,134,940	68
1980-81	1,047,630	46
1981-82	548,529	41
1982-83	584,908	48
1983-84	996,763	45
1984-85	1,229,298	83
1985-86	1,164,261	103
1987	1,077,379	87
1988	944,763	127
1989	CLOSED	--
1990	CLOSED	--
1991	271,379	68
1992	354,868	107
Average	1,166,790	62

Table 15. Historical commercial King crab catch in pounds by season, in the Southern District of the Cook Inlet Management Area, 1960-1990. (ADF&G 1992b).

Season	Pounds
1960-61	2,699,680
1961-62	1,619,642
1962-63	2,763,343
1963-64	1,960,426
1964-65	1,892,479
1965-66	1,948,012
1966-67	1,347,904
1967-68	1,117,397
1968-69	750,906
1969-70	1,464,721
1970-71	1,540,018
1971-72	1,992,224
1972-73	1,391,024
1973-74	1,971,841
1974-75	1,816,512
1975-76	1,674,872
1976-77	1,035,316
1977-78	584,090
1978-79	664,388
1979-80	853,584
1980-81	508,670
1981-82	183,899
1982-83	CLOSED
1983-84	CLOSED
1984-85	CLOSED
1985-86	CLOSED
1986-87	CLOSED
1987-88	CLOSED
1988-89	CLOSED
1989-90	CLOSED
1990-91	CLOSED

Table 16. Commercial Dungeness crab catch by year, Southern District, 1961-1991. (Dave Nelson, pers. commun.)

Year	Catch (Pounds)
1961	193,683
1962	530,770
1963	1,665,599
1964	417,005
1965	74,211
1966	12,523
1967	7,168
1968	484,452
1969	49,894
1970	209,819
1971	97,161
1972	38,930
1973	308,777
1974	718,729
1975	361,893
1976	118,903
1977	74,195
1978	1,212,571
1979	2,130,963
1980	1,875,281
1981	1,850,977
1982	818,380
1983	746,585
1984	799,638
1985	1,389,891
1986	550,968
1987	761,423
1988	677,334
1989	170,266
1990	28,938[1]
1991	CLOSED

[1] East of Spit opened June 29, closed August 8, by Emergency Order; West of Spit opened June 1 by regulation; closed September 7 by Emergency Order; closures due to low stock conditions.

Table 17. Trawl shrimp catches in the Kachemak Bay trawl shrimp fishery in the Cook Inlet Management Area, 1969-1991. (ADF&G, 1992b).

Season	Number of Vessels	CATCH (lbs) Jun 1 - Oct 31	Nov 1 - Mar 31	Apr 1 - May 31	Total
1969-70[a]	7	1,289,656	1,692,854	889,330	3,871,840
1970-71[a]	3	3,211,924	2,076,228	617,836	5,905,988
1971-72[a]	7	2,618,630	1,761,569	140,707	4,520,906
1972-73[a]	10	2,772,422	2,109,660		4,882,082
1973-74[b]	13	2,502,154	2,323,780		4,825,934
1974-75	4	2,512,764	2,519,148		5,031,912
1975-76	4	1,997,563	2,421,456		4,419,019
1976-77	5	2,545,885	2,453,101		4,998,986
1977-78	7	2,490,969	2,546,977		5,037,946
1978-79	6	2,952,733	3,060,066		6,012,799
		Jul 1 - Sep 30	Oct 1 - Dec 31	Jan 1 - Mar 31	
1979-80	7	2,013,298	2,052,646	1,731,483	5,797,427
1980-81	15	1,780,298	2,691,746	1,704,706	6,177,129
1981-82	23	1,614,868	1,686,781	1,693,850	4,995,499
1982-83	15	998,522	1,012,388	1,009,857	3,020,767
1983-84	10	CLOSED	CLOSED	525,508	525,508
1984-85	10	519,651	528,506	518,529	1,566,686
1985-86	5	488,606	257,782	503,340	1,249,728
1986-87	3	504,206	CLOSED	CLOSED	504,206
1987-88	0	CLOSED	CLOSED	CLOSED	0
1988-89	0	CLOSED	CLOSED	CLOSED	0
1989-90	0	CLOSED	CLOSED	CLOSED	0
1990-91	0	CLOSED	CLOSED	CLOSED	0

[a] Catches listed for comparative purposes by seasons established in 1973.

[b] June 1 - October 31 & November 1 - March 31 seasons with respective guidelines established.

Table 18. Sport fish saltwater catch and effort by fisheries of finfish species, 1990. (Mills, 1991)

	Anglers	Trips	Days Fished	KI[a]	KS	SS	RS	PS	CS	DV AC	SH	SM	HA	RF	OTHER
SALTWATER CHARTER BOAT:															
Halibut Cove (Kachemak Bay)	30,481	24,018	30,481	52	648	614	166	584	0	325	0	66	72,172	1,876	11,389
Tutka Bay (Kachemak Bay, Homer Area)	4,661	3,885	4,661	10	188	95	0	0	0	136	0	0	8,803	225	694
Kachemak Bay (Homer)	12,282	9,951	12,282	21	178	116	10	385	23	168	0	0	29,753	791	3,820
CHARTER BOAT TOTAL	47,424[b]	37,854	47,424	83	1,014	825	176	969	23	629	0	66	110,728	2,892	15,903
SALTWATER PRIVATE BOAT:															
Halibut Cove (Kachemak Bay)	8,878	10,724	13,464	113	1,311	441	282	423	0	615	0	194	14,053	765	7,696
Tutka Bay (Kachemak Bay, Homer Area)	2,479	2,657	4,471	31	41	21	39	1,897	56	533	0	0	1,800	306	642
Homer Spit (Kachemak Bay)	9,185	11,000	15,150	123	1,096	1,303	29	537	56	502	0	65	16,300	325	3,152
Kachemak Bay (Homer)	7,597	13,349	20,050	51	154	246	19	789	167	297	0	292	21,600	2,036	8,310
PRIVATE BOAT TOTAL	28,139[b]	37,730	53,135	318	2,602	2,011	369	3,646	279	1,947	0	551	53,753	3,432	19,800
BOAT TOTAL	75,563[b]	75,584	100,559	401	3,616	2,836	545	4,615	302	2,576	0	617	164,481	6,324	35,703
**********															
**															
SALTWATER SHORELINE:															
Tutka Bay (Kachemak Bay, Homer Area)	761	599	953	31	133	72	78	309	201	554	103	0	145	19	65
Homer Spit (Kachemak Bay)	13,090	17,982	22,751	389	3,195	1,806	126	1,177	67	1,066	41	0	2,448	1,252	6,230
Seldovia Bay	405	697	1,424	31	143	123	19	286	0	51	0	0	45	143	256
SHORELINE TOTAL	14,256[b]	19,278	25,128	451	3,471	2,001	223	1,772	268	1,671	144	0	2,638	1,414	6,551
GRAND TOTAL	89,819[b]	94,862	125,687	852	7,087	4,837	768	6,387	570	4,247	144	617	167,119	7,738	42,254

[a] King Salmon less than 16 inches.

[b] Angler totals may not equal sum of sites due to some anglers fishing at more than one site.

KS - King salmon PS - pink salmon HA – halibut DV/AC - Dolly Varden/Arctic Char
SS - Sockeye salmon CS - chum salmon RF - rockfish SH - Steelhead

RS - red salmon SM - capelin

Table 19. Harvest and angler participation directed toward enhanced king, pink, and coho salmon stocks in the Homer Spit fishery, 1985-1991. (Nick Dudiak, pers. commun.)

Year	King Salmon Harvest	Pink Salmon Harvest	Coho Salmon Harvest	Total Days Fished	Total Harvest
1987	1,032				1,032
1988	5,839	2,164		20,000	8,003
1989	2,422	4,508	1,954	16,000	8,884
1990	2,222	937	2,277	37,910	5,436
Mean	2,879	2,536	2,116	24,637	5,839
1991[1]	3,500	1,500	9,000		14,000

[1] Preliminary data.

Table 20. Summary of king salmon harvest, Halibut Cove, Kachemak Bay, 1984-1991. (Nick Dudiak, pers. commun.)

Year	Sport Harvest	Commercial Harvest	Total Return
1984	412	200	612
1985	[1]	300	[1]
1986	110	350	460
1987	905	500	1,405
1988	2,911	1,350	4,261
1989	1,317	1,420	2,737
1990	1,220	810	2,030
Mean	1,145	821	1,966
1991[2]	2,250	420	2,670

[1] No data.
[2] Preliminary data.

Table 21. Harvest of China Poot Bay (Leisure Lake) sockeye salmon returns by user group, 1979 to 1991 (Nick Dudiak, pers. commun.).

Return Year	Sport Harvest	Personal Use Harvest	Commercial Harvest	Total Return [a/]
1979	650	0	ND	650
1980	1,000	1,000	12,000	14,000
1981	1,500	0	10,000	11,500
1982	450	1,320	200	3,400
1983	480	5,910	84,020	90,420
1984	500	2,000	114,360	117,360
1985	500	3,000	61,500	65,920
1986	100	150	18,350	18,800
1987	200	2,000	21,500	23,700
1988	500	1,500	91,445	93,915
1989	1,000	7,000	79,697	89,000
1990	500	3,000	49,587	54,087
1991	500	4,500	117,000 [b/]	122,000
Totals	7,800	31,380	659,659	704,752

[a/] Total return counts include estimates for escapements (i.e., non-harvested fish).

[b/] Includes Hazel Lake returns, estimated at 20,692.

ND = No Data

Table 22. Historical recreational boat harvest of Pacific halibut, 1977-1990 (Dave Nelson, pers. commun.).

Year	Kachemak Bay
1977	9,291
1978	20,422
1979	20,218
1980	21,473
1981	28,858
1982	28,254
1983	35,007
1984	36,113
1985	40,716
1986	40,917
1987	41,688
1988	88,621
1989	70,293
Mean	37,067
1990	86,383

Table 23. Kachemak Bay sport fish saltwater harvest and effort by fisheries for shellfish species, 1990 (Mills, 1991).

Anglers	6,242
Trips	6,533
Days Fished	9,301
King Crab	0
Dungeness Crab	6,840
Tanner Crab	0
Shrimp (Gallons)	1,957
Hardshell Clams (Gallons)	10,268
Other Clams	10,284
Razor Clams	20,601

Table 24. Average annual harvest of waterfowl in Kachemak Bay (including Fox River Flats) from 1981 to 1990 (Compiled by the U.S. Fish and Wildlife Service mail survey).

Species	Average Annual Harvest	Percent of Total
Dabbling Ducks		
Mallard	1,482	34
Gadwall	27	1
American wigeon	203	5
Green-winged teal	269	6
Northern shoveler	108	2
Northern pintail	261	6
Diving Ducks		
Redhead	3	<1
Greater scaup	30	1
Lesser scaup	3	<1
Ring-necked duck	6	<1
Common goldeneye	68	2
Barrow's goldeneye	362	8
Bufflehead	396	9
Oldsquaw	25	1
Harlequin duck	70	2
Steller's eider	3	<1
Common eider	6	<1
Black scoter	124	3
White-winged scoter	303	7
Surf scoter	349	8
Red-breasted merganser	69	2
Common merganser	49	1
Geese		
White-fronted goose	26	1
Canada geese	144	3
TOTAL DABBLING DUCKS	2,350	54
TOTAL DIVING DUCKS	1,866	43
TOTAL DUCKS	4,216	96
TOTAL GEESE	170	4
TOTAL WATERFOWL	4,386	100

Table 25. Estimated waterfowl harvest and hunter-days for Kachemak Bay and China Poot Bay, Alaska (Campbell 1991).

DUCKS

	Estimated Harvest			Estimated Hunter-Days		
Year	Kachemak Bay	China Poot Bay	Total	Kachemak Bay	China Poot Bay	Total
1972	4,127		4,127	1,365		1,365
1973	1,074		1,074	752		752
1974	1,580		1,580	805		805
1975	1,581		1,581	912		912
1976	3,979		3,979	1,604		1,604
1982	2,730		2,730	980		980
1983	3,337		3,337	1,595		1,595
1984	1,727		1,727	1,825		1,825
1985	1,470		1,470	1,195		1,195
1987	2,042		2,042	1,160		1,160
1988	1,618	1,848	3,466	628	595	1,223
1989	1,296	505	1,801	313	101	414
1990	647	100	747	203	48	251

GEESE

	Estimated Harvest		
Year	Kachemak Bay	China Poot Bay	Total
1972	433		433
1973	184		184
1974	80		80
1975	75		75
1976	259		259
1982	110		110
1983	44		44
1987	171		171
1988	83	10	93
1989	66	no data	66
1990	45	no data	45

Data compiled from the Alaska Waterfowl Hunter Survey.

SPECIAL AREA PERMIT REGULATIONS

Title 5 Alaska Administrative Code

ARTICLE 4.
SPECIAL AREAS

Section
400. Implementation of authority
410. Notice requirements
420. Activities requiring a special area permit
430. Conditioning, approval, or denial of special area permits
440. Limitations on special area permits

5 AAC 95.400. IMPLEMENTATION OF AUTHORITY. The commissioner will implement the authorities vested in AS 16.20.050, AS 16.20.060, AS 16.20.120, AS 16.20.170, AS 16.20.250, and AS 16.20.260, excluding hunting, trapping, and fishing, in accordance with procedures established in this chapter. (Eff. 6/5/86, Reg. 98)

Authority:	AS 16.05.020	AS 16.20.060
	AS 16.05.050	AS 16.20.120
	AS 16.05.251	AS 16.20.170
	AS 16.05.255	AS 16.20.250
	AS 16.05.270	AS 16.20.260
	AS 16.20.050	

5 AAC 95.410. NOTICE REQUIREMENTS. (a) Before a lease or other disposal of land under state jurisdiction and control in a special area, or private land in a critical habitat area, the responsible state department or agency or private landowner shall notify the commissioner.

(b) No person or governmental agency may undertake an activity listed in 5 AAC 95.420(a) within a special area unless the commissioner has been notified and a permit for the activity has been issued by the commissioner under 5 AAC 95.700 - 5 AAC 96.760. (Eff. 6/5/86. Reg. 98).

Authority:	AS 16.05.020	AS 16.20.120
	AS 16.05.050	AS 16.20.130
	AS 16.05.251	AS 16.20.170
	AS 16.05.255	AS 16.20.250
	AS 16.20.050	

5 AAC 95.420. ACTIVITIES REQUIRING A SPECIAL AREA PERMIT. (a) No person or governmental agency may engage in the following uses or activities within a special area without first obtaining a special area permit following the procedures of 5 AAC 95.700-5 AAC 95.760:

(1) construction, placement, or continuing use of any improvement, structure, or real property within a special area;

(2) destruction of vegetation;

(3) detonation of an explosive other than a firearm;

(4) excavation, surface or shoreline altering activity, dredging, filling, draining, or flooding;

(5) natural resource or energy exploration, development, production, or associated activities;

(6) water diversion or withdrawal;

(7) off-road use of wheeled or tracked equipment unless the commissioner has issued a general permit under 5 AAC 95.770;

(8) waste disposal, placement, or use of a toxic substance;

(9) grazing or animal husbandry; and

(10)any other activity that is likely to have a significant effect on vegetation, drainage, water quality, soil stability, fish, wildlife, or their habitat, or which disturbs fish or wildlife other than lawful hunting, trapping, fishing, viewing, and photography.

(b) The commissioner makes the final determination as to whether a specific activity is subject to the provisions of this chapter. (Eff. 6/5/86, Reg. 98)

Authority: AS 16.05.020 AS 16.20.120
AS 16.05.050 AS 16.20.130
AS 16.05.251 AS 16.20.170
AS 16.05.255 AS 16.20.260
AS 16.20.060

5 AAC 95.430. CONDITIONING, APPROVAL, OR DENIAL OR SPECIAL AREA PERMITS. If the procedural requirements of 5 AAC 95.700 - 5 AAC 95.760 are met, the commissioner will permit a use or activity listed in 5 AAC 95.420 that meets or can be conditioned to meet the following standards:

(1) the use or activity is consistent with the protection of fish and wildlife and their use, protection of fish and wildlife habitat, and the purpose for which the special area was established; and

(2) the use or activity does not unduly restrict or interfere with the public use and enjoyment of the resource values for which the special area was established; and

(3) any adverse effect upon fish and wildlife, and their habitats, and any restriction or interference with public use, is mitigated in accordance with 5 AAC 95.900. (Eff. 6/5/86, Reg.98)

Authority: AS 16.05.020 AS 16.20.120
AS 16.05.050 AS 16.20.130
AS 16.05.251 AS 16.20.170
AS 16.05.255 AS 16.20.260
AS 16.20.060

5 AAC 95.440. LIMITATIONS ON SPECIAL AREA PERMITS. A permit issued under 5 AAC 95.700 - 5 AAC 95.760

(1) does not convey an interest in state land or grant any preference right for the lease or purchase of state land; and

(2) does not allow the permittee to restrict or interfere with public access across or public use of a special area unless specified in the permit. (Eff. 6/5/86, Reg. 98)

Authority: AS 16.05.020 AS 16.20.120
AS 16.05.050 AS 16.20.130
AS 16.05.251 AS 16.20.170
AS 16.05.255 AS 16.20.260
AS 16.20.060

ARTICLE 7.
PERMIT PROCEDURES

Section
700. Application procedures
710. Permit decision
720. Permit conditions and assignment
730. Permit term
740. Amendments to the permit
750. Retention of permit: inspection of permit sites
760. Renewal of permit
770. General permits

5 AAC 95.700. APPLICATION PROCEDURES. (a) An applicant for a permit shall submit a completed application on a form or in a manner approved by the commissioner. The application must be correct and complete to the best of the applicant's knowledge and be signed and dated by the applicant or the applicant's designee. The submission of a completed application satisfies any related notification required by AS 16 and this chapter. An application form is available from the department's offices.

(b) The completed application must include the anticipated commencement date, duration, and area

of proposed activity including a scaled map, identification of waterbodies at the site, description of type of activity, description of any proposed facility, description of proposed access route and means and time of travel, and other information necessary for the commissioner to determine whether the activity will comply with the applicable provisions of this chapter.

(c) A completed application must be submitted to the department's habitat division office representing the region or area in which the proposed activity will occur. (Eff. 6/5/86, Reg 98)

Authority: AS 16.05.020 AS 16.20.120
AS 16.05.050 AS 16.20.130
AS 16.05.251 AS 16.20.170
AS 16.05.255 AS 16.20.250
AS 16.20.050 AS 16.20.260
AS 16.20.060

5 AAC 95.710. PERMIT DECISION. (a) The commissioner will issue a permit if he or she determines that the requirements of this chapter are met.

(b) The commissioner will notify an applicant in writing of any denial. The notice will include:

(1) the reason for the denial; and

(2) a statement that the applicant may appeal under 5 AAC 95.920 or submit new or additional information and ask for reconsideration under (c) of this section.

(c) The commissioner will, in his or her discretion, reconsider a denial of an application if the applicant submits, to the appropriate habitat division office, factual information which is new or additional to that supplied with the original application. An applicant may submit the new or additional information as an amendment to the original application, or the applicant may submit a new application. The procedures of 5 AAC 95.700 - 5 AAC 95.760 apply to reconsideration. (Eff. 6/5/86, Reg 98)

Authority: AS 16.05.020 AS 16.20.120
AS 16.05.050 AS 16.20.130
AS 16.05.251 AS 16.20.170
AS 16.05.255 AS 16.20.250
AS 16.20.050 AS 16.20.260
AS 16.20.060

5 AAC 95.720. PERMIT CONDITIONS AND ASSIGNMENT. (a) To provide for the proper protection and management of fish and wildlife, and their habitats, the commissioner will consider and will, in his or her discretion, include as conditions of the permit:

(1) the duration of the proposed activity, including any provision for changing the time period during which the permit is valid and any provision for changing the effective time period of

the permit;

(2) any other seasonal use restrictions on a specific activity;

(3) limitation of the areal extent of the activity;

(4) any provision for the mitigation of damage to fish or wildlife, or their habitats;

(5) any provision to facilitate periodic monitoring of the proposed land or water use or activity by an authorized representative of the state, including inspection and sampling;

(6) reporting requirements;

(7) any provision for the posting of a performance bond or other surety as authorized in 5 AAC 95.950, necessary to insure compliance with the provisions of this chapter or conditions of the permit; and

(8) any other necessary condition.

(b) A permit may not be transferred but may be assigned upon written consent by the commissioner.

(c) The commissioner will, in his or her discretion, require a permit applicant to sign and date the permit before its validation as acknowledgement of the permittee's agreement to, and full understanding of, all conditions of the permit. (Eff. 6/5/86. Reg. 98)

Authority: AS 16.05.020 AS 16.20.120
AS 16.05.050 AS 16.20.130
AS 16.05.251 AS 16.20.170
AS 16.05.255 AS 16.20.260
AS 16.20.060

5 AAC 95.730. PERMIT TERM. (a) Except as provided in (b) and (c) of this section, a permit will, in the commissioner's discretion, be issued for a fixed term not to exceed two years, subject to the provisions of this chapter.

(b) A permit for a personal use cabin issued concurrent with 11 AAC 65 will, in the commissioner's discretion, be issued for up to six years.

(c) A permit will, in the commissioner's discretion, be issued for a fixed term exceeding two years if the commissioner determines that the activity meets the purposes and requirements of this chapter and the activity is permanent in nature. (Eff. 6/5/86, Reg. 98)

Authority: AS 16.05.020 AS 16.20.120
AS 16.05.050 AS 16.20.130

	AS 16.05.251	AS 16.20.170
	AS 16.05.255	AS 16.20.260
	AS 16.20.060	

5 AAC 95.740. AMENDMENTS TO THE PERMIT. (a) The commissioner will, in his or her discretion, initiate action to amend a permit to correct any condition or change any method authorized by the permit which was reasonably unforeseeable at the time of permit approval and which threatens to cause a substantially adverse effect upon:

(1) fish or wildlife, or their habitat; or

(2) if the permit is a special area permit, the purpose for which the special area was established.

(b) Any action a permittee desires to take which increases the overall scope of the project or which negates, alters, or minimizes the intent or effectiveness of any condition contained in a permit, is a deviation from the approved plan and requires an amendment before initiation of the action.

(c) A permittee may request amendment of a permit by submitting, to the department's habitat division office where the permit was issued, a written statement explaining why the amendment is necessary, including the amended plan, the location, commencement time, duration, and type of activity requiring amendment.

(d) The commissioner will issue an amendment to the permit if he or she determines that the requirements of this chapter will be met. Review of a request for amendment after receipt of the written statement in the appropriate habitat division office will not exceed 30 days. The procedures of 5 AAC 95.700 - 5 AAC 95.760 apply to a request for amendment.

(e) An amendment approved by the commissioner becomes effective upon receipt by the permittee, or at a later date specified by the amendment. An amendment is valid for the duration of the permit or for a shorter specified period. (Eff. 6/5/86, Reg. 98)

Authority:	AS 16.05.020	AS 16.20.120
	AS 16.05.050	AS 16.20.130
	AS 16.05.251	AS 16.20.170
	AS 16.05.255	AS 16.20.260
	AS 16.20.060	

5 AAC 95.750. RETENTION OF PERMIT: INSPECTION OF PERMIT SITES. (a) A permittee shall keep a copy of the permit, including any amendments, at the work site until completion of the project, and shall make it available for inspection upon request by an authorized representative of the state.

(b) For the purpose of inspecting or monitoring compliance with any condition of the permit or the

requirements of this chapter, a permittee shall give an authorized representative of the state free and unobstructed access, at safe and reasonable times, to the permit site. A permittee shall furnish whatever assistance and information as the authorized representative reasonably requires for monitoring and inspection purposes. (Eff. 6/5/86, Reg. 98)

Authority: AS 16.05.020 AS 16.20.120
AS 16.05.050 AS 16.20.130
AS 16.05.251 AS 16.20.170
AS 16.05.255 AS 16.20.260
AS 16.20.060

5 AAC 95.760. RENEWAL OF PERMIT. (a) A permittee may request renewal of an existing permit before the expiration of the current term of the permit. Procedures in this chapter apply to renewal, except that the filing of a new application under 5 AAC 95.700 is not required.

(b) If an existing permit expires or is revoked, a permittee may obtain a new permit only by filing a new completed application in accordance with 5 AAC 95.700. (Eff. 6/5/86, Reg. 98)

Authority: AS 16.05.020 AS 16.20.120
AS 16.05.050 AS 16.20.130
AS 16.05.251 AS 16.20.170
AS 16.05.255 AS 16.20.260
AS 16.20.060

5 AAC 95.770. GENERAL PERMITS. Notwithstanding 5 AAC 95.700 and 5 AAC 95.750 - 5 AAC 95.760, the commissioner will, in his or her discretion, issue a permit to the public at large for a specific activity in a specified area. (Eff. 6/5/86, Reg. 98)

Authority: AS 16.05.020 AS 16.20.120
AS 16.05.050 AS 16.20.130
AS 16.05.251 AS 16.20.170
AS 16.05.255 AS 16.20.260
AS 16.20.060

ARTICLE 8.
GENERAL PROVISIONS

Section
900. Mitigation of damages
910. Failure to adhere to standards
920. Appeals
930. Exclusion periods
940. Exemption for emergency and police power activities
950. Bonding or security
990. Definitions

5 AAC 95.900. MITIGATION OF DAMAGES. (a) Each permittee shall mitigate any adverse effect upon fish or wildlife, or their habitat, which the commissioner determines may be expected to result from, or which actually result from, the permittee's activity, or which was a direct result of the permittee's failure to:

(1) comply with a permit condition or a provision of this chapter; or

(2) correct a condition or change a method foreseeably detrimental to fish or wildlife, or their habitat.

(b) Mitigation techniques must be employed in the following order of priority:

(1) avoid an impact altogether by not taking a certain action or parts of an action;

(2) minimize an impact by limiting the degree of magnitude of the action;

(3) rectify the impact by repairing, rehabilitating, or restoring the affected environment;

(4) reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action;

(5) compensate for the impact by replacing or providing substitute resources or environments.

(c) The duty to mitigate in (a) of this section does not apply to unavoidable adverse effects upon fish or wildlife populations, or their habitat, arising from an overwhelming force of nature with consequences not preventable by due and reasonable precautions.

(d) The commissioner will, in his or her discretion, specify, by permit amendment, additional provisions for mitigating damage to fish and wildlife populations, and their habitat.

(e) Notwithstanding the expiration or revocation of a permit, a permittee is responsible for the obligations arising under the terms and conditions of the permit, and under the provisions of this chapter. (Eff. 6/5/86, Reg. 98)

Authority:	AS 16.05.020	AS 16.20.120
	AS 16.05.050	AS 16.20.130
	AS 16.05.251	AS 16.20.170
	AS 16.05.255	AS 16.20.260
	AS 16.20.060	

5 AAC 95.910. FAILURE TO ADHERE TO STANDARDS. The commissioner will, in his or her discretion, require in writing that a permittee correct a condition or remove a structure or installation constructed under permit by the permittee, which is not in accordance with a provision of

the permit. (Eff. 6/5/96, Reg. 98)

Authority:	AS 16.05.020	AS 16.20.120
	AS 16.05.050	AS 16.20.130
	AS 16.05.251	AS 16.20.170
	AS 16.05.255	AS 16.20.260
	AS 16.20.060	

5 AAC 95.020. APPEALS. An interested person may initiate an appeal of a decision made under this chapter in accordance with the provisions of AS 44.62.330 - 44.62.630 by requesting a hearing under AS 44.62.370. (Eff. 6/5/86, Reg. 98)

Authority:	AS 16.05.020	AS 16.20.120
	AS 16.05.050	AS 16.20.130
	AS 16.05.251	AS 16.20.170
	AS 16.05.255	AS 16.20.260
	AS 16.20.060	

5 AAC 95.930. EXCLUSION PERIODS. (a) The commissioner will notify a permittee that the term of the permit is or will be interrupted for a period of time of the commissioner determines that:

(1) a temporary environmental condition exists which was reasonably unforeseeable at the time of permit approval and the permitted activity, if allowed to continue, threatens to cause a substantial adverse impact;

(2) the permittee has failed to implement a required mitigating or preventative measure; or

(3) the permittee has failed to comply with a provision of this chapter, or a condition of the permit.

(b) The exclusion period established under (a) of this section will be as long as necessary for abatement of the temporary condition, completion of the required mitigating or preventative measure, or compliance with the permit condition or the provisions of this chapter, and will not exceed a total of 30 days in any calendar year, without the consent of the permittee.

(c) The commissioner will, by notice to the permittee, terminate an exclusion period after the permittee demonstrates abatement, compliance, or implementation of the required mitigating measures.

(d) If the commissioner finds, before or during an exclusion period, that corrective action is unlikely to be completed within any available exclusion period, the commissioner will, in his or her discretion, initiate a revocation proceeding under AS 44.62.330 - 44.62.630. (Eff. 6/5/86. 98)

Authority:	AS 16.05.020	AS 16.20.120
	AS 16.05.050	AS 16.20.130

	AS 16.05.251	AS 16.20.170
	AS 16.05.255	AS 16.20.260
	AS 16.20.060	

5 AAC 95.940. EXEMPTION FOR EMERGENCY AND POLICE POWER ACTIVITIES. In an emergency, the commissioner will, in his or her discretion, issue an oral permit for emergency or policy power activities before receiving the completed application required in 5 AAC 95.800. A completed application must be submitted within the time specified by the commissioner, whether before or after the emergency or police power activity takes place. (Eff. 6/5/86, Reg. 98)

Authority:	AS 16.05.020	AS 16.20.120
	AS 16.05.050	AS 16.20.130
	AS 16.05.251	AS 16.20.170
	AS 16.05.255	AS 16.20.260
	AS 16.20.060	

5 AAC 95.950. BONDING OR SECURITY. (a) The commissioner will, in his or her discretion, require a performance bond with a surety company authorized to transact business in Alaska, or other specified security to secure the performance of the terms and conditions of a permit issued under this chapter.

(b) A performance bond or security required when (a) of this section is limited to an amount reasonably necessary to ensure compliance with the provisions of this chapter or the terms and conditions of a permit issued under this chapter.

(c) The commissioner will inspect or review actions taken under each applicable term or condition of a permit issued under this chapter, and will make a written finding that each applicable term and condition of the permit has been completed, before the permittee's performance bond or security is released.

(d) The posing of a performance bond or the taking or other security under (a) of this section does not limit the department's right, under applicable law, to seek further compensation from the permittee for actual damages to fish or wildlife, or their habitats, or for a violation of the permit. (Eff. 6/5/86, Reg. 98)

Authority:	AS 16.05.020	AS 16.20.120
	AS 16.05.050	AS 16.20.130
	AS 16.05.251	AS 16.20.170
	AS 16.05.255	AS 16.20.250
	AS 16.20.050	AS 16.20.260
	AS 16.20.060	

5 AAC 95.990. DEFINITIONS. In addition to the definitions set out in AS 16.05.940, as used in this chapter:

(1) "authorized representative of the state" means one who is legally empowered to enforce a statute under which regulations in this chapter are promulgated;

(2) "completed application" means the submission of full plans, specifications, and notifications required by AS 16.20, and includes a form, series of forms, letter, or other documents that provide all of the information necessary for the commissioner to issue, condition, or deny a permit;

(3) "emergency" means an unforeseeable situation that presents an imminent threat to life or property;

(4) "mitigate" means to compensate fully for damage to fish and wildlife populations and their habitat by employing the most appropriate techniques;

(5) "permittee" means the holder of a permit and includes anyone employed, contracted, or assigned by the person or the organization to whom the permit was issued to conduct a land or water use operation;

(6) "permit" means the approval of plans and specifications required by AS 16.20.060 or AS 16.20.260, and any authorization made under AS 16.20.120, 16.20.130, or 16.20.170;

(7) "special area" means a state game refuge, a state game sanctuary, or a state fish and game critical habitat area, established under AS 16.20;

(8) "wildlife" means any species of bird or mammal as described in AS 16.05.940(14). (Eff. 6/5/86, Reg. 98)

Authority: AS 16.05.020 AS 16.20.120
AS 16.05.050 AS 16.20.130
AS 16.05.251 AS 16.20.170
AS 16.05.255 AS 16.20.260
AS 16.20.060

COOPERATIVE AGREEMENT
between the
Alaska Department of Fish and Game,
Habitat Division
and the
Alaska Department of Natural Resources,
Division of Parks and Outdoor Recreation

This cooperative agreement is designed to assist the agencies in cooperatively managing the area of overlap of the Kachemak Bay State Park and the Kachemak Bay Critical Habitat Area. The agreement pertains to the responsibilities of the Alaska Department of Fish and Game, Habitat Division and the Alaska Deparmtne of Natural Resources, Division of Parks and Outdoor Recreation within Kachemak Bay and in no way alters existing authorities and responsibilities either between or within the agencies.

WHEREAS, the Alaska Department of Fish and Game (ADF&G) has a legislatively mandated responsibility to manage the Kachemak Bay Critical Habitat Area (AS 16.20.590); and

WHEREAS, the Alaska Department of Natural Resources (ADNR) has a legislatively mandated responsibility to manage the Kachemak Bay State Park (AS 41.21.130-143); and

WHEREAS, portions of Kachemak Bay are designated as both state critical habitat area and state park; and

WHEREAS, it is desireable to have maximum consistency between state park and state critical habitat area regulation and administration; and

WHEREAS, it is the intention of the ADNR/Division of Parks and Outdoor Recreation (DPOR) and the ADF&G/Habitat Division to coordinate administrative efforts in managing the overlapping portions of the state park and state critical habitat area;

NOW, THEREFORE, the parties hereto agree as follows:

THE DEPARTMENT OF NATURAL RESOURCES, DIVISION OF PARKS AND OUTDOOR RECREATION AGREES:

1. To consult with ADF&G, through the Habitat Division, in the development of a management plan for Kachemak Bay State Park.

2. To seek the advice of ADF&G, through the Habitat Division, on regulations and major park policies or decisions which apply to the portions of the Kachemak Bay which are designated both state park and state critical habitat area. These include the management of mariculture, sport fishing charters or other commercial operations, and the development of park facilities when habitat values or use conflicts can reasonable be anticipated to be affected.

3. To monitor tideland and water use activities, to report any special area permit violations or other resource management problems within the area covered by this agreement promptly to the Habitat Division, and to coordinate compliance operations where appropriate.

4. To review and comment on state critical habitat area management plans, regulations, major policies or decision and permits for that portion of the critical habitat area which is in the state park.

5. Comply with the notice and, if applicable, ADF&G special area permit requirement of AS 16.20.520-530 and 5 AAC 95 for park developments, uses, and activities in the critical habitat area.

THE DEPARTMENT OF FISH AND GAME, THROUGH ITS HABITAT DIVISION, AGREES:

1. To consult with DPOR in the development of a management plan for the state critical habitat area.

2. To monitor multiple use activities, to report state park permit violations or other resource management problems in the portion of Kachemak Bay which is state park to DPOR, and to coordinate compliance operations where appropriate.

3. To review and comment on state park management plans, regulations, major policies or decisions, and permits for the portion of the state park which is in the critical habitat area.

4. To seek the advice of DPOR on regulations and major policies or decisions which apply to the portion of the critical habitat area that is in the state park (such as mariculture, habitat enhancement activities, introduction of non-native species or placement of structure or facilities).

5. To apply for a park use permit when required under 11 AAC 18.010 for developments or sues and activities in the state park.

THE DEPARMTNE OF NATURAL RESOURCES AND DEPARTMENT OF FISH AND GAME MUTUALLY AGREE:

1. Nothing in this cooperative agreement alters the obligation of DPOR and the ADF&G resource management divisions (Wildlife Conservation; Sport Fish; Commercial Fisheries; Fisheries Rehabilitation, Enhancement, and Development, and Subsistence) to work with each other on issues regarding management of fish and wildlife populations and harvest.

2. Nothing in the cooperative agreement shall obligate any party in the expenditure of funds or for future payments of money in excess of appropriations authorized by law.

3. Each party aggress that it will be responsible for its own acts and the results thereof, and each party shall not be responsible for the acts of the other party, and each party agrees it

will assume to itself risk and liability resulting in any manner under this agreement.

4. Each party will comply with all applicable laws, regulations, and executive orders relative to equal employment opportunity.

5. Nothing herein is intended to conflict with federal, state, or local laws or regulations. If there are conflicts, the laws and regulations shall prevail; this agreement will be amended at the first opportunity to bring it into conformance with conflicting laws or regulations.

6. Either the ADNR or the ADF&G may terminate its participation in this cooperative agreement by providing to the other party notice in writing 60 days in advance of the date on which its termination becomes effective.

7. A free exchange of research and information between agencies is encouraged and is necessary to attain the management goals of the state.

8. To follow permit consultation procedures that are in compliance with state regulations governing notice and review periods.

9. Amendments to this agreement may be proposed by either agency and shall become effective upon approval of both agencies.

10. The effective date of this agreement shall be from the date of final signature.

Don W. Collinsworth
Commissioner
Alaska Department of Fish and Game

1-11-89
Date

Lennie Gorsuch
Commissioner
Alaska Department of Natural Resources

7/24/89
Date