Palmer Hay Flats State Game Refuge

Revised *Management Plan*

December 200**2**

Prepared by the Division of Wildlife Conservation

Alaska Department of Fish and Game
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Introduction

Palmer Hay Flats State Game Refuge, located 30 miles north of Anchorage in the Matanuska-Susitna Valley, was first established by the Alaska Legislature in 1975 and expanded in 1985. Its purpose is "to protect and preserve the natural habitat and game populations."

Just over 40 square miles in area, the refuge provides important resting and staging areas for water birds during spring and fall migration. Uses of refuge lands are controlled to prevent habitat changes that would be harmful to the wildlife. Hunting, fishing, trapping, and recreational activities in keeping with the primary reason for establishing the refuge, are encouraged. It is located in the center of the fastest growing metropolitan area in the state and also provides hunting, fishing, and wildlife viewing opportunities to thousands of Alaskans each year.

The purpose of the refuge management plan is to provide consistent long-range guidance to the Department of Fish and Game in managing the refuge. Since creation of the refuge in 1975, the Anchorage/Mat-Su Valley population has increased dramatically. According to Department of Labor estimates, the Matanuska-Susitna Borough population has increased 316% since 1980. Expanding urbanization in the Anchorage/Palmer/Wasilla area has placed many new demands on lands in and adjacent to the refuge. Palmer Hay Flats has grown to be one of the most popular recreational areas in the state.

To evaluate the compatibility of these various uses with the protection of fish and wildlife, their habitats, and public use of the refuge, the Department of Fish and Game undertook a comprehensive refuge management planning process in 1986, which incorporated public input. The original planning process is described in the section "Management Planning Process."

The 1986 management plan stated "this plan will be formally reviewed and, if appropriate, updated every ten years. Public participation will be solicited during the update process." The rise in the number of users in the Anchorage and Mat-Su area makes revision of the management plan appropriate. The revision process began in early 1998, and will be completed in 1999. The process for revising the plan is described in the section titled "The Management Planning Process."

The plan presents management goals, sub-goals and guidelines for the refuge and its resources, to determine whether proposed activities are compatible with the purposes for which the refuge was created. The plan will guide management of the refuge for the next ten years. The plan affects state lands only, not private, municipal or federal lands. The plan does not address harvest regulations.

The plan is implemented by the Department of Fish and Game in several ways:

- A Special Areas Permit is required for any construction work, including any habitat altering activity on state land or water, in a designated State Game Refuge (5 AAC 95.420). A Special Areas Permit application form can be obtained from any Department of Fish and Game office and should be submitted to the Habitat Division Regional Office in Anchorage. The Habitat Division will review all proposed activities for consistency with this plan and with regulation 5 AAC 95.505. Activities will be approved, conditioned, or denied based on the direction provided in this plan.
- On-the-ground management activities of the Department of Fish and Game will also be directed by this plan. An operational plan will be developed by the managing agency, in this case the Division of Wildlife Conservation. The operational plan will detail department research programs, public use facilities and other department projects.

Other state, federal, and local agencies have management responsibilities on refuge lands as well. Any disposition of resources such as gas, minerals or timber on state land in the refuge requires Department of Natural Resources authorization. Activities affecting air or water quality require authorization from the Department of Environmental Conservation. Activities within the Glenn Highway right-of-way are reviewed by Department of Transportation. The U.S. Army Corps of Engineers evaluates applications for the Department of the Army (DA) permits that includes the construction of structures, filling, dredging and discharging dredge and fill materials. Various federal and state agencies, along with the local government entity, review the proposals for DA permits, pursuant to the Fish and Wildlife Coordination Act (16 USC 661-666e). The Mat-Su Borough comments on issues and projects under their management authority on their own lands within Palmer Hay Flats State Game Refuge. The Bureau of Land Management (BLM) retains management responsibility over several hundred acres of land bordering the Knik Arm that is selected by the state Mental Health Trust until such time as that land is conveyed to the state.

This plan will be formally reviewed and, if appropriate, updated every ten years. Public participation will be solicited during the update process.

The Management Planning Process

1986 Palmer Hay Flats State Game Refuge Management Plan

The original 1986 Palmer Hay Flats State Game Refuge Management Plan was the result of a public planning process led by the Department of Fish and Game. The plan was developed by a team representing state, federal, and municipal agencies: Alaska Departments of Fish and Game, Natural Resources, Environmental Conservation, and Transportation and Public Facilities; Matanuska-Susitna Borough; and the United States Fish and Wildlife Service. At the outset of the planning process public meetings were held in Wasilla and in Anchorage to explain the planning process and solicit citizens' issues, interests, and concerns for the refuge. These meetings helped to identify list of issues to be addressed in the plan. The planning team developed a list of alternative policies for each identified issue. Each alternative policy was analyzed for its ability to meet the refuge management objectives. Based on this analysis, the planning team identified preferred policy alternatives for each issue. At the same time background information was collected and synthesized on the refuge's fish and wildlife populations and their habitats, other natural resources, existing land use and land ownership. This information, presented in both map and narrative form, became the plan's Resource Inventory. Based on comments received during the public review process, final policies were developed. The commissioner then adopted the goals, objectives, and policies (5 AAC 95.500). The commissioner also adopted regulation 5 AAC 95.505 to provide detail in implementing the plan. The drafters of the 1986 plan called for formal review and, if appropriate, revision of the plan every ten years.

1999 Management Plan Revision

ADF&G had the following goals for the public process resulting in the revision of the Palmer Hay Flats State Game Refuge Management Plan:

- To broaden public awareness, appreciation and use of Palmer Hay Flats;
- To promote communication among the public, refuge users, interested groups, and the Department of Fish and Game; and
- To advise the Department of Fish & Game on the management and operations of Palmer Hay Flats State Game Refuge

Public meetings were held in March 1998 in Anchorage, Wasilla & Palmer to identify issues that should be addressed in the plan revision. The issues and suggestions that were raised at these meetings and in written comments were summarized in an appendix in the draft management plan. The department staff also prepared inventories of fish and wildlife resources and their habitats, public access, land use and land ownership. Appendices E and F contain the results of these inventories.

In spring 1998, a The Citizens' Advisory Group & Planning Team was formed. Eleven citizens and 7 agency representatives were selected to represent the citizens who use Palmer Hay Flats and agencies that manage refuge land or resources. This group reviewed the 1986 goals, sub-goals and management guidelines and made recommendations for changes. Goals, sub-goals, management guidelines and regulations formed the basis for planning team agendas and the discussions. . All discussions were based on the purpose for which the area was established with additional guidance provided in law. Some recommendations for operational management and prioritization of projects were collected and are presented in Appendix B.

Written comments on the draft management plan were collected during a 45 day public comment period from September 15 through October 31, 1999. Oral testimony was also collected in public forums in Anchorage, Wasilla and Palmer. Department staff prepared the final management plan based on comments received from the Citizens' Advisory Group and Planning Team and the draft management plan public review process. The Commissioner of Fish and Game reviewed the plan and made changes. However, the Department of Law case file expired in 2000 prior to adoption of the revised plan. A new written public comment period was opened during October 2002.

Purposes, Goals and Sub-goals

Statutory Purpose

The purpose for which Palmer Hay Flats State Game Refuge and all state refuges were established is as follows:

Sec. 16.20.020. Purpose. The purpose (of state game refuges) is to protect and preserve the natural habitat and game populations in certain designated areas of the state.

Goals And Sub-Goals

Goal 1: ***Manage the refuge to preserve, protect and enhance the natural habitat and fish and wildlife populations.***

SUB-GOALS:

1.1 Wildlife Population Habitat Protection

Maintain and protect habitat for water birds, moose, furbearers, small game, fish and non-game populations.

1.2 Wildlife and Habitat Disturbance

Minimize disturbance to water bird, moose, furbearer, small game, fish and non-game species populations and their habitat.

1.3 Wildlife Population and Habitat Enhancement

Maintain and enhance water bird, moose, furbearer, small game, fish and non-game populations and habitat.

1.4 Water Bird Migration

1.41 Maintain, protect, and where feasible enhance the quality and quantity of nesting, rearing, and staging habitat for migrant water birds; and

1.42 Minimize disturbance to staging water birds.

1.5 Seasonal Moose Populations and Their Habitat

1.51 Protect important moose winter habitat;

1.52 Maintain natural movement corridors for moose to and from the refuge;

1.53 Minimize disturbance of wintering moose; and

1.54 Reduce moose mortality caused by motor vehicles and other forms of transportation

Goal 2: Maintain and encourage a variety of recreational, educational, and scientific uses of the refuge fish and wildlife resources, when compatible with the purpose of the refuge

SUB-GOALS:

2.1 Public Use of the Refuge

2.11 Maintain opportunities to hunt, fish, and trap;

2.12 Maintain opportunities to observe and study water birds, moose, furbearers, small game, nongame species, fish, and the refuge environment;

2.13 Provide information to the public about the refuge and its resources; and

2.2 Fish and Game Management Activities

2.21 Conduct activities necessary to achieve goals, objectives, and policies of the Palmer Hay Flats State Game Refuge Management Plan; and

2.22 Use the most appropriate methods and means consistent with resource and habitat protection to accomplish management activities.

Goal 3: Maintain scenic resources and protect the natural quiet

SUB-GOALS:

3.1 Quality of visitor experience

3.11 Maintain opportunities to appreciate the aesthetic qualities of the refuge such as scenery, natural quiet, natural sounds associated with the physical and biological resources of the refuge (for example, the wind, call of a loon, or chorus of cranes); and

3.12 Prevent or minimize unnatural sounds that adversely affect refuge resources or values or users' enjoyment of them. However, sounds associated with hunting, trapping, and fishing activities such as firearm noise and engine noise will not be regulated to adversely interfere with these traditional activities.

Management Guidelines

The department uses management guidelines to prioritize activities when funds become available.

Access

To ensure adequate public access to refuge lands at appropriate locations the department will:

1) maintain, improve, and consolidate into refuge management existing access sites, particularly the Knik River and Rabbit Slough sites;
2) acquire and develop additional access points that do not damage habitat, or provide full mitigation for habitat damage caused by access development;
3) clearly mark existing access points and future access points when developed and provide public information about access points; and
4) prevent or reduce habitat damage at both marked and unmarked access points.
5) maintain and improve pedestrian and other non-motorized forms of access

Additions to the Refuge

To ensure protection of public access and consistent management of fish and wildlife resources and habitat within the refuge, the department will evaluate and pursue acquisition of appropriate federal, state, borough, and privately owned lands through trade, purchase, or lease/easement from willing owners.

Bird Dog Training and Organized Events

To encourage those uses that promote fish and wildlife conservation on the refuge the department:

1) will allow the use of refuge lands for bird dog training consistent with the goals and sub-goals of this plan; and
2) may allow, by permit, field trials and hunting dog events on refuge lands that are consistent with the goals and sub-goals of this plan.

Cabins/Camping/Duck Blinds

To maintain public use opportunities, protect refuge resources, and preclude proprietary use of refuge land, the department will:

1) not allow the construction of private or commercial, permanent, and/or non-portable structures such as cabins, tent platforms, and permanent duck hunting blinds. Temporary, unobtrusive, portable duck hunting blinds will be allowed; and
2) allow no more than 14 consecutive days of camping at a density not harmful to refuge resources.

Commercial and Large Group Use

The department, at its discretion, shall establish a fee schedule for commercial activities and require non-fee permits for non-commercial groups of 20 or more persons.

Discharge of Firearms

To encourage access by a variety of users, the department will close a limited area in the vicinity of refuge access points to the discharge of firearms.

Fish and Wildlife Enhancement

To maintain and improve the productivity of fish and wildlife populations on the refuge, the department will:

1) cooperate with other land and wildlife management agencies to monitor and protect fish and wildlife populations and their habitats within and outside the refuge;
2) evaluate the possibility of enhancing habitat, especially for waterfowl populations;
3) research and evaluate the effects of future salmon stocking in Wasilla and Cottonwood creeks;
4) monitor and maintain water quality in all flowing water, and protect hydrological integrity;
5) prohibit temporary storage and disposal of wastes within the refuge; and
6) cooperate with Alaska Department of Transportation and the Alaska Railroad to reduce moose/vehicle accidents and conflicts on transportation corridors.

Information/Education

To promote public awareness, understanding, and enjoyment of refuge resources, the department will:

1) evaluate and develop facilities such as interpretive signs, boardwalks, trails, and parking areas consistent with the purposes and goals of the refuge;
2) develop public information products such as pamphlets, guidebooks, maps, and media programs; and
3) make research results and data available to the public.

Motorized Vehicle Use

To ensure the protection of sensitive habitats, avoid harmful disturbance of fish and wildlife on the refuge, and to accommodate a variety of refuge users, the department will:

1) establish horsepower, motor type, gross vehicle weight, and vehicle type restrictions;
2) establish corridors for the use of authorized motorized vehicles;
3) establish opened and closed periods for the use of authorized motorized vehicles;
4) establish altitude guidelines;
5) promote forms of transportation that cause little or no damage to habitat and have low impact on visitors and or nearby residents;
6) evaluate the habitat impacts at the posted corridor as a result of ORV use; and
7) evaluate methods and materials for reducing habitat impacts of the ORV corridor.

Vandalism and Law Enforcement

Strongly encourage enforcement of state regulations regarding vandalism, litter and other illegal activities.

Other Uses Defined in 5AAC 95.420

To protect refuge habitat and fish and wildlife populations the department may allow by permit only those activities compatible with the purpose for which the refuge was established, terms and standards of 5AAC 95, and the goals, sub-goals, and management guidelines of this plan.

Section 500. Palmer Hay Flats State Game Refuge Management Plan
505. Palmer Hay Flats State Game Refuge

5 AAC 95.500. Palmer Hay Flats State Game Refuge Management Plan. The goals, objectives, and policies of the Palmer Hay Flats State Game Refuge Management Plan dated January 2003 are adopted by reference. The plan presents management goals and guidelines for the refuge and its resources which the department will use in determining whether proposed activities in the refuge are compatible with the protection of fish and wildlife, their habitats, and public use of the refuge. Under 5 AAC 95.420, a special area permit is required for certain activities occurring in a designated state game refuge. All special area permit applications will be reviewed for consistency with the management goals, objectives, policies and guidelines adopted by reference in this section. Special area permits issued for the Palmer Hay Flats State Game Refuge will be approved, conditioned, or denied based on the criteria set out in those goals, objectives, and policies, and on the standards contained elsewhere in this chapter. (Eff. 1/11/87, Register 101; am ____/____/2003. Register ____)

Authority: AS 16.05.020 AS 16.20.020 AS 16.20.060
AS 16.05.050 AS 16.20.032

Editor's Notes: Copies of the Palmer Hay Flats State Game Refuge Management Plan are available at the Anchorage office of the Department of Fish and Game, 333 Raspberry Road, 99518-1599, and at the department's Palmer office, 1800 Glenn Highway, Suite 4, Palmer, AK 99645-6736.

5 AAC 95.505. Palmer Hay Flats State Game Refuge. The following apply to the implementation of the Palmer Hay Flats State Game Refuge Management Plan:

(1) **Off Road Vehicles**. The off-road use of a wheeled, tracked, or other ground-effect motorized vehicle is not allowed in the Palmer Hay Flats State Game Refuge, except that

(A) a general permit for a special area issued may be issued under 5 AAC 95.770 for the off-road use of any wheeled, tracked, or other ground-effect motorized vehicle less than 1,000 pounds gross vehicle weight as follows:

(i) from November 9 through March 31, when there exists adequate snow depth and ground frost as described in the general permit, on all refuge land except state land in sections 22, 27, and 34 of T17N, R1E, Seward Meridian; and

(ii) from August 15 through November 15 only in a posted corridor extending from the western boundary of the refuge eastward to the stream mouth located in

T17N, R1W, SEC 36, SW1/4, within 100 yards of the north bank of Palmer Slough and Knik Arm; this general permit will, in the commissioner's discretion, be terminated or not reissued if it is determined that use of the corridor is detrimental to the protection of refuge resources;

(B) an individual special area permit may, in the commissioner's discretion, be issued under this chapter, on a case-by-case basis for the off-road use of wheeled, tracked, or other ground-effect vehicle not allowed under (A) of this paragraph if the use fulfills a demonstrable need for which there is no feasible alternative, and meets the goals and guidelines of the management plan, and is consistent with the purpose for which the refuge was established.

(2) Motorized Watercraft. The use of motorized watercraft in the Palmer Hay Flats State Game Refuge is allowed as follows:

(A) the Knik River, Matanuska River and Knik Arm waters are open year round to the use of a motorized watercraft;

(B) Wasilla Creek is open to the use of motorized watercraft, except that Wasilla Creek is closed during openings of the Wasilla Creek weekend-only sport fishery, to all motorized watercraft capable of producing more than 42 lbs. of thrust or 3 horsepower;

(C). on all other waters not listed in (A) or (B) of this paragraph, use of motorized watercraft is prohibited, except that from August 16 through March 31 motorized watercraft with a motor of 20 horsepower or less may be used;

(D) an individual special area permit may, in the commissioner's discretion, be issued under this chapter, on a case-by-case basis, for the use of motorized watercraft prohibited under (B) or (C) of this paragraph if the use fulfills a demonstrable need for which there is no feasible alternative, and meets the goals and guidelines of the management plan, and is consistent with the purpose for which the refuge was established.

(3) **Aircraft**. An aircraft may not land in the Palmer Hay Flats State Game Refuge, except:

(A) from Nov. 10 through March 31 by a general permit for a special area issued under 5 AAC 95.770, provided there is adequate snow cover as described in the general permit, and ice depth adequate to support aircraft.

(B) an individual special area permit may, in the commissioner's discretion, be issued under this chapter, on a case-by-case basis for the landing of aircraft not allowed under (A) of this paragraph if the use fulfills a demonstrable need for which there is no feasible alternative, meets the goals and objectives of the management plan, and is consistent with the purpose for which the refuge was established. (Eff. 1/11/87, Register 101, am ___/____/2003, Register ___)

Authority:	AS 16.05.020	AS 16.20.020	AS 16.20.060
	AS 16.05.050	AS 16.20.032	

Appendix A: Alaska Statute Establishing Palmer Hay Flats State Game Refuge

Alaska Statutes which pertain specifically to the establishment of management of Palmer Hay Flats State Game Refuge are as follows:

Sec. 16.20.020. Purpose

The purpose of AS 16.20.010 - 16.20.080 is to protect and preserve the natural habitat and game populations in certain designated areas of the state.

Sec. 16.20.032. Palmer Hay Flats State Game Refuge

(a) The following state-owned land and water is established as the Palmer Hay Flats State Game Refuge:

(1) Township 16 North, Range 1 West, Seward Meridian
Sections 1 - 12
Section 13: N 1/2
Sections 14 - 18;

(2) Township 17 North, Range 1 West, Seward Meridian
Section 25
Section 26: S 1/2, S 1/2 N 1/2, N 1/2 NE 1/4, NE 1/4 NW 1/4
Section 27: S 1/2, SE 1/4 NE 1/4
Section 31: Lot 4, SE 1/4, E 1/2 SW 1/4, SE 1/4 NE 1/4, S 1/2 SW 1/4 NE 1/4
Section 32: S 1/2, S 1/2 NE 1/4, NE 1/4 NE 1/4, SE 1/4 NW 1/4
Sections 33 - 36;

(3) Township 17 North, Range 1 East, Seward Meridian
Section 19: Lots 3 and 4, E 1/2 SW 1/4, S 1/2 SE 1/4
Section 22:
excluding NW 1/4 NW 1/4
excluding N 1/2 NE 1/4 NW 1/4
excluding NE 1/4 NE 1/4 NE 1/4
Section 25: Lots 1 - 6, NW 1/4, N 1/2 NE 1/4, N 1/2 SW 1/4, SW 1/4 SW 1/4
Section 26: SE 1/4 NE 1/4, S 1/2
Section 27: Lot 1, N 1/2, N 1/2 S 1/2, SE 1/4 SW 1/4, S 1/2 SE 1/4
Section 28: Lots 1 - 2, N 1/2 SE 1/4, SW 1/4 SE 1/4, S 1/2 SW 1/4
Section 30: Lots 1 - 4, E 1/2, E 1/2 W 1/2
Section 31: Lots 1 - 10, NE 1/4 NW 1/4, SW 1/4 NE 1/4, N 1/2 NE 1/4
Section 32: Lots 3 - 7, NE 1/4, SW 1/4 SW 1/4, NE 1/4 SE 1/4
Section 33: Lots 5 - 9, S 1/2 SE 1/4, SW 1/4 NW 1/4, including all state ide and submerged land
Section 34: Lots 1 - 3, E 1/2 NW 1/4, SW 1/4, E 1/2
Section 35: Lots 1 - 5, NW 1/4, N 1/2 SW 1/4, SW 1/4 SW 1/4, N 1/2 NE 1/4, SW ¼ NE 1/4, NW 1/4 SE 1/4
Section 36: Lots 1 - 10, SE 1/4 SW 1/4, S 1/2 SE 1/4, NE 1/4 SE 1/4;

(4) Township 16 North, Range 1 East, Seward Meridian

Sections 4 - 9
Section 17: N 1/2
Section 18: N 1/2
All state tide and submerged land;

(5) Township 16 North, Range 1 East, Seward Meridian
Section 2: Portion lying west of the Alaska Railroad
Section 3: Lot 1, excluding portions lying east of the Alaska Railroad centerline, Lots 2, 3, 4, 5, 6, NW1/4, NW 1/4, NE 1/4
Section 10: Lots 1, 2, 3, 4, 6, and portions lying west of the Alaska Railroad
Section 15: All state land lying north of the south bank of the Knik River and west of the Alaska Railroad
Section 16: All state land lying north of the south bank of the Knik River.

(b) Selections under 43 U.S.C. 1601 - 1628 (P.L. 92-203, Alaska Native Claims Settlement Act) are recognized as valid prior claims to the land within the area described in (a) of this section. Land specified in (a) of this section may not include land patented to a Native corporation under that Act.

(c) Land selected by the Matanuska-Susitna Borough in Township 17 North, Range 1 East S.M. shall be included in the Palmer Hay Flats State Game Refuge, subject to borough approval. If the borough relinquishes the selection of the land, the selected land becomes part of the Palmer Hay Flats State Game Refuge.

(d) The state may not acquire by eminent domain privately owned land within state-owned land specified in (c) of this section for inclusion in the Palmer Hay Flats State Game Refuge. The Department of Natural Resources may adopt, in accordance with AS 44.62 (Administrative Procedure Act), zoning regulations governing privately owned land within the Palmer Hay Flats State Game Refuge.

(e) Notwithstanding the provisions of (a) of this section, the land described in this subsection is excluded from the Palmer Hay Flats State Game Refuge established under (a) of this section for the establishment of a transportation and utility corridor. Land within the transportation and utility corridor that is determined by the commissioner of transportation and public facilities to be unnecessary for future transportation or utility corridors becomes a part of the Palmer Hay Flats State Game Refuge. The commissioner of transportation and public facilities is directed to provide access to the Palmer Hay Flats State Game Refuge during future development of state highways in the area. The land that is excluded from the Palmer Hay Flats State Game Refuge under this subsection is described as:

Township 17 North, Range 1 East, Seward Meridian
Section 22: SE 1/4 NW 1/4, W 1/2 NE 1/4, SE 1/4 NE 1/4, S 1/2 NE 1/4 NE 1/4, NW 1/4 NE 1/4 NE 1/4, NE 1/4 SW 1/4, W 1/2 SE 1/4
Sections 27 and 34: a corridor 300 feet on either side of the existing highway centerline

Sec. 16.20.075. Regulations

The board shall, under AS 16.05, adopt regulations governing the taking of game on state game refuges it considers advisable for conservation and protection purposes.

Sec. 16.20.050. Multiple land use

Where the use, lease, or disposal of real property in state game refuges created by AS 16.20.010 - 16.20.080 is under the control or jurisdiction of the state, whether through federal permit or state ownership, the responsible state department or agency shall notify the commissioner of fish and game before initiating any use, lease, or disposal of real property. The commissioner shall acknowledge receipt of notice by return mail.

Sec. 16.20.060. Submission of plans and specifications

If the commissioner so determines, the commissioner shall, in the letter of acknowledgment required under AS 16.20.050 , require the person or governmental agency to submit full plans for the anticipated use, full plans and specifications of proposed construction work, complete plans and specifications for the proper protection of fish and game, and the approximate date when the construction or work is to commence, and shall require the person or governmental agency to obtain the written approval of the commissioner as to the sufficiency of the plans or specifications before construction is commenced. The commissioner shall abide by the principle that recognizes preferences among beneficial uses as more particularly set forth in Article VIII of the state constitution.

Appendix B: Comments and Recommendations of the Palmer Hay Flats Citizens' Advisory and Planning Team

This appendix contains supplemental material to the management guidelines developed for this plan. While the goals, sub-goals and management guidelines were the focus of discussions during meetings of the Citizens' Advisory Group and Planning Team, there were comments made that indicate the intent of the group regarding the additions and changes to the management guidelines. A more complete record of the Citizens' Advisory Group and Planning Team meeting proceedings are provided in the meeting minutes.

Discussion of Goals and Sub-goals

- The group affirmed that the three goals are presented in priority order.
- Goal #3 was crafted by the group as a tool to help managers preserve quiet and scenery. While the group was not unanimous in supporting this goal, the majority felt that some protection for the qualities of "natural quiet" were needed, especially since the refuge is sandwiched between the two most populated areas in the state. The group also discussed the need to be far-sighted about the potential impacts of future recreational vehicles and technology. Future refuge users should have little impact on the solitude and scenery in addition to having minimal impact on wildlife and their habitat.
- The members that opposed goal #3 were concerned about the consistency of the plan. They felt that such a goal would be unreasonable in a refuge crossed by a railroad, an ORV corridor and the Glenn Highway.
- Several members were concerned that Goal #3 might affect the rights of hunters. After discussing the issue with department representatives, they were assured that hunting rights would not be in danger. Only the Board of Game and the Board of Fish can change hunting and fishing regulations. However, it was noted that any limitations to access to the refuge would apply to all recreational users, including hunters.
- The group agreed to change the term "waterfowl" to "waterbird" to include shorebirds and other species of birds that feed or breed in aquatic environments.

Discussion of Management Guidelines

Access

- The group discussed two opposing views about how to deal with access to the refuge. One view held that more access points spreads out use and diminishes the impact of users. The other view held that it is better to concentrate access and subject less habitat to damage by foot traffic and motor vehicles.
- The group agreed that any development of new access points be accompanied by plans for mitigation for any loss of habitat.
- The group discussed access to the east side of Glenn Highway. Though a right-of-way is platted at the Matanuska Townsite, the access has not been developed. Most people use the railroad right-of-way or tracks to access that part of the refuge. Other users cross private land adjacent to the far

eastern edge of the refuge The state and the group members did not condone trespass on private land.

- The group members were concerned that the new housing subdivisions along the bluff adjacent to the refuge will create new access for vehicles that would cause habitat damage
- Nelson Road was noted as a potential access point that could be developed. Currently the Matanuska-Susitna Borough maintains a locked gate on this road though no current permit for the gate exists. Nelson Road provides access to Borough land which is contiguous to the refuge.
- There was widespread concern within the group (including some ORV users) about the impacts of ORV use. ORVs run beside old, wet trails and create wider trails damaging habitat. Two forms of ORV-caused habitat damage were cited: 1) "illegal" summer trails outside of the ORV corridor; 2) the widening and deepening of the ORV Corridor; and 3) trails developed by snowmachines traveling on inadequate snow cover.
- There is a public advocacy group promoting the formation of designated corridors for a winter snowmachine and summer bike corridor from Anchorage into the Matanuska-Susitna Valley. One member of the group strongly advocated the trail development through Palmer Hay Flats, either across the refuge or within railroad or highway right-of-ways. While no formal vote was taken on this issue, many members voiced strong reservations about the impacts of the trail on moose and habitat in the refuge.
- The members discussed the phrase "promote pedestrian and other non-motorized forms of access." They agreed that the intent of this statement was to encourage non-motorized use because it has the least impact on habitat and does not restrict other forms of access.

Additions to Refuge

Additions to the refuge are purchased from willing sellers, land trades, or donations. Funds to purchase lands have been donated by conservation organizations such as Ducks Unlimited and The Nature Conservancy, from Sport Fish Restoration Act and the Alaska State Waterfowl Conservation Stamp (Duck Stamp) funds, and from a USFWS National Coastal Wetlands grant. ADF&G operating funds are not used to purchase land.

- The group suggested the following criteria for designating priority of land acquisitions:
  - Acquire parcels at the access points.
  - Acquire the parcels within the boundary so that the refuge is managed as one integral whole.
  - Acquire parcels whose habitat values are most threatened.
- A few members suggested that adding wildlife viewing facilities and interpretation could complement any bird dog training development by incorporating boardwalks and informational signs. See the "Information and Education" management guideline for more discussion of interpretive facilities.
- Through this planning process, the Advisory Group and Planning Team has identified Borough-owned lands within and adjacent to the refuge that are suitable for inclusion in the refuge. The Borough and DNR should consider exchanges so that the state can acquire these lands.

Commercial and Large Group Use

- Planning team members expressed strong opinions about the negative aspects of commercial guiding. Most members agreed that commercial fishing, hunting and wildlife viewing guiding was not yet a problem in Palmer Hay Flats. However, they worried that commercial guides could and would take advantage of the refuge and keep others from using the best fishing, hunting, and

viewing areas. Several members cited the Little Su as a place where commercial fishing guides have displaced individual fishermen from the most desirable fishing areas. They did not want to see similar situations develop on Palmer Hay Flats.

- It was the intention of the majority of the members of the planning team to prohibit or limit commercial uses of the refuge. However, department representatives told the planning team that the Fish and Game Commissioner lacked the authority to make these types of limitations. The management guideline suggested in the revised plan will not directly limit commercial uses of the refuges. However, it requires permits and fees from commercial operators. Such a requirement would allow managers to monitor commercial activities.
- The majority of group members were concerned about the impacts of large groups of users on refuge habitat. They wanted to adopt requirements similar to Alaska State Parks for groups larger than 20 people. Groups larger than 20 people would need a permit to use the refuge, however they would not be required to pay a fee. The permit requirement would allow managers to monitor the impacts of large groups.

Discharge of Firearms

- The group discussed and affirmed the validity of lawful discharge of firearms for the purpose of hunting and trapping.
- Members of the group repeatedly expressed dismay at the safety hazards caused by target shooting at the Cottonwood Creek access and the Knik River boat launch. Residents along the bluff complained about stray bullets. Hikers, hunters, and boaters have expressed fear about the barrage of bullets at these access points. Several members said that target shooters at public access points ruined the reputation of law-abiding hunters.
- The group did not think that any place within the refuge boundaries could be suitable for development of a pistol and rifle range. The only area with an adequate backstop would be the bluff along the edge of the northern boundary, and this would be unsuitable because of residential development at the top of the bluff.
- Two members expressed concern that target shooting and waterbird habitat did not belong together because of possible lead and/or hydrocarbon pollution.
- The majority of members said that restrictions on the discharge of firearms should be confined to as small an area as is needed to provide safe access and reduce user conflicts at the access sites.

Fish and Wildlife Enhancement

- The group encouraged ADF&G managers to actively pursue watershed protection upstream and outside the refuge boundaries. They cited the need to work with the Borough since their land use planning and developments would have the most impact on fish and wildlife habitat. Any plans for fish stocking would be affected by the upstream pollution of refuge water.

Information and Education

- Many members thought the refuge needs to be better "advertised" via maps, signs and brochures. However, the general consensus was that it should not be developed as a major destination for tourists. At least five members thought it should remain a relatively little known local attraction for outdoor enthusiasts. Some members voiced concern that more users would degrade fragile wetlands and diminish the quality of wildlife watching, hunting and fishing experiences.

- Several members suggested the refuge managers need to set thresholds for development of visitation and services, both for now and for the long-term so visitation does not diminish habitat or other users' experiences.
- The planning team endorsed the concept of information kiosks at the major access points so visitors could find boundaries, private land, regulations and opportunities.
- It was suggested that the areas of highest usage be confined to the edges of the refuge, while more remote areas remain low profile.
- There was some disagreement among group members about the types of natural history interpretation that should be developed. Boardwalks were mentioned as a method to direct high traffic visitation and conserve habitat. Other members opposed efforts to develop interpretive services, saying that the refuge should cater to more traditional users such as hunters and fishers.
- Conflicts between bird watchers and hunters were not a concern cited by the group because of the seasonal differences in their activities.
- Several members had many suggestions for educational development. It was suggested that managers plan for categories of visitors and provide wildlife viewing sites for the different categories. For example, a viewing site along the highway would create opportunities for the less adventurous visitor. This would give the refuge "scaled" usage opportunities.

Motor Vehicles (Air)

- Adjacent landowners said they witnessed harassment of birds and illegal landings in the refuge during the closed season.
- Two members of the team expressed frustration at the number of low-flying aircraft that disturbed them while visiting the refuge
- The majority of members agreed that we should try to keep our regulations consistent with other agencies to make compliance easier for the public.

Motor Vehicles (Water)

- The group was concerned about the impacts of the Knik Arm and Palmer Slough portage trails on Duck Lake. The trails have become ditches that have the potential to drain the lake. Erosion may be caused by the ebbing Knik Arm high tides receding with great velocity. The ebbing tide could erode the portage trails.
- Future conflicts between personal watercraft ("jet-skis") and nesting birds were discussed. No one has seen personal watercraft in the refuge, though many suspect that they will become users in the years to come. The majority of the members were concerned about the effect of personal watercraft.

Motor Vehicles (Ground)

- The group questioned the suitability of ORVs on fragile wetland habitat. The wet ground is easily compacted by all users, though foot traffic does not seem to cause noticeable damage. Lack of an enforcement presence on the refuge makes restriction of illegal access by ORVs nearly impossible. A vehicle passing through shallow lake sedges forms a trail that is often followed by subsequent users. Illegal trails develop, especially in the fall after the bridge across Cottonwood Creek is open to ORVs. Enforcement agents are pulled away from the refuge by the higher priority moose-hunting season.

- Members of the group observed that the majority of ORV and snowmachine users may abide by regulations while outlaw riders abuse habitat. More or stricter regulations may not affect the actions of the illegal users.
- The group would like to see a comprehensive study of the effects of the ORV Corridor on the refuge drainage patterns. A slight change in hydrological patterns or damage to shallow lake boundaries could drastically reduce habitat and hunting opportunities. The planning team wants the department to establish a higher priority for a study of and solutions for habitat damage
- The majority of group members encouraged ADF&G to research engineering solutions for the habitat impacts of the ORV Corridor. If the most sensitive parts of the corridor could be hardened or bridged, ORV users could continue to use the refuge. Other members of the group were uncomfortable promoting any ORV use on the refuge.
- The group at several meetings discussed the harassment of moose by snowmachines. Some members said that not all the snow machine users are guilty of wildlife harassment and that better law enforcement or signs would solve many problems.
- The group endorsed any effort to advertise the General Permit stipulations for winter travel in the refuge. Many members thought that it was difficult to find out about the 12" ground frost and 12" snow cover requirement for winter travel by ORVs. In addition, members said that it was difficult to find out about day-to-day snow cover conditions in such a windy area.

Vandalism and Law Enforcement

- The planning team often discussed trash dumping, abandoned cars and appliances, and the litter left by target shooters. Many members felt that these problems made Palmer Hay Flats look like a refuge for unsavory outlaws rather than a refuge for wildlife. The group endorsed all efforts at enforcing laws against littering and dumping.
- Members suggested that the local community might help with cleaning the area up. They suggested youth groups, conservation groups, and hunting clubs as possible sponsors for clean-up events.

Discussion of Regulations

- Several members agreed that we should keep our aircraft regulations consistent with other agencies if possible for ease of enforcement
- The planning team discussed the need to post regulations more prominently on the refuge and in publications. They said that the 12" ground frost and 12" snow cover requirement for winter travel by ORVs needed to be widely publicized or made into regulation so that the public is aware of them.
- Many group members felt that the 1,000 GVW restrictions should be applied to aircraft as well as to off-road-vehicles. They said that snow compaction and habitat damage could occur as easily from aircraft as from ground transportation.
- The group wanted to allow more access to Wasilla Creek without disturbing bank anglers during the weekend fishery. After much discussion, they agreed that electric motors of 42 lbs. (3 horsepower) of thrust would be satisfactory.

Priorities for Implementation and Operations

The Citizens' Advisory Group and Planning Team discussed many operational concerns in the course of revising the goals, sub-goals and management guidelines. Many of their suggestions for changes

and projects were recorded. Each member had an opportunity to numerically prioritize these projects in order of importance and urgency. The individual prioritizations were collected and compiled. The following table presents the top 25 priorities resulting from that compilation.

Priority	***Project***
1.	Seek funding to acquire private land within the refuge
2.	Acquire ownership of MSB land adjacent to and within the refuge
3.	Acquire state ownership of the properties along the Glenn frontage road
4.	Conduct research about the impact of ORVs on wetlands
5.	Post more signs (or kiosks) showing access points, explaining transportation restrictions
6.	Develop a Community Watch-type number to report vandalism & dumping
7.	Gravel & Grade Rabbit Slough access road
8.	Develop partnerships with service organizations to help with cleaning & maintenance
9.	Improve boat launch at Rabbit Slough
10.	Expand refuge to include as much coho rearing habitat in Spring Creek as possible
11.	Arrange for restroom facilities on fishing weekends and opening day of waterfowl hunting
12.	Examine and rehabilitate portage trail damage to avoid lake drainage
13.	Increase size of parking and add gravel to Rabbit Slough
14.	Require, not just recommend, 1500' altitude limit over Palmer Hay Flats for aircraft
15.	Develop an access point for the east side of the refuge (Matanuska Townsite or other easement)
16.	Enforce existing regulations that prohibit the building of permanent structures
17.	Clarify horsepower restrictions on Wasilla Creek in hunting and fishing regulations
18.	Open the Nelson Road gate
19.	Barricade the perimeters of Rabbit Slough and Cottonwood Creek parking areas in order to protect habitat, and promote safety
20.	Develop boardwalks to encourage bird viewing
21.	Develop a vehicle pull-off on Glenn Highway to watch winter moose
22.	Research potential impacts of the proposed Anchorage-to-Valley Winter Trail
23.	Develop summer access for retriever/bird dog trainers
24.	Install warning signs about currents and winds at Knik River

Appendix C: Citizens' Advisory Group and Planning Team

Citizen Advisors

Name	Palmer Hay Flats Interests
Karen Boorman	Highway commuting, wildlife watching
Russell K. Butts	Hunting, fishing, hiking, gun safety
Bonnie Dinkel	Adjacent landowner, wildlife watching
Bob Doyle	Hunting, fishing, retriever training, Ducks Unlimited
Chuck Doyle	Bowhunting, youth hunter education
Daniel Eliott	Adjacent landowner, wildlife watching
Carl Grauvogel	Duck hunting, ORV user, boating
Wes Hamrick	ORV user, ORV business proprietor
Larry Van Patten	Duck hunting, Palmer Hay Flats cabin permittee
Dean Vogt	Hunting, fishing, trapping, hiking
Nicole Whittington-Evans	Wildlife watching, wildlife education, highway commuting

Agency Representatives

Kent Patrick-Riley	Alaska Department of Environmental Conservation--Watershed Protection
Linda Brannian	Alaska Department of Fish & Game--Commercial Fisheries Division
Cevin Gilleland •	Alaska Department of Fish & Game--Habitat and Restoration Division
Herman Griese •	Alaska Department of Fish & Game--Wildlife Conservation Division
Craig Whitmore •	Alaska Department of Fish & Game--Sport Fish Division
Dick Mylius •	Alaska Department of Natural Resources--Division of Land
Murph O'Brien •	Alaska Department of Transportation & Public Facilities
Lisa Paerels	Alaska Mental Health Trust Lands
Jeff Denton	Bureau of Land Management--Anchorage District
Bruce Seppi •	Bureau of Land Management--Anchorage District
Beth McKibben •	Matanuska-Susitna Borough--Division of Planning
Jonathan Hall •	US Fish & Wildlife Service--Ecological Services

The following goals for the Citizens' Advisory Group and Planning Team were adopted during their first meeting in April 1998:

- To recommend any necessary changes to the goals, sub goals and management guidelines of the 1986 Palmer Hay Flats State Game Refuge Management Plan;
- To review and recommend changes to public uses of Palmer Hay Flats Refuge compatible with the management plan goals, sub-goals and management guidelines;
- To identify which uses of Palmer Hay Flats Refuge are in conflict with each other and to recommend ways to reduce or eliminate these conflicts; and
- To establish a mechanism for continuing public participation in the management of Palmer Hay Flats, including future planning efforts.

The Planning Team met 12 times between April 1998 and May 2000. The team adopted a consensus style for making most decisions, except when discussions became too time-consuming. On those occasions team members could call for a vote, with 2/3 of the members present carrying the vote.

• Voting agency representatives of the Planning Team

Appendix D: Natural Resource Inventory

Following the 1964 earthquake, much of the Palmer Hay Flats subsided an average of 2 feet (National Research Academy 1972). As a result of the subsidence, an even larger area is subjected to flooding by both high tides and high water from the Matanuska and Knik Rivers. The hayfields and pasturelands west of Cottonwood Creek became unsuitable for agriculture.

Waterfowl, however, have benefited from the creation of more wetlands on the flats. Waterfowl population estimates for the flats prior to the earthquake are unavailable and intensive surveys did not begin until the early seventies.

Physical Environment

Climate

The mean annual temperature for the area is 35.2 degrees Fahrenheit and ranges from a low of -41°F to a high of 91°F. Average annual precipitation is 15.49 inches. September is the wettest month, averaging over 2.5 inches while March, the driest month, averages only 0.52 inches. Maximum snow accumulation occurs in January, averaging 8.3 inches (Ritchie et al. 1981). Spring thawing usually begins in April.

The refuge is buffeted by winds blowing from various directions. The major winds influencing the Mat-Su valley are locally known as "Matanuska winds" and "Knik winds. Matanuska winds are caused by cold air dropping out of the Copper River plateau. Cold air funnels down the Matanuska River from the north east and blows across the valley and the Hay Flats. Matanuska winds may occur any month of the year, but average about four days a month from October through April. Knik winds come from the southeast can occur in any month, though May is usually the windiest from this direction. The Knik winds tend to carry a large dust load when they do blow (Dale 1956). There are no records of average or maximum wind speeds on the refuge.

Snow Cover

The depth of snow cover in the refuge varies according to the protection provided by the plant communities. Snow depth in spruce forests on the east side of the refuge corresponds closely with the snow depth in Palmer. However, winter winds blow snow out of the open expanses of refuge wetlands and waterways.

Soils

Palmer Hay Flats soils are composed entirely of tidal marsh and clunie types (Schoephorster 1968). These soils range from peat to silty, clay loams. Drainage is typically very poor with water tables at or near the surface. These soils are subject to extreme frost action. Tidal marsh soils are a direct result of silt deposition by the Matanuska and Knik rivers. Clunie soils result from a build-up of woody vegetation in poorly drained sites where accumulation greatly exceeds decomposition. Very high tides and river flooding intermittently inundate both soils. Because of their structural characteristics neither of these soils is suitable for topsoil, fill, or construction purposes (Schoephorster 1968).

Glaciation

During the ice-age this area was periodically covered by glaciers which created the Matanuska and Knik River valleys and what is now Knik Arm. Advancing and receding glaciers left a layer of

glacial till over much of the area. Subsequently, tidal marsh and clunie soils have developed and cover these large glacial deposits. Upstream glaciers on both of the Matanuska and Knik rivers continue to add sediment to Cook Inlet (including the Hay Flats and Knik Arm) at the rate of 13 to 19 million tons per year (Schoephorster1968). This deposition has developed extensive mud flats, which extend several miles west of the existing refuge boundary.

Hydrology

The 1964 earthquake caused bedrock to subside 11to 25 inches, however, the surface of the refuge may have been lowered more due to compaction of sedimentary deposits (Plafker 1969). Subsidence has caused increased flooding of many areas during high tides and high river run-off. A Corps of Engineers report (1985) indicates that clearwater marshes near the Alaska Railroad on the east end of the refuge are maintained by ground water recharge from aquifers, local runoff, and precipitation. This process is probably functional throughout the refuge. Annual river flooding and periodic high tides were found to maintain the character of saltwater marshes (Corps of Engineers 1985). Hydrology along with landform, soils, and climatic influence determine the vegetative communities that develop on a given site. Changes in these factors across the refuge has resulted in a zonation or gradient of plant communities from the tide flats to the better drained upland sites.

Biological Resources

Vegetation

The Palmer Hay Flats refuge is primarily composed of tidal mud flats, vegetated mud flats, bogs, lakes, ponds, creek levees, and sloughs.

These features can be grouped into 3 landform types that are predominant on the refuge: mudflats, permanent or intermittent ponds, and tidal creeks. These landforms are dominated by herbaceous and shrubby vegetation. Trees are limited in distribution and occur in pure or mixed stands of cottonwood and spruce on better-drained sites.

Sellers (1979) classified vegetative communities within Palmer Hay Flats State Game Refuge into five major groups. These communities are comparable to the zonation of plant species in salt marshes as published by Vince and Snow (1984):

- **Tidal Flats** extend towards the inlet from about mean high tideline and consist of exposed mud flats vegetated only by algae.
- **Puccinellia-Triglochin Community** is located just inland from mean high tideline and is dominated by patches of creeping alkali grass (*Puccinellia phryganodes*), clumps of large alkali grass (*Puccinellia grandis*) and seaside arrow-grass (*Triglochin maritimum*) interspersed with patches of mud often colonized by slender glasswort (*Salicornia europaea),* spurry (*Spergularia canadensis*), sea blight (*Suaeda depressa*) and algae. Other important plants in these communities are goose tongue (*Plantago maritima*), Pacific silverweed (*Potentilla egedii grandis*) and sea milkwort (*Glaux maritima*). Recently exposed mud, such as where ponds were drained by tidal guts, often supports nearly pure patches of creeping alkali grass.
- **Ramenski Sedge-Shallow Pond Community** begins further inland where Ramenski sedge (*Carex Ramenskii*) gains dominance over the Puccinellia-Triglochin community. Clumps of seaside arrow-grass are often scattered in the Ramenski Sedge-Shallow Pond Community. Ponds within this habitat are shallow (generally less than two feet) with sharply defined shorelines, little emergent vegetation and usually unvegetated bottoms. Intermittent ponds near the interface with the Marsh Community are deeper and have four-leaf mare's tail (Hippuris tetraphylla) and may support pondweed (*Potomageton filiformis*). Slightly elevated ground, such as banks of tidal guts

and edges of oxbows, are vegetated by grass-forb communities featuring beach rye (*Elymus arenarius mollis*), bluejoint (*Calamagrostis canadensis*), blue grass (*Poa eminens*), red fescue (*Festuca rubra*), Pacific silverweed, Arctic daisy (*Chrysanthemum arcticum*), wild iris (*Iris setoa*) squirrel-tail barley (*Hordeum jubatum*), lupine (*Lupinus arcticus*), beach lovage (*Ligusticum scoticum*), wild celery (*Angelica lucida*), shooting star (*Dodecatheon pulchellum*) and *Saussurea nuda*.

- **Marsh Community** is a diverse interspersion of wetland, wet meadow and grass-forb communities. Waterbodies vary from shallow ponds to small lakes, and are characterized by indistinct shorelines with a fringe of emergent vegetation. Many of the smaller wetlands are nearly covered by emergents, the most prevalent being sedges (*Carex spp*), low bulrush (*Scripus paludosus*), four-leaved mare's tail, and tall bulrush (*Scripus validus*). Many ponds support submergents including pondweeds (*Potomageton spp*), horned pondweed (*Zanichellia palustris*), water milfoil (*Myriophyllum spicatum*) and wigeon grass (*Ruppia spiralis*). Wet meadows are inundated by high tides (+32 feet) several times during the year. Plants growing here (sedges, silverweed, goose tongue, and seaside arrow-grass) are tolerant of saturated alkaline soil conditions. Drier sites have grass and forb species as described for the Ramenski Sedge-Shallow Pond Community.
- **Shrub-Bog Community** is the least affected by tidal flooding and covers the largest area on PHFSGR. It extends inland from the Marsh Community to the point where elevation and drainage allow upland plants to grow. Ponds within this habitat are generally deeper and have distinct, though often floating, shorelines and little aquatic vegetation. The plants include sweet gale (*Myrica gale*), dwarf birch (*Betula nana*), Arctic dock (*Rumex arcticus*), water hemlock (*Cicuta douglasii*), cotton grass (*Eriphorum spp*), bluejoint, marsh five finger (*Potentilla palustris*), and buckbean (*Menyanthes trifoliata*). Slightly drier sites have willow (*Salix spp*.), alder (*Alnus tenuifolia*), black spruce (*Picea mariana*), heaths (*Ledum spp*.), and (*Kalmia spp*.).

Ritchie et al. (1981) and Batten et al. (1978) have described similar vegetation communities for PHFSGR and Ritchie et al. have provided a list of plant species (Table 1).

Succession

No matter how plant communities are described, gradations from one type to another occur as a result of micro-site variations. Long term changes in site conditions, as mentioned earlier, alter plant communities. Factors at work changing site conditions within PHFSGR were described by Ritchie et al. (1981) and include:

1) ***Fluvial action***: stream channel cutting and filling, channel changes, any stream channel activity.
2) ***River flooding***: annual flooding of lowland areas and channel maintenance through scouring. (The severity of flood action on the Knik river has decreased considerably since the ice dam creating Lake George has been washed out.)
3) ***Loess and silt deposition***: wind and water deposited fines.
4) ***Peat formation***: accumulation of undecomposed plant material in wet sites.
5) ***Tidal flooding***: eliminates salt intolerant species.
6) ***Glaciation***: glacial action shaped the area and continues to fill in tide and submerged lands.
7) ***Earthquake***: uplifting and subsidence of refuge lands.

8) ***Human caused***: railroads, roads, dikes, and ditches change patterns of water movement and provide microhabitats.

Faunal Diversity

As a result of the wetland nature, lack of upland habitat, and surrounding development activity, faunal diversity on the refuge is limited. Large mammals in general are absent except for moose and occasional bears. Waterfowl, furbearers, small game and a diversity of non-game are abundant on the refuge.

Amphibians

The only amphibian recorded for this area is the wood frog (*Rana sulvatica*) (Ritchie et al. 1981).

Birds

Waterbirds

With such a wide variety of plant communities a wide variety of bird life can be expected. Because of the estuarine nature of the Hay Flats, waterfowl are particularly attracted to it. Timm (1977) estimated that over 100,000 ducks, 50,000 geese including Canada geese (*Branta canadensis*), snow geese (*Chen caerulescent*), and white-fronted geese (*Anser albifrons*), and 5,000 swans including tundra (whistling) swans (*Olor columbianus*) and trumpeter swans *(Olor buccinator*) use d the PHFSGR in the spring. These large spring concentrations usually occur between April 10 and May 10 with peak numbers in late April to early May (Timm 1977). Timm (1977) also estimated that fall use was reduced to 50,000 ducks, 10,000 geese, and 15,000 swans, with use occurring from mid-August to early October. Swans are reported to use Reedy, Dinkel and Weinie lakes in the fall for feeding and nesting. The summer nesting population of waterfowl is limited primarily to dabbler and diving ducks. Timm (1978) documented dabbling duck densities between 38.5 and 70.8 ducks per square mile in the years 1975 through 1978.

Sellers (1979) evaluated use of habitat by the following bird groups:

- The density of adult **dabbling ducks** was consistently highest in the Marsh Community, ranging from 300 birds per square mile in July to over 1,100 per square mile during the fall migration in August. For three days following tidal flooding, mallards and pintails heavily used the Puccinella-Triglochin community which was covered by two to three inches of water. After flood waters receded duck use of this habitat diminished drastically. Use of tidal flats, particularly by **mallards** (*Anas platyrhynchos*) and **wigeon** (*Anas americana*), increased in late August. During the early part of hunting season (September and early October), ducks concentrated on these mud flats where they found food (mollusks and algae) and security from hunters.

  Marsh and Ramenski Sedge-Shallow Pond Communities received most brood use in July (46 and 23 broods per square mile, respectively).

  Adult **Pintail** *(Anas acuta)* and broods used the shallow ponds in the Ramenski-Sedge Community throughout the summer more than any other species, although **green-winged teal** (*Anas crecca*) did show some preference for this habitat in August. Brood use of the Ramenski Sedge-Shallow Pond type was somewhat surprising because these wetlands offer little escape cover. Food (Chironomid largae, other invertebrates, and aquatic plants) did not appear more abundant than in Marsh ponds.
- **Diving ducks, mergansers, loons, and grebes** used deeper water bodies within the Marsh and, to a lesser extent, Shrub-Bog Communities. Common loons have nested on lakes in the past and pacific loons use the lakes each year (pers. comm. Tom Oliger)

- **Canada geese** used all habitats from Marsh to Tidal Flats during June. Aerial surveys suggest that Marsh or Ramenski Sedge-Shallow Pond communities are important during the middle of summer (July early August). By late August, Canada geese were concentrated on the tide flats, and used the Puccinella-Triglochin and Marsh habitat only moderately occurred.
- **Cranes and shorebirds'** habitat preference varied both by species and month. Unlike other shorebirds, sandhill cranes and common snipe preferred the Shrub-Bog Community. The heaviest use of this habitat by sandhill cranes occurred in August, while snipe shifted from this habitat to the Ramenski Sedge-Shallow Pond Community in August.

  Sandhill cranes frequent grain and potato fields near Palmer, and to a lesser extent, utilize the refuge. Small flocks of this species feed on levees and in forested wetlands of Coffee Point in late April 23, 1980. Occasional pairs were observed throughout the summer by other investigators (Batten et al. 1979; Sellers 1979) and flocks of as many as 50 birds were noted in July and August 1980. Numbers of cranes during fall migration fluctuate annually (Felzien pers. comm.).
  No large concentrations of migrating **shorebirds** (greater than 100 birds) have been described for the mudflats in this area. Concentrations in lower Cook Inlet (Arneson 1978), suggest more of an outer coastal route or southern route for the numerous shorebirds that use the Copper River Delta (Isleib and Kessel 1973; Senner 1977). Primary shorebird species represented on the refuge are breeders (e.g., greater yellowlegs *Tringa melanoleucus*) that winter along coastal-marshes as far south as the tip of South America (Hall 1960).

  Greater Yellowlegs were primarily associated with Marsh in June, with Shrub-Bog Community habitat used secondarily. Later in the summer, use of Tidal Flats and Ramenski Sedge-Shallow Pond community increased and use of Shrub-Bog Community areas dropped.

  Greater Yellowlegs and **common snipe** are common in spring and summer and likely breed throughout the refuge.. N**orthern phalarope** *(Phalaropus lobatus)* are less common breeders (Griese, pers. comm). Short-billed dowitchers *(Limnodromus griseus*) and least sandpipers (*Calidris minutilla*) may also be summer residents and breeders (Sellers 1979; Bakus et al. 1979). In summer species such as snipe feed on dipterans (Aquatic fly larvae) and other bog invertebrates (Tuck 1972).

  Short-billed dowitchers preferred Marsh habitat in June, but later in the summer, as the water levels dropped, they switched to feeding on the mud bottoms of shallow ponds in the Ramenski Sedge-Shallow Pond Community. When these ponds were full, in early June, a sharp edge was formed where thick Ramenski sedge cover abutted water several inches deep. Perhaps this sharp shoreline gradient discouraged use by short-billed dowitchers which prefer to wade and feed on exposed mud or in very shallow water.

  Hudsonian godwits *(Limosa haemastica)* were most abundant in July and used a combination of Marsh, Ramenski Sedge-Shallow Pond Community, and Puccinella-Trigochin habitats. Like dowitchers, Hudsonian godwits concentrated on exposed mud flats adjacent to shallow water. In July, only Hudsonian godwits made significant use of tidal sheet water on the Puccinella-Trigochin flats. Least and semipalmated sandpipers (Calidris pusillas) were abundant during July on tidal mud flats and on exposed mud fringes of drying wetlands.

Raptors

All raptors observed on the refuge are typically tree nesters with the exception of northern harriers (*Circus cyaneus*) and short-eared owls (*Asio flammeus*). With timber stands limited to a small portion of the refuge along the eastern boundary, resident raptors can be expected to be few in numbers. Bald eagles (*Haliaeetus leucocephalus*) have been sighted on the refuge year-round.

- A wide variety of **raptors** use the refuge during the year. Ritchie (1981) suggests that the primary use of the refuge by raptors occurs during migration. In 1998 there were 3 **bald eagle** nests in the hay flats area. Migrants and occasional visitors include: **bald eagle**, **golden eagle** (*Aquila chrysaetos*), **osprey** (*Pandion haliaetus*), **red-tailed hawk** (*Buteo jamaicensis*), **rough legged hawk** (*Buteo algopus*), and **merlins** (*Falco columbarius*). Nesting raptors are few in numbers and few nests have been located. Ritchie (1981) lists **goshawks** (*Accipiter gentilis*), red-tailed hawks, **northern harriers** may be breeding in the refuge. An osprey nest has been located near the hay flats. Red-tailed hawks have nested on the eastern edge of the refuge. **Northern harriers** are observed on the refuge throughout the summer but no nests have been reported. Swainson's hawks *(Buteo swainsoni*) have reported during migration.
- **Great-horned owls** (*Bubo virginianus*) are probable breeding raptors in the refuge area (Ritchie (1981). Possible breeders are **short-eared owl**, **northern saw-whet owl** (*Aegolius acadicus*), **hawk owls** (*Surnia ulula*), and **boreal owl** (*Aegolius funereus*) (Griese, pers. comm.). A family of **great gray owls** (*Strix nebulosa*) have been sighted near the Cottonwood Creek area in the spring (Masteller pers. comm..), and short-eared owls have been sighted near the Knik River on the east side of Glenn Highway in December and January (Lawton, pers. comm.), as well as during spring and fall migrations.

Other Avifauna

Ritchie (1981) gives a good account of other avifauna of the refuge area:

- **Spruce grouse** (*Canachites canadensis*) and **ruffed grouse** (*Bonasa umbellus*) reside in the uplands of the study area, and in willow stands as far west as Coffee Point. The willow stands occasionally attract wintering ptarmigan (*Lagopus spp*.). Ruffed grouse were introduced in 1989 at Big Lake and at Hayfield Road in 1990 (Steen, pers. comm.).
- **Passerines**, including **Lapland longspurs** (*Calcarius lapponicus*), **white-crowned sparrows** (*Zonotrichia leucophrys*), and **savannah sparrows** (*Passerculus sandwichensis*), are common to abundant in migration. The savannah sparrow may be the most common breeding passerine throughout the Coffee Point area and winters as far south as El Salvador (Bent 1968). In spring, migrating Lapland longspurs feed on seeds of numerous levee sedges and grasses (Bent 1968). Passerine diversity increases in brush and woodland habitats with thrushes, warblers, and **dark-eyed juncos** (*Junco hyemalis*) common to abundant. American pipits (*Anthus rubescens*) are also common in migration.

See Table 2 for a more complete list of birds that may occur in Palmer Hay Flats State Game Refuge.

Mammals

The lack of significant areas of upland habitat limits the variety of upland mammals occurring in the refuge. The most visible mammals are **moose**. The refuge provides both wintering and calving habitat (Masteller, in press). As surrounding upland forest is cleared for development, the refuge becomes increasingly important for over-wintering moose.

In some heavy snow years at least 500 moose winter in the refuge and adjacent areas and motorists on the Glenn Highway may see 40-100 moose. It was assumed that these moose made yearly migrations from the eastern river valleys of the Matanuska and Knik. However, between 1995 and 2000 ADF&G biologists tracked the movement of 45 cow moose that were radiocollared in Palmer Hay Flats during the winter. Twenty-five percent of these cows remained on or near PHFSGR during most seasons and were deemed "resident" animals. Seventeen percent of the collared animals

spent most of the year near Willow Mountain and the west side of the Susitna River. Fifty-eight percent moved west to the heavily wooded areas near Nancy Lake and Big Lake during the non-winter months. This study also found that most of the collared the moose came to the Hay Flats only during heavy snow years or during heavy snow events. This study indicates that there is little interchange between moose wintering on or near PHFSGR and those moose in the Knik and Matanuska River drainages.

Masteller (pers. comm.) estimates between 25 and 30 moose calve on the refuge annually, principally in the patches of trees and tall shrubs found in the northeast portion of the refuge. As winter snow depth and available habitat fluctuate, numbers of moose can be expected to vary as well.

Hunters take a few moose annually from the refuge; generally along the railroad or in the more wooded areas of the refuge (See Appendix F). As adjacent natural vegetative communities are converted into housing development, gravel pits and industrial sites, fewer moose can be accommodated in areas surrounding the refuge. In winters with deep snow accumulation mortality will increase as a result of this reduced winter range. Under these conditions the importance of refuge habitat can be expected to increase.

Caribou were seen on the refuge but only rarely (Didrickson pers. comm.). No other wild ungulates occur on the refuge. Ritchie et al. (1981) listed additional mammals that possibly occur on the refuge (Appendix B).

Brown bears (*Ursus arctos*) infrequently occur on the refuge are consistently reported using the refuge each summer and fall, but **black bears** (*Ursus americanus*) (Griese pers. comm.). Ritchie et al. (1981) suggests that **muskrats** (*Ondatra zibethicus*) are probably the most abundant furbearer on the refuge. Muskrats numbers are impacted by deep ice resulting from extreme cold temperatures prior to adequate snow cover (Masteller pers. comm.). **Beaver** (*Castor canadensis*) have historically impacted water birds in the Spring Creak area but their numbers have been reduced in recent years probably due to heavy trapping (Griese pers. comm.). **Coyote** (*Canis altrans*), **red fox** (*Vulpes vulpes*), **mink** (*Mustela vison*), **least weasel** (*Mustela nivalis*), and **ermine** (*Mustella erminea*), and **snowshoe hare** (*Lepus americanus*) reach their highest levels in the wooded and shrub communities of the refuge. **Wolves** (*Canis lupus*) have consistently been sighted in recent years. **River otters** (*Lutra canadensis*) are sometimes sighted in the Spring Creek system but are considered uncommon.

See Table 3 for a more complete list of mammals that may occur in Palmer Hay Flats State Game Refuge.

Fish

Both resident and anadromous fish reside in waters located within the refuge. Wasilla Creek/Rabbit Slough, Spring Creek and the Matanuska and Knik Rivers support the majority of fisheries resources in the refuge. Other waters within the refuge undoubtedly contain small numbers of fish such as juvenile **coho salmon** (*Onchorhynchus kisutch*) which frequently migrate long distances to seek waters they can successfully rear in for the two year period necessary for smolt development.

- ***Wasilla Creek/Rabbit Slough*** - This drainage supports populations of anadromous coho, **sockeye** (*Onchorhynchus nerka*) **chinook** (*Onchorhynchus tshawytscha*) and **pink salmon** (*Onchorhynchus gorbuscha*) as well as resident species which **include rainbow trout** (*Onchorhynchus mykiss*) and **Dolly Varden** (*Salvelinus malma*). The coho salmon is the most abundant of the anadromous species and adult returns average about 5,000 fish. The other anadromous species combined probably number less than 1,000. There are no estimates of resident fish numbers.

  The majority of adult anadromous salmon and resident species spawn in waters located outside of refuge boundaries. Limited coho spawning has been documented in the Spring Creek

tributary partially located in the refuge. Juvenile rearing of anadromous and resident species occurs throughout the drainage. The Spring Creek drainage provides the majority of rearing area for coho salmon utilizing the Wasilla Creek drainage. Although the majority of adult coho salmon spawn in the upper portion of Wasilla Creek the resulting juveniles migrate into Spring Creek.

- ***Matanuska River*** - This drainage contains all **five species of anadromous salmon**, **rainbow trout** and **Dolly Varden**. Population numbers are not available except on individual tributaries located outside the refuge.

  There is some **coho, pink,** and **chum salmon** spawning occurring in sloughs and upwelling areas in that portion of the river located in the refuge. These same areas are utilized by juvenile salmon.

- ***Knik River*** - This drainage also contains all **five species** of **anadromous salmon**, **rainbow trout**, **Dolly Varden** and **whitefish** (*Prosopium cylindraceum*). Population numbers are not precisely known. There is a private nonprofit hatchery located just outside refuge boundaries. This hatchery produces primarily chum salmon and has not reached full production levels.

  There are no spawning or rearing areas located in that portion of the drainage located within the refuge.

  The gravel pit located between the mouths of Knik and Matanuska rivers near tidewater contains sockeye and coho salmon and **Bering ciscoe** (*Coregonus laurettae*). Although there are no inlets or outlets, fish move into and out of the gravel pit at high tides. During some years, coho and sockeye grow to a size that is attractive to anglers.

- ***Cottonwood Creek*** - While this drainage is outside the refuge, it is immediately adjacent to it. The primary access to the western portion of the refuge requires users to cross Cottonwood Creek near its mouth where it flows into Knik Arm.

  The drainage supports populations of anadromous **coho** and **sockeye salmon** and resident species which include **rainbow trout** and **Dolly Varden**. Sockeye salmon are most abundant in the drainage and adult returns vary between 15,000 to 25,000. Coho salmon returns average about 5,000 annually. There are no estimates for resident fish numbers. Sockeye salmon spawn primarily in lakes located up in the headwaters while coho salmon and rainbow trout utilize the upper stream reaches of the drainage. Juvenile rearing of anadromous and resident species occurs throughout the drainage.

Habitat Enhancement

Tidal flooding and the lack of one or more of the basic nesting habitat requirements may render large areas of the refuge unsuitable for waterfowl nesting. The potential exists to improve waterfowl nesting by development of these habitat requirements: open water for brood and pair movement, nest sites that are secure from flooding and terrestrial predators, suitable aquatic vegetation for food and cover, invertebrate production, and proper interspersion of these elements (Rosenberg, 1985).

DU pond development

In 1986, Ducks Unlimited, Inc. (DU) and the Department developed a waterfowl enhancement project in the eastern portion of the refuge to test the feasibility of more extensive habitat enhancement projects on the refuge. The selected area did not contain all of the habitat requirements listed above and provided little if any waterfowl habitat. Construction of the railroad track pad and highway roadbed have altered water movement patterns of the area.

Located on both the east and west sides of the Glenn Highway and about 1 mile north of the Matanuska River, the project encompasses about 135 acres (Fig. 1). The project is designed to

increase nesting and brood rearing habitat for mallards and pintails. Thirteen ponds totaling 18 acres and averaging approximately 1.4 acres are interconnected by almost 3 miles of level-ditches. Spoils from excavating level-ditches were placed along the edge of the ditch to increase potential nest sites and provide loafing mounds. The sites were seeded and fertilized and willow sprigs were planted.

Glenn Highway expansion mitigation

Expansion of the Glenn Highway from 2 to 4 lanes beginning in 1992 was expected to remove some wetland and change flow of water across the Hay Flats. In an effort to mitigate for the loss of wetlands caused by the highway expansion, 2 culverts that transmit water from the east side of the Glenn Highway to the west side were blocked by water control structures (Fig. 1). It was hypothesized that the blockage would raise the east side water elevation 12 to 18 inches to provide more habitat for key species such as dabbling ducks, coho fry and muskrats. After 5 years of monitoring, it appears that the water elevations raised an average of 8.5 inches and the goal of 12 inches was not achieved (Table 4)

From 1992 to 1997, simultaneous with the highway mitigation study, waterfowl migration and nests were surveyed on the east and west side of Glenn Highway in and around the DU ponds (Tables 5, 6 and 7). Since comparable surveys were not conducted prior to construction of the DU ponds, these surveys are not valid measures of nesting success for the ponds. The waterfowl nesting surveys also did not indicate any significant changes in either the number of nests or nesting success as a result of the water control structures at the Glenn Highway culverts.

No salmon fry were found in the mitigation area during the 5-year study. However, it should be noted that the water control structures were not designed to allow fish passage. When water levels failed to raise to a level sufficient for fish rearing, the design of the water control structures became irrelevant.

Muskrat pushup and house counts in the mitigation and the Spring Creek areas were conducted in 1991-1994 and 1996-1997 (Table 8). Lack of snow cover leading to deep-freezing in the winter of 1995-1996 probably caused a drastic reduction of Palmer Hay Flats muskrats in 1996. No discernible change in muskrat numbers could be attributed to the small rise in water levels due to culvert water control structures (Alaska Department of Fish and Game, 2000).

Need for Further Study

The physical and biological impacts of ORV use within the Trail Corridor are not known. There is cause for concern that the widening and deepening of the trail may change the water drainage patterns in the area. It is possible that the trail could breach the margins of the shallow ponds near Cottonwood Creek drainage of the shallow ponds would diminish both waterfowl habitat and waterfowl hunting opportunities.

There are deep portage trails forming in two locations on the perimeter of “Duck Lake” near Coffee Point. Extreme high tides (>32 feet) in the spring and fall already breach the margins of the lake. Study of the hydrological impacts may reveal a need to prevent further deepening of the trails.

The abundance and distribution of most animal species on the refuge are not well documented. Waterfowl census and waterfowl hunter and moose hunter surveys are the most frequent inventory activities that the department conducts on the refuge. Habitat types have not been accurately mapped thus making it difficult to establish relationships between wildlife and habitat. A comprehensive inventory of refuge resources would provide essential baseline information.

Table 1. Annotated List Of Plant Species (Ritchie et al. 1981)

Plants are listed alphabetically by genus and species. Nomenclature of vascular plants generally follows Hulten (1968), and the name used by Hulten is provided in parentheses wherever a different nomenclatural authority was used. Nomenclature of willows (*Salix* spp) follows Argus (1973). Collection numbers are given in parentheses at the end of each account. The plants were collected by A. Batten and R. Ritchie (numbers 80-1 to 80-80), A. Batten and R. Sellers (80-81 to 80-105), and A. Batten and P. Reed *80-106 to 80-280). Any other collectors are mentioned specifically by name.

Achillea borealis Bong. Slough levees, roadsides. (80-165).
Agropyron trachycaulum (Link) Male (=*A. pauciflorum* (Schwein.) Hitchc.). Silt bars, roadsides. (80-198).
Alnus tenuifolia Nutt. Very common, often forming dense stands, especially on creek banks. Often present as a scattered overstory species in many wetland types. (80-16, 80-127).
Alopecurus aequalis Sobol. Rare. Found in a wet meadow adjacent to a lake off the Knik River road. *80-214).
Andromeda polifolia L. In peat, usually associated with Sphagnum spp. (80-112).
Angelica incidor L. Upland cottonwood forests. (No specimen).
Arctagrostic latifolia (R.Br.) Griseb. Uncommon component of several wet meadow and shrubby types. (80-142, 80-225).
Aster junciformis Rydb. In ericaceous shrub-sphagnum bogs. (80-161, 80-263).
Atriplex spp. Tidal mud flats. (80-170).
Betula nana L. subsp. *exilis* (Sukatsch.) Hult. Common in some shrubby bogs. (80-179).
Betula papyrifera Marsh. Common in uplands; some are present in alder swamps; sapling size individuals common in shrubby wetlands. (No specimen.).
Calamagrostis canadensis (Michx.) beauv. Common in a side range of wetland and upland begetation types throughout the study area. (80-128, 80-159).
Calamagrostis deschampsioides Trin. Uncommon component of some coastal wetland types. (80-277).
Callitriche palustris L. shallow freshwater. Found on the shore of Jim Lake. (80-133).
Caltha palustris L. Locally common in fresh wet meadows. (80-44, 80-61).
Carex aquatilis Wahlenb. Dominant in many fresh wet meadows. (80-115).
Carex diandra Schrank. In clumps at pond and pool margins. Scattered in wet meadows. (80-41).
Carex Laeviculmis Meinsh. Occasional in sphagnum bogs. (80-105).
Carex leptalea Wahlenb. Rare in sphagnum bogs. (80-265).
Carex limosa L. Often associated with Myrica gale in freshwater wetlands. (80-72, 80-93, 80-116).
Carex lyngbyaei Hornem. Characteristic dominant of large areas of brackish wetlands, and also present in a few sites rarely if ever flooded by tidewater. (80-19, 80-40, 80-202).
Carex mackenziei Krecz. Locally common in shallow water on floating peat mats. Periodically flooded by brackish water (80-84).
Carex media R. Br. Found in a wetland dominated by *Myrica gale* and *Calamagrostis* canadensis. (80-143).
Carex phyllomainca W. Boott. Occasional in bogs. (80-264).
Carex pluriflora Hult. Associated with *Myrica gale* or *Carex Lyngbyaei*, usually in sites occasionally flooded by tidewater. Closely related to C. limosa, but has broader, flat leaves and black bracts. (80-81).
Carex ramenskii Kom. Locally common near the seaward edge of the Carex lyngbyaei type. (80-88, 80-172, 80-173).
Carex rostrata Stokes. Freshwater wet meadows. *80-42_.
Carex Saxatilis L. subsp. laxa (Trauty.) Kalela. Rare, in freshwater wet meadows. (80-141).
Carex sitchensis Prescott. Freshwater wet meadows, sometimes intergrading with and growing in close proximity to C. aquatilis and C. lyngbyaei. (80-46), 80-94, 80-201).
Carex tenuiflora Wahlenb. Occasional in bogs and myrica fens. (80-241, 80-258).
Chamaedaphme calyculata (L.) Moench. Bogs and myrica fens. (80-75, 80-237).
Chara spp. On the bottom of laeks and ponds. (80-30, 80-168).
Chrysanthemum arcticum L. Rare, on slough levees periodically inundated by tides. (80-278).
Cicuta virosa L. (C. mackenzieana) Raup. Occasional in wet meadow and myrica types, both fresh and brackish. (80-174).
Conioselinum chinense (L.) BSP. Occasional on slough levees. (80-279).
Corallorrhiza trifida Chatelain. Occasional in black spruce forests. (80-222).

Cornus canadensis L. Basically a plant of moist forests, sometimes growing on the tops of hummocks in shrubby wetlands. (80-233).
Cornus stolonifera Michx. Occasional in openings in cottonwood forests and better-drained alder thickets.
Delphinium glaucum S. Wats. Occasional in cottonwood groves. (Not collected).
Deschampsia beringensis Hult. Apparently rare in the study area, but present on some slough levees and locally abundant on one or two silt bars of major rivers.
Dodecatheon pulchellum (RAF.) Merr. Subsp. *superbum* (Pennell and Stair) Hult. Slough levees, willow thickets. (80-49).
Drosera rotundifolia L. Bogs. (80-244).
Dryopteros assimilis S. Walker (=D. *dilatata* (Hoffm.) Gray subsp. *americana*). Cottonwood groves and alder thickets. (80-184).
Elaeagnus commutata Bernh. Openings in some willow thickets; and dunes along the Knik River. (80-10).
Eloacharis palustris (L.) Roem. and Schult. Occasional in wet meadow and *myrica* types. (80-235).
Eleocharis kamtschatica (Link) Schult. Found in 10cm slightly alkaline water (pH 8.0-8.5) with *Scirpus paludosus* and *Triglochin palustris*. (80-79).
Elymus arenarius L. Common on slough levees and locally on tidal flats. (80-1).
Elymus sibiricus L. Roadsides and silt bars; rare in undisturbed habitats. (80-199).
Empetrum nigrum L. subsp. *hermaphroditum* (Lange) Bocher. Common in black spruce forests. (80-191).
Epilobium angustifolium L. Occasional in cottonwood groves and alder thickets. (Not collected).
Epilobium glandulosum Lehm. Occasional in fresh wet meadows. (80-216).
Epilobium palustre L. Occasional in wet meadows, especially the *Carex lyngbyaei* type. (80-164B).
Equisetum arvense L. Cottonwood groves, alder thickets, willow thickets, and sometimes extending into the more mesic parts of wet meadows. (80-8).
Equisetum fluviatile L. Wet meadows, bogs, *myrica* fens. (80-38).
Equisetum variegatum Schleich. Occasional in some wet meadows. (80-59).
Eriophorum angustifolium Honck. subsp. *subarcticum* (Vassiljev.) Hult. Occasional in wet meadows and bogs. (80-57).
Eriophorum gracile W. D. J. Koch. Bogs. (80-103).
Eriophorum russeolum E. Fries. Wet meadows and myrica fens. (80-35, 80-58, 80-111).
Erysimum cheiranthoides L. Roadside, trailsides. (80-122).
Festuca rubra L. Slough levees. (80-2).
Fritillaria camschatcensis (L.) Ker-Gawl. Occasional in willow thickets and the upstream parts of slough levees. (80-50).
Galium trificum L. An occasional, minor component of many wetland types. (80-62).
Galium triflorum Michx. Found once in an alder thicket. (80-183).
Gentiana spp. Rare on slough levees. Specimen is immature, not flowering. (80-164A).
Geocaulon lividum (Richards.) Fern. Occasional in black spruce forests. (80-192).
Geum macrophyllum Willd. Cottonwood forests. (No specimen).
Glaux maritima L. Rare on tidal mudflats. (80-171).
Hammarbya paludosa (L.) Ktze. Rare in bogs. (80-257).
Hedysarum alpinum L. subsp. *americanum* (Michx.) Fedtsch. Slough levees, willow thickets. (80-158).
Heracleum lanatum Michx. Cottonwood forests. (No specimen).
Hierochloe odorata (L.) Wahleng. Occasional on slough levees, sometimes extending into (brackish) wet meadows that are periodically inundated by tides. (80-4).
Hippuris tetraphylla L. Brackish pool; rare in study area. (80-180).
Hippuris vulgaris L. Freshwater pools; common. (80-23).
Hordeum brachyantherum Nevski. Slough levees. (80-160).
Hordeum jubatum L. Roadsides, slough levees. Rare in undisturbed habitats. (80-175).
Iris setosa Pall. Slough levees, willow thickets, edges of wet meadows. (80-48).
Juncus alpinus Vill. Found growing in flooded gravel of BP road. (80-260).
Juncus bufonius L. Tidal mud flats. (80-90).
Juncus castaneus Sm. subsp. *leucochlamys* (Zinz.) Hult. Found in moss at the edge of a rivulet. (80-243A).
Lathyrus palustris L. subsp. *pilosus* (Cham.) Hult. Slough levees, wet meadows, willow thickets. (80-157).
Ledum groenlandidum Oeder. Black spruce forests. (80-189).
Ledum palustre L. subsp. decumbens (Ait.) Hult. Bogs. (80-245).
Lemna minor L. Pools, floating on the surface. (80-130).
Lemna trisulca L. Pools, floating on the surface. (80-29).
Ligusticum scoticum L. subsp. Hultenii (Fern.) Calder and Taylor. Slough levees. (80-163).
Linnaea borealis L. Open forest floors (birch and black spruce). (80-223).

Lysimachia thyrsiflora L. Occasional in flooded sites: pond margins, wet meadows, *myrica* fens. (80-67a0.
Malaxis monophylla (L.) Sw. var. *brachypoda* (Gray) Morris and Amex. Found in wet peat in a *myrica* fen. Probably also in bogs. (80-69).
Menyanthes trifoliata L. Common in ponds and pools. (80-66).
Mertensia paniculata (Ait.) G. Don. Cottonwood groves, alder thickets. (No specimen).
Myrica gale L. Abundant in *myrica* fens. (80-33).
Myriophyllum spicatum L. Common in pools and in water beneath *Scirpus validus*. (80-24, 80-154).
Nuphar polysepalum Engelm. Ponds and laeks. (80--43).
Oplopanax horidus (Sm.) Miq. (=*Echinopanax horridum* (Sm.) Deene and Planch.) Moist cottonwood groves. (No specimen).
Oxycoccus microcarpus Turcz. *Sphagnum* peat. (80-246).
Parnassia palustris L. subsp. *neogaea* (Fern.) Hult. Occasional on slough levees and at the marging of wet meadows. (80-162).
Pedicularis labradorica Wirsing. Bogs. (80-243C).
Pedicularis parviflora J. E. Sm. In wet peat of bogs and myrica fens. (80-70).
Picea glauca (Moench.) Voss. Tall trees on streambanks and other relatively mesic sites (sometimes mixed with cottonwoods or overtopping alder thickets). Small, somewhat stunted trees in *myrica* fens. (No specimen).
Picea mariana (Mill.) Britt., Sterns and Pogg. Black spruce forests, bogs, and other sites with stagnant, nutrient-pool water (80-238).
Plantago maritima L. Slough levees and tidal flats. (80-31).
hyperborea (L.) Lindl. Occasional in bogs, wet meadows, and willow thickets. (80-3, 80-256).
Poa alpigena (E. Fries) Lindm. Occasional in slough levees, margins of wet meadows, and willow thickets. (80-9, 80-178, 80-261).
Poa eminens Presl. Slough levees and tidal flats. (80-5).
Polemonium acutiflorum Willd. Rare, in fresh wet meadows. (80-209).
Populus trichocarpa Torr. and Gray. Streamsides and course alluvium. (No specimen).
Potamogeton alpinus Balb. subsp. *tenuifolius* (Raf.) Hult. Found in a small pool in a wet meadow. (80-55).
Potameton berchtoldii Fieb. Occasional in small ponds; sometimes as "understory" beneath *Scirpus validus*. (80-22, 80-205).
Potamogeton filiformis Pers. Ponds that are periodically inundated by tides. (80-83, 80-85B, 80-153).
Potamogeton friesii Rupr. Common in the stagnant (clear) part of Jim Creek. (80-119B).
Potamogeton pectinatus L. Common in lakes, ponds, and sluggish streams , both in entirely fresh habitats and sites periodically inundated by tides. (80-85A, 80-119A, 80-121, 80-152).
Potamogeton perfoliatus L. subsp. richardsonii (Bennett) Hult. Lakes, ponds, and sluggish streams, rarely or never inundated by tides. (80-39, 80-118, 80-120, 80-231).
Potamogeton varinatus Turcz. Occasional in pools and ponds. (80-204).
Potentilla egedii Wormsk. subsp. *grandis* (Torr. and Gray) Hult. In fairly well-drained silt of slough levees and around the edges of wet meadows. (80-156).
Potentilla fruticosa L. Bogs and *myrica* fens. (80-240).
Potentilla palustris (L.) Scop. Fresh wet meadows, *myrica* fens, and wet hollows of alder thickets. (80-114).
Puccinellia grandis Swallen. Tidal flata; one of the most seaward-growing species. (80-28, 80-89, 80-89, 80-92).
Pyrola spp. Cottonwood groves. (No specimen).
Ranunculus cymbalaria Pursh. Brackish wet meadows and tidal flats. (80-11).
Ranunculus gmelinii DC. Freshwater pools. (80-37, 80-211).
Ranunculus Hyperboreus Rottb. Fairly rare; found at the margin of Jim Lake. (80-132).
Ranunculus sceleratus L. Found in a shallow pool od alkaline (pH 8.0-8.5) water. (80-76).
Rhinanthus minor L. subsp. *borealis* (Sterneck) Love. Rare; seen in an open willow thicket and in wet gravel on BP road. (80-262).
Ribes triste Pall. Cottonwood groves and alder thickets. (80-131A, 80-185).
Rorippa palustris (L.) Bess. Rare in fresh wet meadows. (80-213).
Rosa acicularis Lindl. Upland forests, alder thickets. (80-187).
Rubus arcticus L. subsp. *acaulis* (Michx.) Focke. Willow thickets, myrica fens, and alder thickets. (80-182).
Rubus chamaemorus L. Bogs and black spruce forests. (80-188).
Rubus idaeus L. subsp. *melanolasius* (Dieck) Focks. Locally present in cottonwood groves. (No specimen.)
Rumex fenestratus Greene. Occasional in fresh wet meadows and wet hollows of alder thickets. (80-232).
Ruppia spiralis L. Locally common in the large pond at Coffee Point; periodically inundated by tides. (80-166).

Salicornia europaea L. Tidal flats. (80-169).
Salix alaxensis (Anderss.) Cov. var. *longistylis* (Rydb.) Schneid. Occasional on riverbanks; also present in some wet meadows. (80-12, Curatolo s.n., 9 May 1980).
Salix barclayi Anderss. Common in willow thickets, often present in alder thickets, and commonly scattered in several other wetland types. (80-17, 80-18, 80-26, 80-51, 80-60, 80-140, 80-280).
Salix bebbiana Sarg. Common in willow thickets, often present in alder thickets, and commonly scattered in several other wetland types. (80-25).
Salix brachycarpa Nutt. subsp. *niphoclada* (Rydb.) Argus. Willow thickets. (80-14, 80-15, 80-150).
Salix fuscescens Anderss. *Myrica* fens. (80-34).
Salix glauca L. Willow thickets. (80-27, 80-151).
Salix lanata L. subsp. *richardsonii* (Hook.) A. Skyv. Occasional in bogs. (Batten and Murphy 77-64).
Salix lasiandra Benth. Found as a minor component of an alder thicket. (No specimen).
Salix scoulerinan Barr. Found on a well-drained site above Jim Lake. (Curatolo s.n.,9 May 1980).
Scirpus paludosus Nels. In small local patches in wet meadows, usually on tidally inundated sites. In wet silt or in up to 15 cm water. (80-77).
Scirpus validus M. Vahl. In 50 cm water or more. Generally inundated by the highest tides, but salinity undetectable most of the time. (80-20).
Scorpidium spp. An aquatic moss. (80-109, 80-247).
Senecio congestus (R. Br.) DC. Rare in shallow water at the margins of ponds. (80-215).
Smilacina stellata (L.) Des. Occasional in wet meadows and willow thickets. (80-7).
Sorbus spp. Cottonwood groves. (No specimen).
Sparganium minimum (Hartm.) E. Fries. Freshwater lakes and ponds. (80-21, 80-131B, 80-203).
Sparganium multipedunculatum (Morong) Rydb. Freshwater ponds. (80-206, 80-234).
Streptopus amplexifolius (L.) DC. Cottonwood groves. (No specimen).
Stellaria calycantha (Ledeb.) Bong. Wet meadows. (80-208).
Stellaria longifolia Muhl. Wet meadows. (80-65, 80-210).
Taraxacum ceratophorum (Ledeb.) DC. Slough levees, willow thickets. (80-6).
Thalictrum sparsiflorum Turcz. Cottonwood groves, alder thickets. (80-129).
Tofielda glutinosa (Michx.) Pers. subsp. *breistyla* Hitchc. Bogs. (80-259).
Trichophorum alpinum (L) Pers. Occasional in bogs and *myrica* fens. (80-117).
Trientalis eutopaea L. Occasional in willow thickets, alder thickets, black spruce forests, bogs, and cottonwood groves. (80-186).
Triglochin maritimum L. Tidal flats, extending into wet meadows and slough levees. (No specimen).
Triglochin palustris L. Occasional on tidal flats, slough levees, and some inland sites. (80-78, 80-91).
Urtica spp. Cottonwood groves. (No specimen).
Utricularia intermedia Hayne. Flooded, well-vegetated sites, such as wet meadows and *myrica* fens. (80-68), 80-113).
Utricularia minor L. Pools. (80-54).
Utricularia vulgaris L. Ponds (80-106).
Vaccinium vitis-idaea L. subsp. *minus* (Lodd.) Hult. Black spruce forests. (80-190).
Viburnum edule (Michx.) Raf. Cottonwood groves and alder thickets. (80-145).

Table 2. Birds which may occur in Palmer Hay Flats State Game Refuge

From Gabrielson and Lincoln (1959), Williamson et al. (1965), Wapora 1976), Anchorage Audubon Society (1978), Kessel and Gibson (1978), Sellers (1979), Ritchie (1981), Griese (pers. comm.), Mat-Su Birders (pers. comm.)

Common Name	Scientific Name	Status	Season
Common Loon	*Gavia immer*	U	s
Pacific Loon	*Gavia pacifica*	U	s*
Red-throated Loon	*Gavia Stellata*	R	s*, m
Yellow-billed Loon	*Gavia adamsii*	hypothetical	
Red-necked Grebe	*Podiceps grisegena*	C	s*
Horned Grebe	*Podiceps aritus*	C	s*
Pied-billed Grebe	*Podilymbus podiceps*	R	m
Great Blue Heron	*Ardea herodias*	U	a
Tundra Swan	*Cygnus columbianus*	C	m
Trumpeter Swan	*Cygnus buccinator*	C	s*, m
Canada Goose	*Branta canadensis*	C	s*, m
Black Brant	*Branta bernicla*	R	m
Greater White-fronted Goose	*Anser albifrons*	C	m
Snow Goose	*Chen caerulescens*	C	m
Mallard	*Anas*	C	s*
	platyrhynchos	U	w
Gadwall	*Anas strepera*	U	m
Northern Pintail	*Anas acuta*	C	s*
Green-winged Teal	*Anas crecca*	C	s
Blue-winged Teal	*Anas discors*	Ca	s
Cinnamon Teal	*Anas cyanoptera*	U	m
Northern Shoveler	*Anas clypeata*	C	s*
Eurasian Wigeon	*Anas penelope*	R	m
American Wigeon	*Anas americana*	C	s*
Canvasback	*Aythya valisineria*	U	s*
Redhead	*Aythya americana*	R	s*, m
Ring-necked Duck	*Aythya collaris*	R	m
Greater Scaup	*Aythua marila*	C	s*
Lesser Scaup	*Aythya affinis*	R	m
Common Goldeneye	*Bucephala clangula*	U	m
Barrow's Goldeneye	*Bucephala islandica*	U	m
		R	w
Bufflehead	*Bucephala albeola*	U	m
Long-tailed Duck	*Clangula hyemalis*	R	s
Harlequin Duck	*Histrionicus histrionicus*	R	s
White-winged Scoter	*Melanitta fusca*	R	m
Surf Scoter	*Melanitta perspicillata*	R	m
Black Scoter	*Melanitta nigra*	R	m
Common Merganser	*Mergus merganser*	U	m
		R	w
Red-breasted Merganser	*Mergus serrator*	U	m
Hooded Merganser	*Lophodytes cucullatus*	Ca	w
Northern Goshawk	*Accipiter gentilis*	U	s, w
Sharp-shinned Hawk	*Accipiter*	U	s
	straitus	Ca	w

Common Name	Scientific Name	Status	Season
Red-tailed Hawk	*Buteo jamaicensis*	U	s*
Rough-legged Hawk	*Buteo lagopus*	U	m
Golden Eagle	*Aquila chrysaetos*	U	m
Bald Eagle	*Haliaeetus leucocephalus*	C U R	s* s w
Northern Harrier	*Circus cyaneus*	U U	m s*
Osprey	*Pandion haliaetus*	R	m
Gyrfalcon	*Falco rusticolus*	Ca	w
Peregrine Falcon	*Falco peregrinus*	R	m
Merlin	*Falco columbarius*	R Ca	s w
American Kestrel	*Falco sparverius*	R	m
Ruffed Grouse	*Bonasa umbellus*	U	s*, w
Spruce Grouse	*Falcipennis canadensis*	U	s*, w
Willow Ptarmigan	*Lagopus lagopus*	U	w
Rock Ptarmigan	*Lagopus mutus*	U	w
White-tailed Ptarmigan	*Lagopus leucurus*		?
Sandhill Crane	*Grus canadensis*	C	s*
American Coot	*Fulica americana*	Ca	s, m
Semipalmated Plover	*Charadrius semipalmatus*	C	s*
Killdeer	*Charadrius vociferus*	R	s
American Golden Plover	*Pluvialis dominicus*	U	m
Black-bellied Plover	*Pluvialis squatarola*	R	m
Hudsonian Godwit	*Limosa haemastica*	R	s
Marbeled Godwit	*Limosa fedoa*	Ca	
Whimbrel	*Numenius phaeopus*	U	m
Upland Sandpiper	*Bartramia longicauda*	Ca	
Greater Yellowlegs	*Tringa melanoleuca*	C	s*
Lesser Yellowlegs	*Tringa flavipes*	C	s*
Solitary Sandpiper	*Tringa solitaria*	U	s*
Spotted Sandpiper	*Actitis macularia*	C	s*
Wandering Tattler	*Heteroscelus incanus*	U	s
Ruddy Turnstone	*Arenaria interpres*	R	m
Red-necked Phalarope	*Phalaropus lobatus*	C	s
Common Snipe	*Gallinago gallinago*	C	s
Short-billed Dowitcher	*Limnodromus griseus*	C	s*
Long-billed Dowitcher	*Limnodromus scolopaceus*	R	s*
Sanderling	*Calidris alba*	R	m
Red Knot	*Calidris canutus*	hypothetical	
Semipalmated Sandpiper	*Calidris pusilla*	R	m
Western Sandpiper	*Calidris mauri*	C	m
Least Sandpiper	*Calidris minutilla*	C	s
Baird's Sandpiper	*Calidris bairdii*	R	m
Pectoral Sandpiper	*Calidris melanotos*	U	m
Dunlin	*Calidris alpina*	R	m
Parasitic Jaeger	*Stercorarius parasiticus*	R	m

Common Name	Scientific Name	Status	Season
Long-tailed Jaeger	*Stercorarius longicaudus*	R	m
Glaucous Gull	*Larus hyperboreus*	R	v
Glaucous-winged Gull	*Larus glaucescens*	C U	s w
Herring Gull	*Larus argentatus*	C R	m w
Mew Gull	*Larus canus*	C	s*
Bonaparte's Gull	*Larus philadelphia*	C	s
Arctic Tern	*Sterna paradisaea*	C	s
Rock Dove	*Columbia livia*	C	s, w
Mourning Dove	*Zenaida macroura*	Ca	
Great Horned Owl	*Bubo virginianus*	U	s*, w
Snowy Owl	*Nyctea scandiaca*	Ca	m
Northern Hawk Owl	*Surnia ulula*	U	m, w
Great Gray Owl	*Strix nebulosa*	R	s*, w,
Short-eared Owl	*Asio flammeus*	U	s*
Boreal Owl	*Aegolius funereus*	U	s, w
Northern Saw-whet Owl	*Aegolius acadicus*	hypothetical	
Rufous Hummingbird	*Selasphorus rufus*	R	s
Belted Kingfisher	*Ceryle alcyon*	U R	s w
Northern Flicker	*Colaptes auratus*	U	s
Hairy Woodpecker	*Picoides villosus*	U	s, w
Downy Woodpecker	*Picoides pubescens*	U	s*, w
Three-toed Woodpecker	*Picoides tridactylus*	R	s*, w
Black-backed Woodpecker	*Picoides arcticus*	U	s, w
Eastern Kingbird	*Tyrannus tyrannus*	hypothetical	
Say's Phoebe	*Sayornis saya*	R	m
Alder Flycatcher	*Empidonax alnorum*	C	s*
Western Wood-Pewee	*Contopus sordidulus*	U	s
Olive-sided Flycatcher	*Contopus cooperi*	C	s*
Horned Lark	*Eremophila alpestris*	U	s
Violet-green Swallow	*Tachycineta thalassina*	C	s
Tree Swallow	*Tachycineta bicolor*	C	s*
Bank Swallow	*Riparia riparia*	C	s
Cliff Swallow	*Petrochelidon pyrrhonota*	U	s
Purple Martin	*Progne subis*	hypothetical	
Gray Jay	*Perisoreus canadensis*	U	s, w
Steller's Jay	*Cyanocitta stelleri*	hypothetical	
Black-billed Magpie	*Pica hudsonia*	C	s*, w
Common Raven	*Corvus corax*	C	s*, w
Black-capped Chickadee	*Poecile atricapilla*	C	s*, w
Boreal Chickadee	*Poecile hudsonica*	C	s, w
Red-breasted Nuthatch	*Sitta canadensis*	U	s, w
Brown Creeper	*Certhia americana*	U	s*, w
American Dipper	*Cinclus mexicanus*	U	s, w
Winter Wren	*Troglodytes troglodytes*	Ca	s, w
American Robin	*Turdus migratorius*	C R	s* w

Common Name	Scientific Name	Status	Season
Varied Thrush	*Ixoreus naevius*	C	s*
Hermit Thrush	*Catharus guttatus*	U	s
Swainson's Thrush	*Catharus ustulatus*	C	s*
Gray-cheeked Thrush	*Catharus minimus*	U	s
Townsend's Solitaire	*Myadestes townsendi*	R	s
Golden-crowned Kinglet	*Regulus satrapa*	U	s, w
Ruby-crowned Kinglet	*Regulus calendula*	C	s*
American Pipit	*Anthus rubescens*	C	s
Bohemian Waxwing	*Bombycilla garrulus*	U	s, w
Northern Shrike	*Lanius excubitor*	U	s, w
European Starling	*Sturnus vulgaris*	R	v
Red-eyed Vireo	*Vireo olivaceus*	Ca	
Orange-crowned Warbler	*Vermivora celata*	C	s*
Yellow Warbler	*Dendroica petechia*	U	s*
Townsend's Warbler	*Dendroica townsendi*	U	s
Blackpoll Warbler	*Dendroica striata*	U	s
Northern Waterthrush	*Seiurus noveboracensis*	U	s
Wilson's Warbler	*Wilsonia pusilla*	C	s
Red-winged Blackbird	*Agelaius phoeniceus*	R	s*
Rusty Blackbird	*Euphagus carolinus*	C R	s* w
Pine Grosbeak	*Pinicola enucleator*	U	s, w
Hoary Redpoll	*Carduelis hornemanni*	R	w
Common Redpoll	*Carduelis flammea*	R	s*, w
Pine Siskin	*Carduelis pinus*	U	s
Red Crossbill	*Loxia curvirostra*	Ca	v
White-winged Crossbill	*Loxia leucoptera*	U	s, w
Savannah Sparrow	*Passerculus sandwichensis*	C	s*
Dark-eyed Junco	*Junco hyemalis*	C U	s* w
American Tree Sparrow	*Spizella arborea*	U R	s w
White-crowned Sparrow	*Zonotrichia leucophrys*	C R	s* w
Golden-crowned Sparrow	*Zonotrichia atricapilla*	C	s
Fox Sparrow	*Passerella iliaca*	C R	s* w
Lincoln's Sparrow	*Melospiza lincolnii*	C	s*
Song Sparrow	*Melospiza melodia*	C	s
Lapland Longspur	*Calcarius lapponicus*	C	m
Snow Bunting	*Plectrophenax nivalis*	U	m

C = Common… 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. **U = Uncommon**…species occurs regularly, but utilizes only some or very little of the suitable habitat, and/or the region regularly hosts relatively small numbers of the species; not observe regularly even in proper habitats. **R = Rare..** species occurs, or probably occurs regularly with the region, but in very small numbers. **Ca = Casual**…species has been recorded no more that a few times, but irregular observations are likely over a period of years. *** = known breeder. s = summer**. **w = winter**. **m = spring** and/or **fall migration**. **Hypothetical = likely to occur** though no sightings have been reported.

Table 3. Mammals which may occur in Palmer Hay Flats State Game Refuge

(from S.O. MacDonald. 1980. Checklist of mammals of Alaska, University of Alaska Museum, Fairbanks; Bill Taylor, pers. comm.)

	Scientific Name
Masked Shrew	*Sorex cinerus*
Dusky Shrew	*Sorex monticolus*
Northern Water Shrew	*Sorex palustris*
Pygmy Shrew	*Sorex hoyi*
Northern Bog Lemming	*Synaptomys borealis*
Red-backed Vole	*Clethrionomys rutilus*
Meadow Vole	*Microtus pennsylvanicus*
Tundra Vole	*Microtus oeconomus*
Meadow Jumping Mouse	*Zapus hudsonicus*
Little Brown Bat	*Myotis lucifugus*
Snowshoe Hare	*Lepus americanus*
Red Squirrel	*Tamiasciurus hudsonicus*
Beaver	*Castor canadensis*
Muskrat	*Ondatra zibethicus*
Porcupine	*Erethizon dorsatum*
Coyote	*Canis latrans*
Wolf	*Canis lupus*
Red Fox	*Vulpes vulpes*
Black Bear	*Ursus americanus*
Brown Bear	*Ursus arctos*
Pine Marten	*Martes americana*
Ermine	*Mustela erminea*
Least Weasel	*Mustela nivalis*
Mink	*Mustela vison*
Wolverine	*Gulo gulo*
River Otter	*Lutra canadensis*
Lynx	*Lynx canadensis*
Moose	*Alces alces*

Figure 1. Glenn Highway Expansion Mitigation Study Area and Ducks Unlimited Enhancement Projects in (ADF&G 2000)

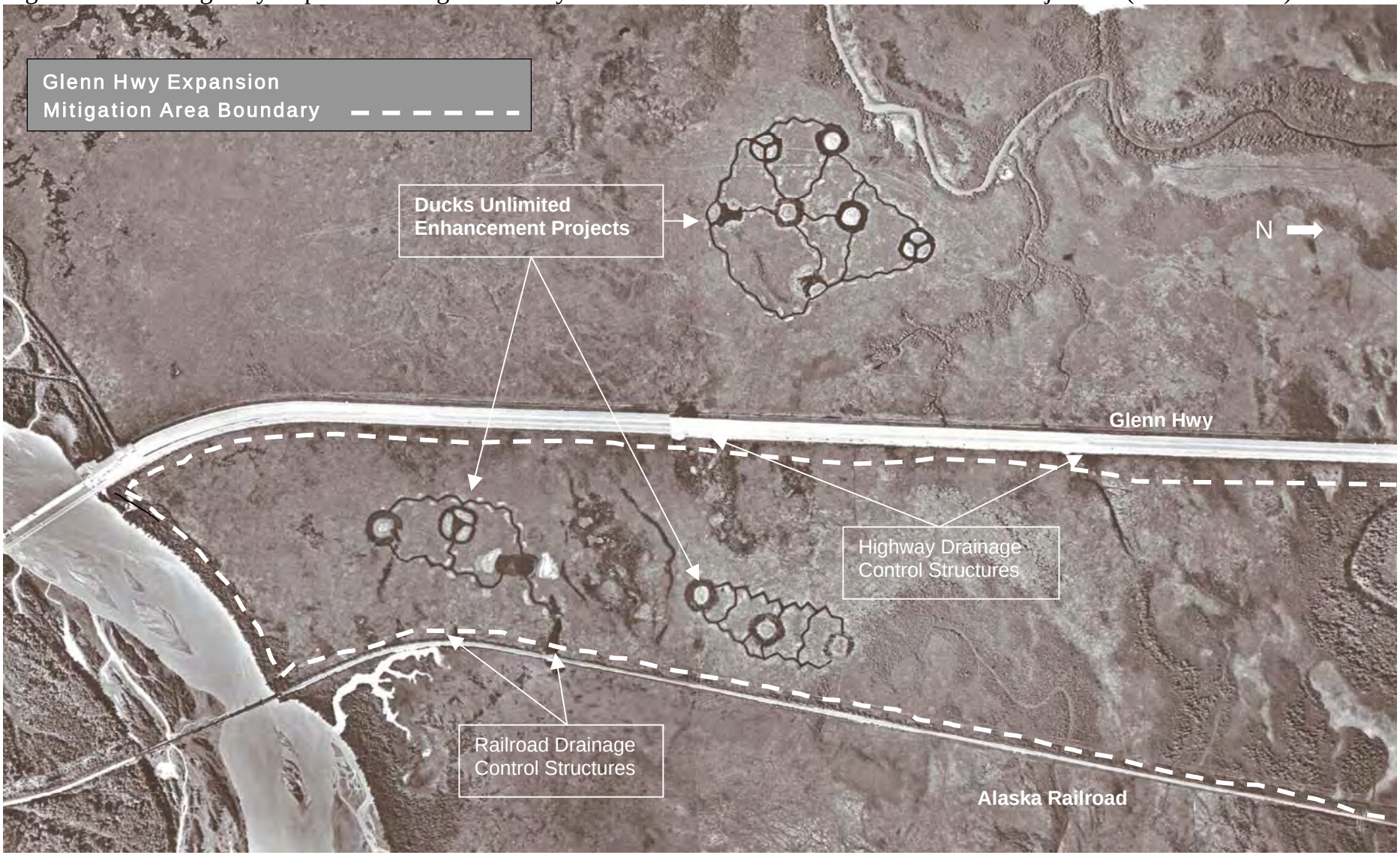

Table 4. Glenn Highway Expansion Mitigation Water Level Change (ADF&G 2000)

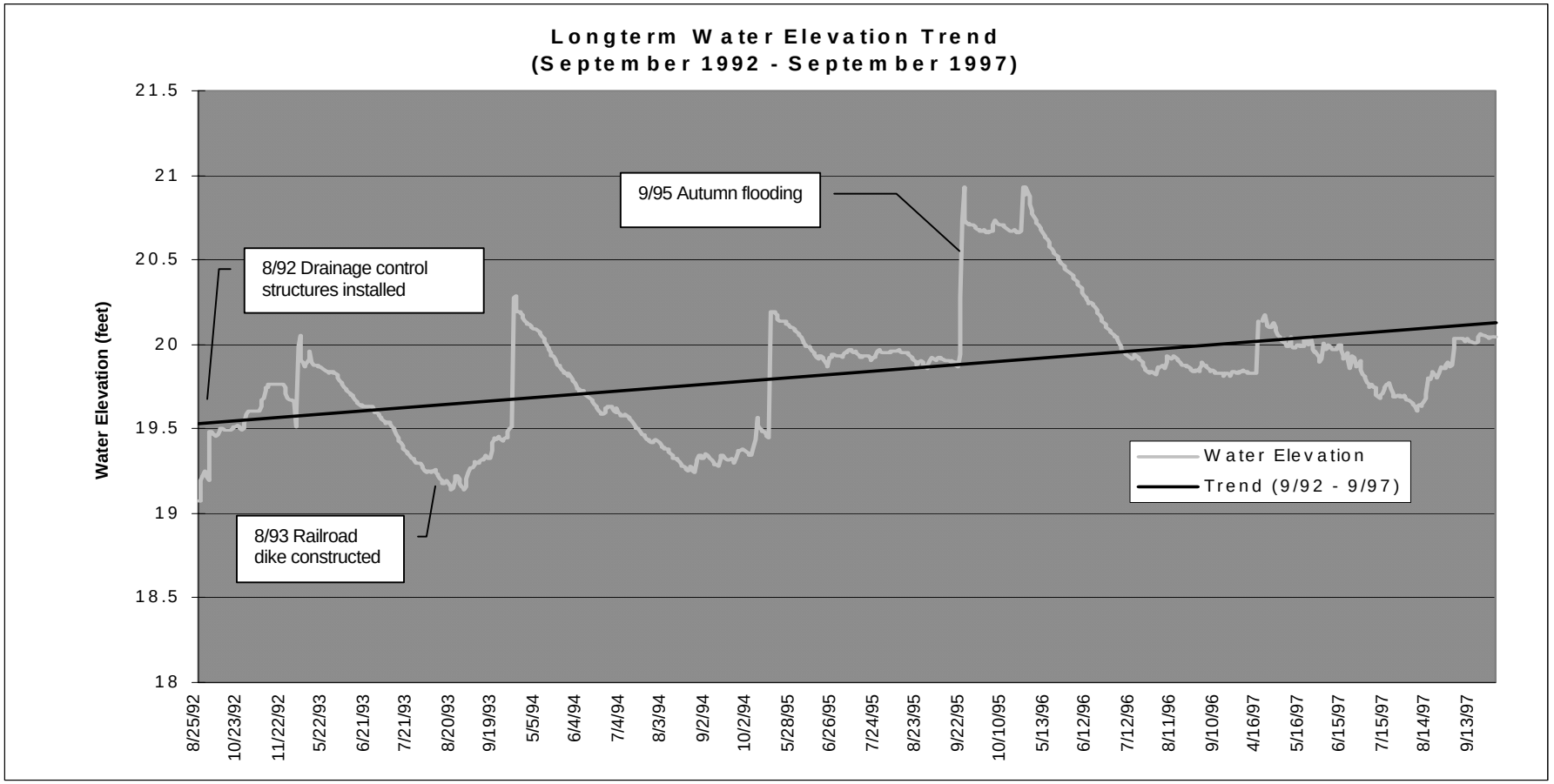

Table 5. Migration Survey Waterfowl Counts near Glenn Highway in Palmer Hay Flats State Game Refuge (ADF&G 2000)

	Fall Migration				Spring Migration				
SPECIES	1992	1993	1994	1996	1993	1994	1995	1996	1997
American Wigeon	21	18	30	82	12	31	103	55	44
Bufflehead	0		0	0	1	4	4	9	4
Canada Geese	3	0	0	0	171	133	172	179	311
Canvasback	0	1	4	0	0	18	38	2	0
Common Goldeneye	00		0	0	0	0	6	0	0
Green winged teal	5	0	16	16	8	8	1	24	2
Horned Grebe	1		1	3	2	1	0	5	2
Mallard	152	8	20	31	41	50	147	107	83
Northern Pintail	10	5	8	3	597	83	601	96	38
Northern Shoveler	80	4	0	2	0	5	16	49	0
Puddle Duck Species	15	15	17	11	1	12	0	12	1
Red-necked Grebe	0		0	0	0	0	0	3	1
Ring-necked Duck	0	0	0	0	0	1	6	13	0
Scaup Species	0	2	0	0	0	16	0	0	0
Teal Species	00	0	16	0	0	0	0	0	0
Trumpeter Swan	1	10	2	2	1	0	280	22	5
White fronted Geese	0		0	0	0	0	4	2	0
Grand Total	79	65	114	150	834	362	1378	578	491
Average # per survey	8.8	5.0	9.5	13.6	166.8	72.4	275.6	115.6	98.2
Range	(2 - 20)0	(1 -13)	(1 - 25)	(6 - 28)	(25 - 404)	(56 - 79)	(96 - 399)	(26 - 160)	(31 - 246)
Number of surveys	n = 9	n = 13	n = 12	n = 11	n = 5	n = 5	n = 5	n = 5	n = 5

Table 6. Nesting survey results: number of nests (ADF&G 2000)

	NUMBER OF NESTS					NUMBER OF NESTS LOCATED ON									
						D.U. ISLANDS					NATURAL				
SPECIES	1993	1994	1995	1996	1997	1993	1994	1995	1996	1997	1993	1994	1995	1996	1997
Canada Goose	18	16	16	12	11	6	6	6	5	4	12	10	10	7	7
Mallard	1		1		2					1	1		1		1
Northern Pintail	2	1		1		1	1				1			1	
Northern Shoveler	1				4	1			1				2	1	3
Horned Grebe	1	1			1	1				1		1			
Canvasback		1										1			
Trumpeter Swan		2	2		1				1						1
Unidentified		3	1									3	1		
Total	23	22	20	15	19	9	7	6	6	7	14	15	14	9	12

Table 7. Nesting survey results: nesting success (ADF&G 2000)

	NEST SUCCESS *									
	% Successful					% Unsuccessful				
SPECIES	1993	1994	1995	1996	1997	1993	1994	1995	1996	1997
Canada Goose	50	56	25	67	64	22	31	56	17	27
Mallard						100				50
Northern Pintail	100	100								
Northern Shoveler	100		100	50	25				50	25
Horned Grebe		100			100	100				
Canvasback		100								
Trumpeter Swan					100					
Unidentified							100	100		
Total	52	55	30	60	53	26	36	50	20	32

* Success of some nests was unknown due to problems in relocating nests. Therefore % nesting success + % unsuccessful may not equal 100% in all cases.

Table 8. Muskrat pushup count data, Palmer Hay Flats State Game Refuge at Glenn Highway 1991-1997**

Count	1991	1992		1993			1994			1996			1997		
Area	Number	Number	% Δ 1991	Number	% Δ 1991	% Δ 1992	Number	% Δ 1991	% Δ 1993	Number	% Δ 1991	% Δ 1994	Number	% Δ 1991	% Δ 1996
1*		46	-68	119	-18	159	126	-13	6	18	-88	-86	31	-79	72
2*		0	-100	0	-100	N/A	3	50	N/A	0	-100	-100	0	-100	0
3		55	31	102	143	85	98	133	-4	31	-26	-68	11	-74	-65
5		97	13	52	-40	-46	55	-36	6	14	-84	-75	66	-23	371
6		131	108	81	29	-38	61	-3	-25	10	-84	-84	16	-75	60
7		79	72	83	80	5	68	48	-18	6	-87	-91	17	-63	183
8		85	89	99	120	16	80	78	-19	11	-76	-86	8	-82	-27
9		102	50	115	69	13	66	-3	-43	5	-93	-92	9	-87	80
10		0	-100	2	-67	N/A	0	-100	-100	0	-100	N/A	0	-100	0
11		3	-90	8	-72	167	0	-100	-100	0	-100	N/A	1	-97	N/A
Total	532	598	12	661	24	11	557	5	-16	95	-82	-83	159	-70	67

* Mitigation project area corresponds to count areas 1 & 2.

** No surveys conducted in 1995 due to poor conditions.

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Appendix E: Public Uses

History

The discovery of gold in 1896 led to expanded settlement of the Matanuska Valley. In 1935 the federal government sponsored development of an agricultural community in and around Palmer (Schoephorster 1968). During these early years grazing and haying were the major agricultural uses of what is now part of Palmer Hay Flats State Game Refuge (PHFSGR).

Because of the value of this area to waterfowl, moose (*Alces alces*) and other wildlife as well as public hunting, fishing, and trapping, the State Legislature created the Palmer Hay Flats State Game Refuge in 1975. In 1985, the refuge was expanded to include portions of Spring Creek, and now contains approximately 26,048 acres of state owned land. Between one-fourth and one-third of this land is either submerged or tide flats and the majority of the remaining acreage is wetlands.

Land Status

Several parcels of private and Mat-Su Borough land are within the boundaries of the refuge but are not subject to refuge authorities (See attached land status map). These parcels can only be added to the refuge by outright purchase from willing sellers or exchange for comparable value land outside the refuge. In 1992 ADF&G purchased a 240 acre private parcel on the west side of Glenn Highway with funds from the Sport Fish Restoration program and Waterfowl Conservation and Enhancement program. At the time of this revision, the Mat-Su Borough has requested to trade their lands within and adjacent to the refuge for other land held by the Alaska Department of Natural Resources.

During the expansion of the Glenn Highway from Eklutna to Parks Highway, the Alaska Department of Transportation purchased many of the bordering private parcels. Other private owners of Palmer Hay Flats wetlands have expressed interest in selling their land to the state for inclusion within the refuge.

In 1961, the Mental Health Trust selected land within two Townships, T16N R1W and T16N R1E, that now lie within the boundary of PHFSGR . The lands have not been disposed at the time of this revision. Until they are disposed, the Bureau of Land Management manages these lands.

Access Points

The 3 major access points to the refuge are the Knik River boat launch, Rabbit Slough and Hayfield Road access points (Table 1). At the time of this revision, all of the points of access to Palmer Hay Flats State Game Refuge are owned and/or managed by entities other than ADF&G. The Department has various agreements with other land management agencies to manage these access points. Efforts are being made to obtain state ownership and direct ADF&G management of the access points.

Hunting and Trapping

The combination of large numbers of waterfowl in close proximity to over one-half of the state's population makes the PHFSGR one of the most heavily used waterfowl hunting sites in the state. In the 1983-84 season the PHFSGR ranked second in the number of ducks taken. In the 1984-85 season it ranked second in the state; although in both years more hunter days were expended on this

refuge than in any other area of the state (Table 2). Moose hunting in Palmer Hay Flats is popular due to easy access (Table 2).

Steen and Didrickson (pers. comm.) indicate that trapping for muskrat, coyote and small game hunting are popular winter activities on the refuge. Muskrat and mink occur throughout most of the refuge thus trapping is spread over the refuge but lack of adequate snow cover may limit access by snowmachine or 4-wheeled off road vehicles. (Steen pers. comm.). There has been interest in wolf trapping since 1995 (Masteller pers. comm.). Small game hunting is most common along the railroad and the better-drained sites in the NE portion of the refuge where shrubs and trees occur (Didrickson pers. comm.).

In recent years there has been growing interest in collecting dropped moose antlers on the refuge during winter and early spring. Collectors typically access the refuge by snowmachine.

For the purposes of the Palmer Hay Flats State Game Refuge Management Plan, subsistence hunting and fishing are allowed in the form of complying with seasons and bag limits established by the Board of Game and the Board of Fish and Special Area Regulations. The Mental Health Land Trust is currently considering selecting 2 large parcels that contain excellent waterfowl habitat. If MHLT does not select these parcels they may revert to federal ownership and federal subsistence laws will apply.

Sport Fishing

Until 2000, that portion of Wasilla Creek/Rabbit Slough within the Refuge supported a significant weekend-only sport fishery that targeted coho salmon. Prior to 2000, this area was previously closed to all fishing on weekdays to allow adequate spawning escapement. Prior its closing, Wasilla Creek supported approximately 2,000 angler days of effort, with an average harvest of about 900 coho salmon per year.

That area of Cottonwood Creek immediately adjacent to the refuge supports a sizeable weekend-only sport fishery, which harvests both sockeye and coho salmon. This weekend fishery harvests an average of 1,700 coho and 1,700 sockeye salmon with an average of 7,000 man-days of effort expended annually. The fishery occurs primarily during July and August. The coho salmon population is being expanded through the addition of hatchery fish in the drainage.

Little, if any, sport fishing occurs in the portions of the Matanuska and Knik Rivers located within the refuge. In the gravel pit located between the Knik and Matanuska rivers, fishing normally is conducted through the ice during winter months. In the gravel pit, fishing effort is less than 500 man-days a year.

Other Recreational Uses

As the human population continues to grow in the Anchorage/Mat-Su area more and varied demands will be placed upon the refuge.

Viewing migratory waterfowl has increased in recent years (Didrickson, Griese pers. comm.). Recreational birding groups, commercial birding guides and school groups occasionally visit the Cottonwood Creek access point in the spring. Public demands for interpretive and viewing facilities as exemplified at Potter Marsh refuge can be expected for Palmer Hay Flats refuge particularly as access is improved along the Glenn Highway.

Target shooting is common at the Cottonwood Creek, Rabbit Slough, and the Gravel Pit Lake at the Knik River boat launch. Many shooters leave behind ammunition shells and refuse. The trash left by shooters is the subject of many public comments.

Recreational snow machining in the refuge has increased along with the increasing population in the Mat-Su Valley and increasing numbers of residences adjacent to the refuge.

Non-Refuge Related Uses

The Palmer Hay Flats' greatest natural resources are its fish and wildlife populations and productive habitat. Palmer Hay Flats is rather unique in its virtual absence of other known natural resources. There is no oil and gas potential. An exploratory oil well drilled in the northern portion of the refuge in the 1950's was dry, and no interest has been subsequently shown in this area. There are no mining claims or mineral leases on the refuge and no known mineral potential. The refuge is very sparsely timbered, with no commercial stands. Although growing of hay and grazing of cattle occurred on the Hay Flats prior to the 1964 earthquake, subsidence due to the earthquake has since precluded grazing and agricultural pursuits. There are no commercial or industrial developments on state or private land within the refuge. The wetlands character of refuge lands renders the area generally unbuildable.

The Glenn Highway, the Alaska Railroad, the Enstar natural gas pipeline, the Matanuska Valley Electric transmission line, and the Matanuska Telephone Association fiber-optic cable traverse the eastern portion of the refuge. The Chugach Electric transmission line was originally (in the mid 1970's) proposed to cross Palmer Hay Flats, however public opposition resulted in its rerouting. No other utility or transportation corridors are currently proposed for the refuge.

Public concern has increased regarding the number of moose-vehicle collisions on the Glenn Highway where it crosses the flats. Table 3 shows annual counts of moose-vehicle collisions recorded by Alaska State Troopers for the area bounded by Knik River Bridge on the south and mile 35 (just north of the railroad crossing) on the north.

A study of moose movements on Palmer Hay Flats was conducted from 1995-2000 and the results of this study are summarized in Appendix D. The study indicates that the majority of the Glenn Highway moose-vehicle collisions probably affect the resident Palmer Hay Flats subpopulation of moose, rather than large migratory movements of moose.

Refuge Use Survey

Managers have made assumptions about the number of visitors and the types of recreational uses on Palmer Hay Flats State Game Refuge (PHFSGR). However, no formal or systematic observations have been made. For this reason, a user survey was conducted between November 1997 to November 1998 to profile refuge users and provide baseline information about refuge use and visitors. The report "Palmer Hay Flats State Game Refuge User Survey" provides a summary of data and results and can be obtained through contacting ADF&G.

One hundred and fifty-one visitors to the refuge volunteered for 10-minute interviews during the yearlong survey. Although a random sampling scheme was devised, there were significant deviations that preclude accurate comparisons of use levels. Nonetheless, these data are informative and represent the best available information concerning PHFSGR users. Survey results include some of the following observations:

- 55% of the respondents lived in the Mat-Su Valley, 26% came from Anchorage, and 15% came from Eagle River
- Over one-half of the respondents reported visiting Palmer Hay Flats between 2 and 6 times per year. Only 14% were first-time visitors.
- A large variety of recreational uses were reported: fishing, hunting, wildlife watching, sight-seeing/exploration, ORV/snowmachine riding for fun, hiking/walking, trapping, dog training, target-shooting, photography, berry-picking, enjoyment of peace and quiet, shed-antler hunting, and picnicking.

- Two-thirds of the respondents traveled on foot while visiting the refuge; 13% did not get out of their vehicles
- Thirty per cent of the respondents reported being at least somewhat familiar with refuge boundaries
- One-half of the respondents reported at least some familiarity with regulations

Need for Further Study

Management decisions determining human use patterns and activities should be evaluated by their potential impacts on refuge resources. Regulations developed by the Board of Game, the Board of Fisheries, and the commissioner could then be used to minimize the human impact. This same information and predicted impacts would be the basis for information and education programs.

The area around the refuge is experiencing rapid human population growth. A periodic survey of refuge users would allow the department to identify changes in demand, anticipate user conflicts and formulate plans to minimize them. This requires a flexible plan that has provisions for periodic updating.

Table 1. Access points in Palmer Hay Flats State Game Refuge

		Mode of transportation
Rabbit Slough	Private with ADF&G right-of-way easement	Foot, Boat, Snowmachine
Cottonwood Creek at Hayfield Road	Interagency Land Management Agreement (ILMA) with Alaska Department of Natural Resources	Foot, ORV, Snowmachine
Knik River Bridge boat launch	Mental Health Trust Lands selection, currently managed by Bureau of Land Management	Foot, Boat
Matanuska Townsite	Private, with undeveloped right-of-way easement next to railroad tracks.	Foot

Table 2. Moose Harvest on Palmer Hay Flats State Game Refuge, sexes combined*

(ADF&G Harvest Data).

Regulatory Year	Number Harvested
68 - 69	6
69 - 70	35
70 - 71	No Data
71 - 72	4
72 - 73	1
73 - 80	No Data
80 - 81	5
81 - 82	9
82 - 83	5
83 - 84	13
84 - 85	No data
85 - 86	25
86 - 87	23
87 - 88	17
88 - 89	24
89 - 90	20
90- 91	10
91 - 92	13
92 - 93	24
93 - 94	10
94 - 95	10
95 - 96	11
96 - 97	22
97- 98	26

Table 2. Waterfowl hunter activity and number of ducks killed on six major waterfowl hunting areas in Alaska (ADF&G Waterfowl Survey and Inventory reports)

											Copper River Delta	
												# of Ducks
71-72	3081	5854	3885	7442			1518	5352	2813	3010	1608	2509
72-73	3561	4677	3798	9696	594	1376	2611	6786	5579	4585	2849	5502
73-74	4861	7978	7060	16385			2836	6984	2720	2238	3819	6357
74-75	4292	5458	3112	6750	697	1867	2307	5027	4346	3447	2736	3806
75-76	4162	7114	3763	9485	342	1054	1710	3689	2851	3864	3649	6148
76-77	4945	6326	5280	11836	735	2551	4411	11020	1871	3163	3609	4489
77-78	No Data											
78-79	No Data											
79-80	No Data											
80-81	No Data											
81-82	No Data											
82-83	5650	9940	6325	16710	1475	5570	3625	10265			2765	2730
83-84	9613	12978	6913	14584	608	2101	2887	9542	2127	3832	2127	4450
84-85	6614	7214										
85-86	3735	4520	5890	13770	320	715	1945	6950	2175	3265	1600	2885
86-87	No Data											
87-88	4203	5613	6644	11796	333	656	2825	6004	2659	2471	1730	2240
88-89	2856	5868	4252	10893	385	1485	2142	7537	1088	1550	1956	2907
89-90	2370	3602	2864	7053	333	985	2138	6338	867	1010	1513	1321
90-91	3187	4628	5088	13853	457	1546	1672	5732	1275	2550	1467	2409
91-92	No Data											
92-93	2050	3361	2785	6397	181	575	8908	2256	1107	1552	1206	2506
93-94	3447	4279	3378	8081	277	614	1542	2841	849	723	996	1207
94-95	1862	3663	2825	5800	373	576	1476	3181	530	1601	602	1333
95-96	2412	4443	3805	11044	218	789	1695	4443	1342	1221	707	1131
96-97	2606	5785	3955	9404	416	1125	1067	2607	2067	3047	708	1541
97-98	2867	6112	3769	9490	311	1237	1353	3387	3597	3576	676	1730

Table 3. Moose-vehicle collisions Mile 30 to Mile 35 Glenn Highway

	Number of Moose-Vehicle Collisions
1992-1993	7
1993-1994	14
1994-1995	27
1995-1996	11
1996-1997	11
1997-1998	11
1998-1999	6

Appendix F: Matanuska Susitna Borough Hay Flats Recreation Area Special Land Use District Ordinance

Sections:

I. General Provisions

17.08.010 Established-Map adopted

There is established a special land use district, the boundaries of which shall be as shown on the map attached to the ordinance codified in this chapter and which is adopted by reference and declared to be a part of this chapter. The following parcel is excluded from the Hay Flats Recreation Area: the north one-half of the northwest quarter and north one-half of the northeast quarter of Section 27, Township 17 North, Range 1 East, Seward Meridian, Alaska.

17.08.020 Purpose

The area within the boundaries of this special district is zoned for recreation uses.

17.08.030 Boundaries

Boundaries which are indicated as approximately following platted lot lines, section or quarter section lines or meander lines shall be construed to follow such lines. If the boundaries of this special land use district divide a lot or parcel which was in single ownership when divided by these regulations, and the ownership is a matter of public record, the regulations applying to the least restricted portion of such lot or parcel shall be considered as extending to the entire lot or parcel, provided one-half or more of the lot or parcel is in the least restricted portion thereof.

II. Definitions

17.08.040 Accessory use or building

"Accessory use of building" is a subordinate use or building customarily incident to and located on the same lot with the main use or building.

17.08.050 Alteration

"Alteration" as applied to a building or structure, is a change or rearrangement in the structural parts or in the existing facilities, or an enlargement, whether by extending on a side or by increasing in height, or the moving from one location or position to another.

17.08.060 Building

"Building" is a structure designed, built or occupied as a shelter or roofed enclosure for persons, animals or property, including tents, lunch wagons, dining cars, camp cars, trailers, and other roofed structures on wheels or other supports used for residential, business, mercantile, storage, commercial industrial, institutional, assembly, educational or recreational purposes. For the purposes of this definition, "roof" includes an awning or other similar covering, whether or not permanent in nature.

17.08.070 Dwelling

"Dwelling" is a building designed or used as the living quarters for one or more families.

17.08.080 Junk

"Junk" is any worn out, cast off, or discarded article or material which is ready for destruction or has been collected or stored for salvage or conversion to some use. Any article or material which, unaltered or unchanged and without further reconditioning, can be used for its original purpose as when new, shall not be considered junk.

17.08.090 Use

"Use" is the purpose for which land or a building is arranged, designated or intended, or for which either land or a building is or may be occupied or maintained.

III. Application of Regulations

17.08.100 Conformance required

No building, structure, land or water area located within this special land use district shall hereafter be used or occupied, and no building, structure, or part thereof, shall hereafter be erected in conformity with the regulations specified in this chapter.

17.08.110 Junk storage unlawful

Notwithstanding any other provisions of this chapter, the outdoor storage, placement or abandonment of any junk as defined herein shall, within sixty days of October 17, 1967, become a prohibited and unlawful use. Failure to remove such junk shall be cause for the removal thereof at the expense of the owner of the land upon which it is located.

17.08.120 Further subdivision permitted

Further subdivision shall be permitted of existing private lands.

17.08.130 Permitted uses

The following land uses shall be permitted within the special land use district herein established:

A. Campgrounds, playgrounds, play and sports fields, trails, boat channels, public buildings, facilities, and uses in keeping with public recreation, including hunting and fishing in conformance with State and Federal Regulations;
B. One single-family dwelling per lot or parcel, provided that no trailer, portable home such as mobile home, or used Quonset hut may be used except as temporary living quarters. Existing dwellings may continue to be used;
C. The raising of vegetables, produce and fruit crops;
D. Home occupations, provided that such use is conducted entirely within a dwelling by the permanent inhabitants thereof; such use is clearly incidental and secondary to the use of the dwelling fo dwelling purposes; and there is no external evidence of the use of any kind except a nameplate not exceeding one square foot in area;
E. Temporary living quarters on the same premises with a dwelling under construction, provided the temporary living quarters are removed from the premises within six months after the new dwelling is completed.
F. Customary accessory uses and buildings, provided such uses are clearly incidental to public recreation and do not include any activity which is inconsistent with such recreation. Any accessory building or use shall be located on the same lot with the principal building or on an abutting lot of the same ownership.

IV. Exceptions

17.08.140 Application-Filing-When issued

An application for an exception shall be filed in writing by the owner of the property concerned and may be issued for any of the following:

A. Public utility or public service uses or public buildings in any district when found to be necessary for the public health, safety, convenienc e or welfare;
B. Removal of minerals and natural materials, including building and construction materials, when incidental to a permitted use or improvement of the land, but not solely for commercial or industrial purposes.

17.08.150 Investigation of use

The Planning Commission shall cause to be made by its own members, or by its authorized representative, an investigation to determine that such uses will not be injurious to public health, safety or welfare or detrimental to other properties or uses in the vicinity.

17.08.170 Application-Approval or Denial

Within twenty-one days after the receipt of an application, the Planning Commission shall render its decision. If it is the opinion of the Commission, after consideration of the report of such investigati9on, that the use as proposed in the application, or under appropriate restrictions or conditions, will not endanger the public health, safety or general welfare, or be inconsistent with the general purposes and intent of this chapter, the commission shall approve the application either with or without conditions. If the proposed use will tend, I the opinion of the Commission, to endanger in any way the public health, safety or general purposes and intent of this chapter, the Commission shall deny the application.

17.08.170 Application-Hearing

When deemed necessary, the Commission may hold a public hearing upon any application for an exception and if such public hearing is to be held, notice thereof shall be given in the manner prescribed in sections 17.08.180 through 17.08.220, except that such a procedure shall specifically refer to an exception and further, that the area considered by the Commission to be affected by the intended use of land as described in such application may be extended in such application to a distance greater than three hundred feet of the exterior boundary of such land and the owners thereof notified of such hearing.

V. Procedure for Appeals

17.08.180 Appeals

Appeals from decisions of the Planning Commission may be made under the provisions of Chapter 15.38 of this code.

VI. Enforcement and Penalty

17.08.230 Violations and enforcement

Violations and enforcement of this chapter shall be consistent with the terms and provisions of Chapter 17.56.

Appendix G: Glossary

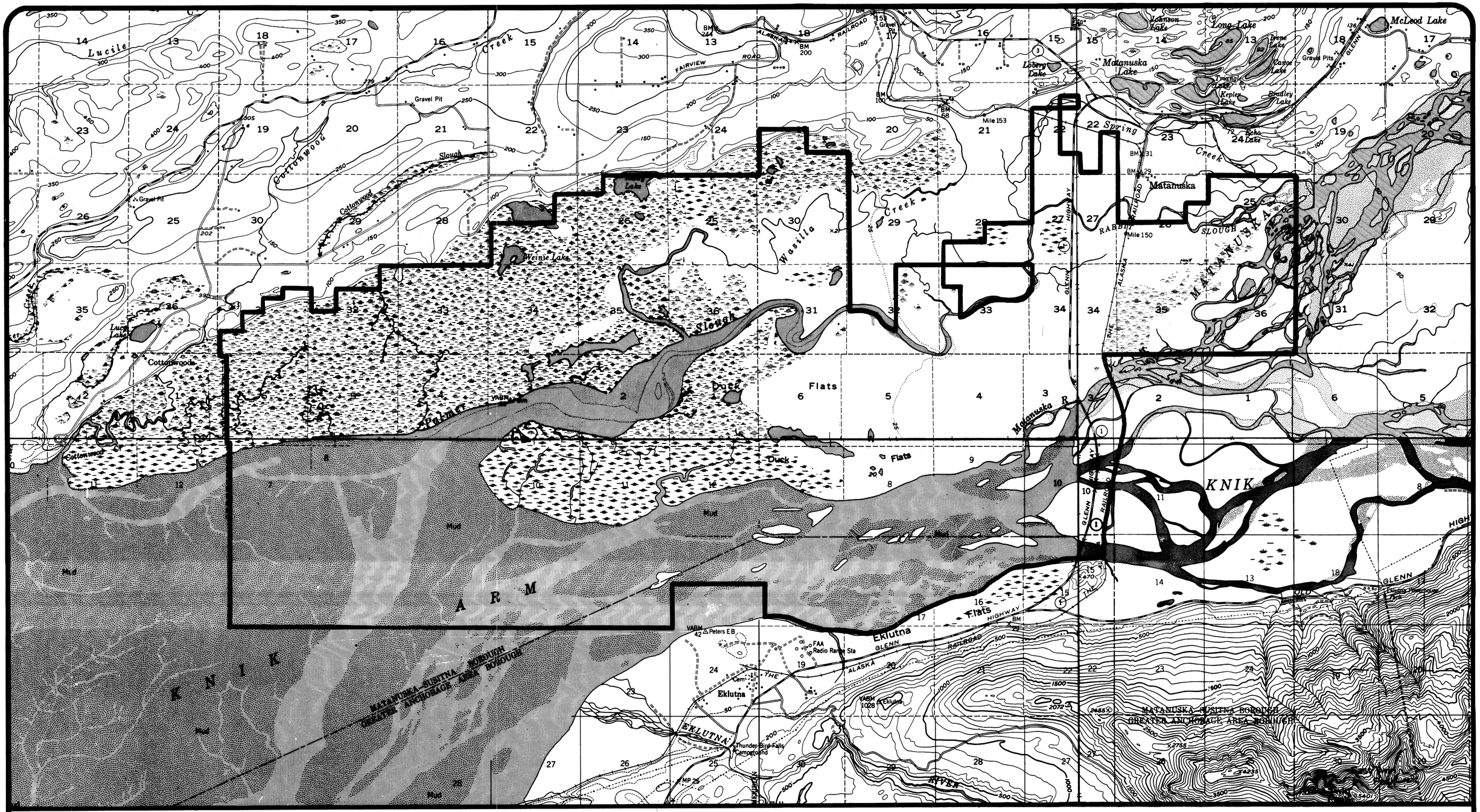
The following are terms were defined for the Citizens' Advisory Group and Planning Team during the revision of the Palmer Hay Flats State Game Refuge Management Plan.

Aircraft[1]:	Any motorized device under 12,500 pounds gross weight that is used or intended for flight or movement of people or goods in the air;
Boat or vessel[2]	A device that is used or designed to be used for the movement of people or goods in or on the water, whether manually or mechanically propelled, but does not include personal flotation devices or other floats such as inner tubes, air mattresses, or surf boards;
Commercial activity	Services offered or supplied by any person to another person with the intent of receiving valuable consideration through barter, trade, or other commercial means;
Encourage	To give support to; be favorable to; foster; help
Game[3]	Any species of bird, reptile and mammal, including feral domestic animals, found or introduced in the state, except domestic birds and mammals; game may be classified by regulation as big game, small game, fur-bearers or other categories considered essential for carrying out the intention and purposes of 16.05 through 16.40 (16.05.940);
Habitat	The physical and biological resources required by an organism for its survival and reproductions; these requirements are species specific. Food and cover are major components of habitat and must extend beyond the requirements of the individual to include a sufficient area capable of supporting a viable population.
Hunting[4]	The taking of game under AS 16.05–AS 16.40 and the regulations adopted under those chapters
Jet ski[5]	A personal watercraft that is (A) less than 16 feet in length; (B) propelled by a water-jet pump or other machinery as its primary source of motor propulsion; and (C) designed to be operated by a person sitting, standing, or kneeling on, rather than being operated by a person sitting or standing inside it;
Motorized watercraft[6]	A boat propelled by an internal combustion engine, water jet pump or any other kind of motor;

[1] 11 AAC 20.990(2)
[2] 11 AAC 20.990(20)
[3] AS 16.05.940(18)
[4] AS 16.05.940(20)
[5] 11 AAC 20.990(9)
[6] Guralnick, D. B., Ed. *Webster's New World Dictionary of the American Language*, Simon and Schuster 1980, p.929

Natural quiet	The absence of man-made sounds;
Nongame fish and wildlife	Wild vertebrate animals that are in an unconfined state and that are not ordinarily taken for sport, fur, or food, except that if under applicable State law…Such term does not include any domesticated species that has reverted to a feral existence;
Off-road vehicle[7]	Includes four-wheel drive trucks and automobiles, motorcycles, three- to eight-wheeled all-terrain recreation and utility vehicles, vehicles with two tracks, air-cushioned vehicles, and airboats operated outside of a navigable waterway;
Permit[8]	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, AS 16.20.130, or AS 16.20.170
Scenery[9]	The general appearance of a place; features of a landscape;
Special Area[10]	A state game refuge, a state game sanctuary, or a state fish and game critical habitat area, established under AS 16.20;
Vehicle[11]	A mechanical device for carrying persons or objects over land, water, or through the air, including automobiles, motorcycles, snowmachines, bicycles, off-road vehicles, motorized boats, and aircraft;
Waterbird	Birds that are dependent on water for all or a major part of their life cycle, such as ducks, geese, shorebirds, grebes and loons;
Waterfowl	The anatidae (ducks, geese [including brant], and swans) and coots (Fulica americana);
Wildlife	Any species of bird or mammal as described in AS 16.05.940(18).
Wildlife Conservation	Planned management of wildlife resource and their habitats to 1) ensure that these resources yield the greatest sustainable benefit to current and future generations; and 2) ensure that the development of these resources is in the best interests of the economy and well-being of the state.

[7] 5 AAC 92.004(c)
[8] 05 AAC 095.0990(6)
[9] Guralnick, D. B., Ed. *Webster's New World Dictionary of the American Language*, Simon and Schuster 1980, p.1272
[10] 05 AAC 095.0990(7)
[11] 11 AAC 20.990(18)



HABITAT DIVISION
NOVEMBER 1986

PALMER HAY FLATS
State Game Refuge

MILES: 1 1/2 0 1 2 3 4
KILOMETERS: 1 5 0 1 2 3 4 5

N

LAND STATUS

PRIVATE

BOROUGH

RAILROAD

MATANUSKA TOWNSITE

STATE MENTAL HEALTH SELECTED

STATE PATENTED

MAJOR ACCESS SITES

LAND STATUS

PALMER HAY FLATS

State Game Refuge

HABITAT DIVISION

NOVEMBER 1986

1 1/2 0 1 2 3 4 MILES

1 5 0 1 2 3 4 5 KILOMETERS

N

WATERBIRD HABITAT
(Areas where concentrations of waterbirds, including ducks, geese, swans and/or shorebirds, have been observed.)

GOOSE STAGING AREAS (SPRING & FALL)
(Areas where concentrations of Canada geese have been observed during spring and fall migration.)

HIGH DENSITY TUNDRA (WHISTLING) SWAN STAGING AREAS (SPRING &/or FALL)
(Areas where concentrations of tundra swans have been observed during spring and/or fall migration.)

PRIMARY DABBLING DUCK NESTING AREAS
(Areas where pairs of dabbling ducks and/or their nests have been observed during nesting season.)

MULTIPLE BALD EAGLE SIGHTINGS
(Areas where bald eagles have been sighted.)

CANADA GOOSE NESTING AREAS
(Areas where pairs of Canada geese, nesting mounds, and/or goslings have been observed during nesting season.)

GOOSE BROOD REARING AREAS
(Areas where goose broods have been observed during the summer.)

REFERENCES

Ritchie, R., et.al. 1981 Knik Arm Wetland Study. USFWS, Anchorage.

Dimitri Bader, ADFG pers.comm.

Bruce Campbell, ADFG pers.comm.

Jack Didrickson, ADFG pers.comm.

CANADA GEESE FALL ARRIVAL

CANADA GEESE FALL DEPARTURE

CANADA GEESE/MOVEMENTS

CANADA GEESE SPRING ARRIVAL

CANADA GEESE FALL DEPARTURE

MATANUSKA-SUSITNA BOROUGH
GREATER ANCHORAGE AREA BOROUGHS

ALASKA DEPARTMENT OF FISH AND GAME

HABITAT DIVISION
NOVEMBER 1986

BIRD HABITAT

PALMER HAY FLATS
State Game Refuge

1 1/2 0 1 2 3 4
MILES

1 5 0 1 2 3 4 5
KILOMETERS

N

MOOSE CONCENTRATIONS
(Areas where moose and calves have been consistently observed during winter and spring.)

KNOWN MUSKRAT POPULATIONS
(Areas where muskrats have been observed.)

REFERENCES

Ritchie, R. et.al. 1981. Knik Arm Wetland Study. USFWS, Anchorage

Dimitri Bader, ADFG pers.comm.

Jack Didrickson, ADFG pers.comm.

ALASKA DEPARTMENT OF FISH AND GAME

HABITAT DIVISION
NOVEMBER 1986

MOOSE & MUSKRAT HABITAT

PALMER HAY FLATS
State Game Refuge

1 1/2 0 1 2 3 4 MILES

1 5 0 1 2 3 4 5 KILOMETERS

N