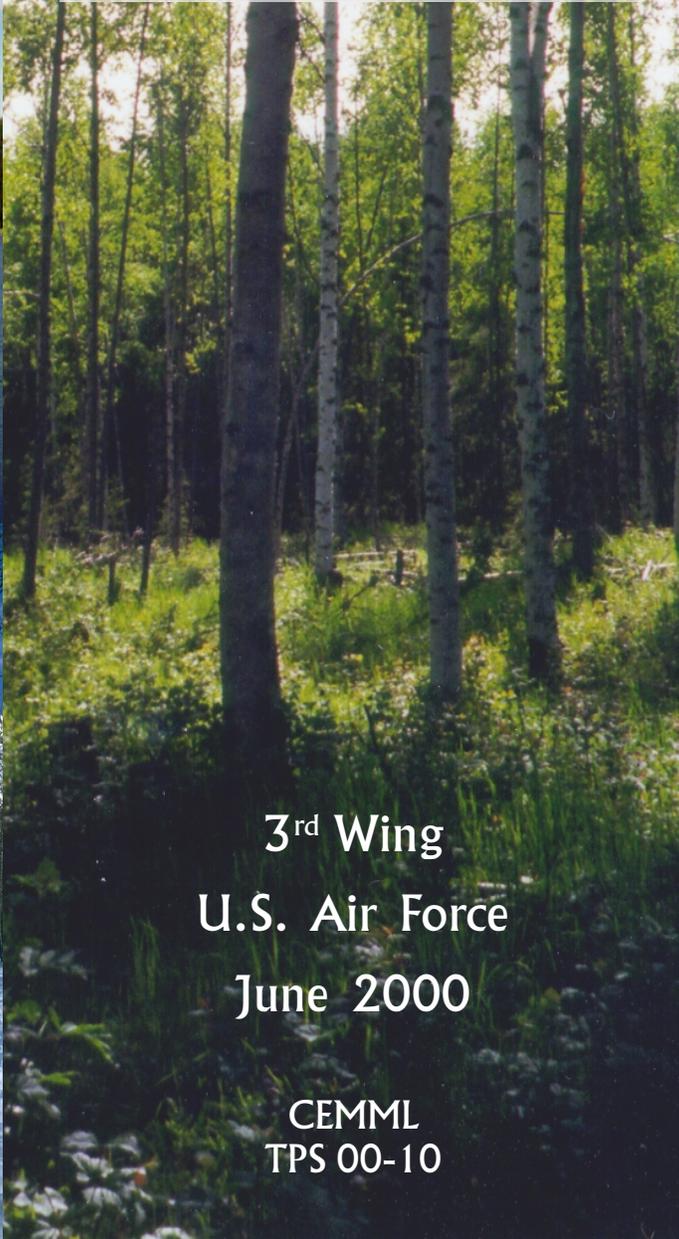




**INTEGRATED
NATURAL
RESOURCES
MANAGEMENT
PLAN
FOR
ELMENDORF
AIR FORCE BASE
2000-2005**



**3rd Wing
U.S. Air Force
June 2000**

**CEMML
TPS 00-10**

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AIR FORCE BASE
2000-2005**

**3rd Wing
U.S. Air Force**

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**INTEGRATED NATURAL RESOURCES
MANAGEMENT PLAN FOR ELMENDORF
AIR FORCE BASE
2000-2005**

**3rd Wing
U.S. Air Force**

APPROVAL

This Integrated Natural Resources Management Plan meets the requirements of the Sikes Act (16 U.S.C. 670a et seq.) as amended.

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Photo: D.D. Wilcox

EXECUTIVE SUMMARY

Purpose

The overall purpose or goal of this Integrated Natural Resources Management Plan (INRMP) is to manage base lands and natural resources in such a way as to support the Air Force mission while promoting biodiversity and ecosystem health, protecting natural and cultural resources, and, where appropriate, providing commodities on a sustainable basis.

Scope

This plan is intended to be part of the base comprehensive planning process. It contains goals, objectives, and management strategies for the management of base lands and natural resources for the next five years. As such, it contains general program information. It is intended to supplement the Base General Plan, and is itself supplemented by two-year Operational Component Plans that contain more detailed information such as census data, project scheduling, and other details for implementing this plan.

Mission

This plan supports the military mission by providing lands that support realistic training, by reducing potential conflicts with the military mission, and by enhancing the safety of aircraft, facilities, and personnel assigned to the installation.

Environmental Compliance

This plan is required by the Sikes Act, Department of Defense (DOD) Instruction (DODI) 4715.3, Environmental Conservation, DODI 4700.4, Integrated Natural Resources Manage-

ment, Air Force Instruction (AFI) 32-7064, and Wing Instruction 32-7001. Individual sections of this plan address many areas of environmental compliance, including wetlands protection, endangered and threatened species, protection of cultural resources, and the National Environmental Policy Act (NEPA).

General Goals

- ▶ Support Air Force mission by providing natural environments for training and by minimizing conflicts between mission requirements and land and natural resources use
- ▶ Maintain functional ecosystems, including viable populations, native species, and commodities
- ▶ Manage under the guidelines and principles of ecosystem management
- ▶ Manage human use of resources for long term sustainability, producing products and services compatible with ecosystem diversity, health, and productivity
- ▶ Protect, maintain, and improve soil, water, and air quality

- ▶ Protect cultural resources
- ▶ Contribute to scientific knowledge

Major New Initiatives

- ▶ Implementation of ecosystem management
- ▶ Integration of natural resources management with other base planning programs
- ▶ Establishment of land management units
- ▶ Establishment of procedures for use of Geographic Information Systems for management decisions
- ▶ Establishment of long-term monitoring of natural resources
- ▶ Implementation of a user fee program for hunting, fishing, and some types of outdoor recreation to help fund natural resource programs
- ▶ Forming ecosystem management partnerships with other state, federal, and local governmental organizations, as well as non-government organizations

Proposed Projects

The following projects have been submitted for funding during this five-year planning period:

Fiscal Year	Project Name/Description	Project Cost
2000-2007	Biodiversity Monitoring	\$10,000/yr
2000	Fish Habitat Repair-Ship Creek	\$30,000
2000	Winter Lynx/Furbearer Baseline Data Survey	\$7,000
2000-2007	Urban Forestry Plantings	\$5,000/yr
2002	Determine Take of Salmon	\$27,500
2002	Identify/Determine Wildlife Corridor Use	\$80,000
2003-2005	Grizzly Bear Use of Elmendorf AFB Study	\$75,000
2003	Fish Rearing Habitat Survey	\$16,000
2003	Install Outdoor Toilets at Six Recreation Facilities	\$100,000
2004	Day Use Site Development	\$50,000
2004	Winter Moose Browse Survey	\$30,000
2004	Vegetation Management/Ecosystem Health	\$20,000
2004-2007	Disturbed Site Restoration	\$20,000/yr
2006	Raptor Habitat/Population Survey	\$30,000



Photo: Staff

1. POLICY, ISSUES, GOALS AND OBJECTIVES

1-1 Policy

1-1a General Policy Statement

The principal purpose of Department of Defense (DOD) lands, according to DOD Instruction (DODI) 4715.3, Environmental Conservation, is *“to support mission related activities...DOD lands and waters shall be made available to the public for educational or recreational use of natural resources when such access is compatible with military mission activities, ecosystem sustainability, and other considerations such as security, safety, and fiscal soundness.”*

Accordingly, the overall goal of conservation management on Elmendorf Air Force Base is to manage base lands and natural resources in such a way as to support the Air Force mission while promoting biodiversity and ecosystem health, protecting natural and cultural resources, and, when and where appropriate, providing commodities on a sustainable basis.

Wing Instruction (WI) 32-7001 states that Elmendorf Air Force Base (AFB) vegetation, wildlife resources, wetlands, lakes, and streams will be managed within the limitations of the overriding military mission under the principles of ecosystem management, and that the 3rd Wing will strive to protect, improve, and enhance environmental quality on Elmendorf AFB. WI 32-7001 further states that lands and natural resources will be managed with the following priorities in mind:

- (1) First priority will be given to protection, preservation, and enhancement of habitat used by threatened and endangered species

- (2) Second priority will be given to maintaining biodiversity through the protection, preservation, and enhancement of fish and wildlife habitat
- (3) Third priority will be given to development, management, and conservation of areas capable of providing intensive recreational use, such as winter sports areas, picnic areas, and nature trails. Such areas will be maintained primarily for their recreational value
- (4) Fourth priority will be to manage the remaining areas for the greatest public benefit. This determination will be made based on an analysis of the ecological factors involved, supply and demand for resources, and both tangible and intangible social and economic values

1-1b Policy Directives

1-1b(1) Policy on Biodiversity and Ecosystem Management

Beginning in the early 1980s, biodiversity and ecosystem management began to emerge nationwide as a better way of managing our natural resources and public lands. Air Force policy began to move in this direction as well. In 1989, DOD Directive 4700.4 called for integration of the various natural resources programs such as forestry, wildlife, and outdoor recreation, and the development of Integrated Natural Resources Management Plans (INRMPs). This important first step led to the military establishing partnerships with other natural resources and land management agencies that were already utilizing the principles of ecosystem management. In 1994, the DOD issued an “Ecosystem Management Policy Directive.” This directive defined the principles of ecosystem management and directed that ecosystem management would become the basis of natural resources and land management in the DOD. The DOD would use the principles of ecosystem management (see Chapter 5) to:

- (1) Restore and maintain ecological associations of local and regional importance
- (2) Restore and maintain biodiversity
- (3) Restore and maintain ecological processes, structures, and functions

- (4) Adapt to changing conditions
- (5) Manage for viable populations
- (6) Maintain ecologically appropriate perspectives

In 1996, DODI 4715.3, the Environmental Conservation Program, was published, further amplifying and implementing the policy of ecosystem management. A brief summary of policies found in the various directives is found below.

1-1b(2) DOD Directives and Executive Orders

DODI 4715.3, Environmental Conservation Program. This regulation provides guidance on implementing policy, assigns responsibilities, and prescribes procedures for the integrated management of natural and cultural resources on DOD lands based on ecosystem management principles. It also defines ecosystem management as “*a goal-driven approach to managing natural and cultural resources that supports present and future mission requirements, preserves ecosystem integrity, is at a scale compatible with natural processes, ...and is realized through effective partnerships. It is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are part of the whole.*”

DODI 4715.3 requires completion of natural and cultural resources inventories, and completion and implementation of INRMPs. It also details how Air Force programs must comply with federal environmental and natural resources laws, and provides the details of how to implement an ecosystem management-based system.

DODI 4700.4, Integrated Natural Resources Management. First published in 1989, DODI 4700.4 requires integration of the various natural resources management programs, and provides guidance for how to integrate programs and what types of issues should be included in an Integrated Natural Resources Management Plan. It assigns responsibilities and provides policy guidance on specific natural resources programs such as forest management, fish and wildlife management, land management, and protection of wetlands, flood plains, and coastal and marine resources.

Executive Orders. Critical Executive Orders (EOs) that affect natural resources include EO 11910, *Protection of Wetlands*, EO 11988, *Flood Plain Management*, and EO 11989, *Off-Road Vehicles on Public Lands*. EO 11910 requires federal agencies to take action to minimize destruction, loss, or degradation of wetlands. EO 11989 provides for closure of areas to use by off-road vehicles where soil, wildlife, or other resource values may be adversely affected. Numerous other Executive Orders have some pertinence to natural resources management on military bases. For jurisdictional EOs, see Appendix C.

1-1b(3) Air Force Directives

Air Force Instruction (AFI) 32-7064, Integrated Natural Resources Management. This Air Force Instruction, which was published 1 Aug 1997, implemented Air Force and DOD Policy Directives. It explains how to manage natural resources on Air Force property in the United States so as to be in compliance with state, federal and local laws and standards for natural resources management.

Other Air Force Directives. Other directives that have some bearing on natural resources management include current Air Force manuals on *Pest Management Programs and Operations*, which details pest management programs for the base, and *Fire Protection*, which covers wildland fire fighting procedures and policy.

Air Force Manuals. Several Air Force Manuals (AFMAN) in the 126-xx series dealt with technical procedures for wildlife management, forest management, land management, and outdoor recreation. These manuals are currently being revised and updated, and will be published during this planning period. AFMAN 32-7081 deals with forest management issues, and AFMAN 32-9008 covers land management. These manuals guide implementation of the various DOD and Air Force directives and instructions by providing detailed instructions, and are directive in nature.

3rd Wing Instruction (WI) 32-7001, Conservation and Management of Natural Resources. This Wing Instruction, which was published in January of 1999, implements Air Force environmental and natural resources policy directives at the base or wing level. It prescribes the policies and responsi-

bilities for the management and conservation of water, forest, fish, wildlife, and outdoor recreation resources, as well as historical and archeological site protection on Elmendorf Air Force Base. It details management priorities, program staffing, and requirements for plans and cooperative agreements. Basic objectives of the various programs are also described, as well as responsibilities of various base-level offices and units. The basic objectives and procedures stated in WI 32-7001 are incorporated into this plan.

1-1b(4) Major Federal Laws

Sikes Act Revision of 1997. The Sikes Act, as amended in 1997, provides much of the legal authority for management of wildlife and natural resources on military lands. Key provisions include:

- ▶ Requirement for preparation and implementation of INRMPs
- ▶ Sustainable use of resources
- ▶ Migratory bird management
- ▶ Outdoor recreation on military bases
- ▶ Authority for the DOD to enforce all federal environmental laws
- ▶ Requirement for enforcement personnel to have state or federal certification
- ▶ Required elements for INRMPs
- ▶ Authority to charge fees for natural resources use
- ▶ Public comment required for INRMPs
- ▶ Requirement for fish and wildlife management on military lands

Other Important Natural Resources and Environmental Laws. Some other important federal that affect this plan include:

- ▶ Americans with Disabilities Act
- ▶ Bald and Golden Eagle Protection Act
- ▶ Clean Water Act
- ▶ Clean Air Act
- ▶ Coastal Zone Management Act

- ▶ Endangered Species Act
- ▶ Erosion Protection Act
- ▶ Fish and Wildlife Coordination Act
- ▶ Hunting, Fishing and Trapping on Military Lands
- ▶ Land and Water Conservation Fund
- ▶ Marine Mammal Protection Act
- ▶ Migratory Bird Conservation Act
- ▶ National Environmental Policy Act (NEPA)
- ▶ Lacey Act
- ▶ Alaska National Interest Lands Conservation Act (ANILCA)
- ▶ Federal Advisory Committee Act (FACA)
- ▶ Federal Land Policy Management Act (FLPMA) (secondary authority for entering into cost share programs)
- ▶ Department of Interior and Related Agencies Appropriations Act of 1991 (para 101-512) (BLM authorization for challenge cost share programs)

Cultural Laws. Important cultural resources laws that affect this plan include:

- ▶ Antiquities Act of 1906/National Historic Preservation Act
- ▶ Archeological and Historic Preservation Act
- ▶ Archaeological Resources Protection Act (ARPA)
- ▶ Native American Graves Protection and Repatriation Act (NAGPRA)

The above lists of acts are not intended to be all-inclusive. Details on the federal laws listed above, as well as others, may be found in the DOD Desk Reference for Natural/Cultural Resources Managers.

1-1b(5) State and Local Directives

Alaska Forest Practices Act. The Alaska Forest Practices Act applies to all state and private lands

in Alaska. It specifies harvesting procedures, best management practices, and provides penalties for non-compliance. Although not regulatory on federal lands, most federal land management agencies accept these standards as a minimum.

State Fish and Game Regulations. State fish and game laws apply to federal lands within the state of Alaska, and are enforced on Elmendorf AFB. Titles 5 and 16 detail state laws and regulations relating to use of fish and wildlife resources and habitat protection.

1-2 Issues and Planning Factors

1-2a Environmental/Natural Resources Involvement in Comprehensive Base Planning

Complete involvement in the base comprehensive planning process by environmental and natural resources personnel is critical to the successful implementation of this plan. Natural resources and environmental constraints must be formally included in the general plan. Coordination and communication between engineering planners, community planners, and Environmental Flight personnel is also critical, particularly in terms of coordinating new projects through the Air Force (AF) Form 332 process. Medium and long-term base planning should be coordinated as well. Long-term changes in mission should be anticipated and planned for. Failure to coordinate between engineering designers, community planners, and environmental planners will result in degrading natural habitats and could possibly result in violations of federal environmental and cultural laws.

1-2b Urban Encroachment and Development

Urban encroachment and increasing development are facts of life for most military bases. Elmendorf AFB, by nature of its location close to downtown Anchorage, has more such issues than most. Mission-essential activities are requiring increased facilities, and new units and personnel are being sent to Elmendorf AFB every year. New base-level developments that are likely to impact natural re-

sources include development of new housing areas, a base commissary and hospital, proposed expansion of the flight line and associated support facilities, realignment of the Alaska railroad right-of-way, and Arctic Warrior realignment, to name a few. These developments are particularly impacting the remaining outwash plain area east of the runway, as well as the Ship Creek flood plain. Elmendorf AFB is being increasingly developed, and habitat is being fragmented more and more each year.

In addition to mission-related activities (which by regulation take priority over natural resources on military bases), many projects proposed or planned by the civilian community will have an impact. Examples include the proposed realignment of the Alaska Railroad rights-of-way on the southern portion of Elmendorf AFB, possible expansion of the Port of Anchorage and its associated rail access, and other projects.

In some cases, improving habitat and more efficient management practices can mitigate this development. However, there is a limit to how much can be done, and at some level, less wild land will equal fewer natural resources.

1-2c Public Access and User Fee Issues

Public access is required by regulation, within the restrictions of non-mission interference and security requirements. Events over the past several years have forced installations to tighten security requirements. The long-term effect this will have on public access is unknown.

User fees are authorized under the new Sikes Act and are common at bases in the lower 48 states. Given the status of other funding options for natural resources programs, it is critical that user fees for hunting, fishing, and certain types of outdoor recreation be instituted. Exactly how the base goes about doing this will largely determine the amount of resistance to this change. The fact that neighboring Fort Richardson is contemplating instituting user fees in 2000 will help. Elmendorf AFB should look at doing the same, as well as standardizing fees with Fort Richardson.

1-2d Subsistence Uses

A possible future issue is use of the base for subsistence hunting, fishing, and trapping by local native groups. Several local groups have expressed an interest in this. Since about 50% of Elmendorf AFB is owned by the Bureau of Land Management, such an issue could be difficult to resolve.

1-2e Ecological/Natural Resources Issues

1-2e(1) Development of Ecosystem Management Partners

This plan is the first step toward implementing ecosystem management on Elmendorf AFB. By definition, ecosystem management requires management across jurisdictional boundaries, looking at ecosystems at the landscape scale. This can only happen through development of ecosystem management partners. Some good first steps have been made in this process, but there is a long way yet to go. Potential, even critical partnerships need to be formed with agencies such as the Alaska Department of Fish and Game (ADF&G), the Bureau of Land Management, and others. The most critical partner is the U.S. Army and Fort Richardson. Issues such as wildlife habitat improvement, management of large animals such as bears (*Ursus* spp.) and moose (*Alces alces*), and forest health and fragmentation, can only be dealt with if both military bases come together and speak with one voice.

It is possible that the next integrated plan will be one written for both bases. If so, this plan has laid some of the groundwork, but much yet remains to be done. Ecosystem management is a concept or process whose time has come. Implementing it on two military bases under different command and management systems will not be easy, but the long-term health of the lands in question requires it.

1-2e(2) Biodiversity and Landscape Ecology

Conservation of biodiversity is a critical issue. The Department of Defense Biodiversity Management Strategy (The Keystone Center 1996) identifies the Integrated Natural Resources Management Plan as

the primary vehicle for implementing biodiversity protection on military lands.

This implementation is conducted by:

- ▶ Monitoring and inventory efforts to provide information for adaptive management
- ▶ Protection of sensitive areas
- ▶ Use of native species and natural landscaping techniques
- ▶ Wetlands management and protection
- ▶ Restrictions on activities that negatively affect biodiversity

Important biodiversity issues at Elmendorf AFB include identification and protection of critical habitat, travel corridors and linkages, minimizing fragmentation, and ensuring viable populations of native species and communities.

1-2e(3) Viability of Commercial Timber Sales Program

The viability of Elmendorf AFB's timber sales program is tied to two issues - resolution of the dispute with the Bureau of Land Management (BLM) over vegetative rights and timber receipts, and the state of the local market for wood products. A compromise between the BLM and Elmendorf AFB is certainly possible, as both agencies should have the same goal - long-term forest health in the Anchorage Bowl. The recommendations in Chapter 9 concerning timber receipt disposition, if adopted, could resolve this situation, at least temporarily.

Market conditions are another matter. So long as timber salvage sales glut the market with timber, market conditions are unlikely to change. It is difficult to have a commercial sales program when there are few or no bidders for timber contracts. The demand for personal-use firewood sales also appears to have topped out at 300 cords per year. This output could be increased if woodcutting was opened to civilians, but this is unlikely. A custodial forest harvest program seems best for the short term.

1-2e(4) Beetle Infestation and Old Growth Issues

Much of the base (70%) is over-mature timber or out of production due to invasive species such as

alder and blue joint grass. The beetle infestation is also devastating some stands and opening them up, which will result in further problems with invasive species. The two major methods for dealing with this problem are commercial logging, which is barely feasible due to market conditions and legal problems, and prescribed fire, which is limited due to narrow burning windows and air quality standard conflicts. Also, questions need to be asked and decisions made concerning long-term disposition of forest lands on Elmendorf AFB. How much old growth is enough? How many acres are going to remain undeveloped? What long-term effect is the bark beetle infestation going to have? Until some of these questions are answered, it will be difficult to conduct long-term forest planning

1-2f Cultural Resources and Natural Resources Management

The Cultural Resource Management Plan to be written in the next five years will outline Elmendorf AFB's management of cultural resources and the interaction with natural resource management in more detail. This plan will only touch on a few management actions.

Natural resources management projects have not been scrutinized in the past for what effects they may have on cultural resources. Activities such as tree removal and development of recreation areas are potentially damaging to cultural resources. In order to reduce impacts to cultural resources, projects that require ground-disturbing activities will be processed through the base's cultural resources manager.

Determination of effect and consultation guidelines provided in implementing regulations for the National Historic Preservation Act (36 Code of Federal Regulations (CFR) 800) will be followed during review of projects. Any project assessed as having an effect on cultural resources or historic property will be coordinated with the Alaska State Historic Preservation Officer (SHPO).

1-3 General Goals and Objectives

The following general goals and objectives are intended to implement management of natural resources in accordance with Department of Defense,

Air Force, and 3rd Wing policies and directives. Individual program management objectives, as well as the strategies to implement them, will be found in the various management chapters (Chapters 9-13).

1-3a GOAL 1: Support the Air Force mission and enhance readiness by providing natural environments for training, minimizing conflicts between mission requirements and land and natural resources use and wildlife, and acting as stewards of the land.

This goal will be accomplished through the following objectives:

- ▶ Provide natural environments for training
- ▶ Minimize conflicts between flying and wildlife
- ▶ Minimize conflicts between Air Force missions and natural resources and land use
- ▶ Ensure public safety by minimizing human-wildlife conflicts
- ▶ Integrate natural resources management with the base comprehensive planning process and with other plans such as the base general plan, pest management plan and base landscaping plan
- ▶ Ensure compliance with natural resource laws and regulations, including NEPA

1-3b GOAL 2: Maintain functional ecosystems and natural diversity including viable populations, native species, and communities.

This goal will be accomplished through the following objectives:

- ▶ Analyze current status of ecosystem integrity and function
- ▶ Emphasize and maintain viable populations of native species and maintain diversity of species and communities that occur on base

- ▶ Restore disturbed areas to native vegetation patterns
- ▶ Maintain or improve native vegetation patterns, successional stages, and biodiversity
- ▶ Maintain or improve forest health
- ▶ Restore disturbed areas to natural vegetation where practical and consistent with mission requirements
- ▶ Reintroduce fire to the ecosystem within the constraints of mission, safety, and air quality standards
- ▶ Use land management techniques which mimic natural disturbance
- ▶ Identify and protect sensitive areas such as wetlands, riparian areas, critical and seasonal habitats, wildlife travel corridors, and linkage zones
- ▶ Incorporate environmental and natural resources concerns and constraints in the base comprehensive planning process

1-3c GOAL 3: Manage under the guidelines and principles of ecosystem management

This goal will be accomplished through the following objectives:

- ▶ Integrate the various natural resources management programs with each other
- ▶ Conduct long-term monitoring of changes in ecosystem status and health based on biodiversity indicators and Management Indicator Species
- ▶ Monitor quantity/quality of habitats and track losses of habitat
- ▶ Utilizing the principles of adaptive management, monitor results of management activities and adjust management practices based on results
- ▶ Manage at the landscape level by coordinating and managing across jurisdictional boundaries

- ▶ Using risk factors, identify species and habitats at risk at the base level and at the regional level
- ▶ Identify and maintain functional wildlife corridors and habitat linkages
- ▶ Emphasize species and habitats that are of limited distribution in a regional context
- ▶ Manage urban areas as part of the ecosystem
- ▶ Manage developed lands so as to minimize adverse ecological effects while maximizing cost efficiency

1-3d GOAL 4: Manage human use of resources for long-term sustainability, by producing products and services at levels compatible with the military mission and ecosystem diversity, health, and productivity

This goal will be accomplished through the following objectives:

- ▶ Manage for long-term sustainability
- ▶ Identify land or ecosystem management areas to assist in integrating resource management
- ▶ Establish biological, physical, and management databases to assist in management and planning
- ▶ Place equal emphasis on consumptive and non-consumptive resource uses
- ▶ Emphasize wild stocks and native ecosystems
- ▶ Provide diversity of natural resource-based recreation opportunities for the base residents
- ▶ Educate about the natural world to ensure wise resource use
- ▶ Provide effective enforcement of all federal, state, and local natural resources laws and regulations

1-3e GOAL 5: Protect, maintain, and improve soil, water, and air quality

This goal will be accomplished through the following objectives:

- ▶ Integrate natural resources management programs with environmental programs such as pollution control, hazardous waste, and restoration programs
- ▶ Minimize pollution
- ▶ Maintain or improve water quality
- ▶ Maintain or improve air quality
- ▶ Prevent vegetation stripping where possible and re-vegetate stripped areas
- ▶ Prevent or control erosion
- ▶ Mitigation of habitat losses

1-3f GOAL 6: Protect cultural resources

This goal will be accomplished through the following objectives:

- ▶ Integrate natural and cultural resources management plans and activities
- ▶ Ensure natural resources management activities do not degrade known cultural resources sites

1-3g GOAL 7: Contribute to scientific knowledge

This goal will be accomplished through the following objectives:

- ▶ Conduct long-term monitoring program and provide results to other interested local agencies
- ▶ Conduct studies with wide-ranging applications and impacts, analyze data and publish results
- ▶ Attend professional meetings and workshops
- ▶ Share results of work with other agencies and the public by presenting papers at national and regional conferences and workshop
- ▶ Maintain list of possible or needed future studies and projects and encourage and cooperate with university research programs and graduate students



Photo: D.D. Wilcox

2. GENERAL BACKGROUND

2-1 Location, Acreage, and Population

Elmendorf AFB is located in south-central Alaska (latitude/longitude: 61°15'N/149°18'W), just north of Anchorage (Figure 2-1). It is bordered on the east by Fort Richardson (U.S. Army Alaska), on the south by residential, industrial, and business districts of Anchorage, and on the north and west by the Knik Arm of Cook Inlet.

Of the 13,130 acres that comprise Elmendorf AFB, 3,713 acres are classified as improved, 1,118 acres as semi-improved and the remaining 8,299 acres are unimproved (Pacific Air Forces 1998). Improved grounds include buildings, runways, pavement, and lawns that require maintenance on a regular basis. Semi-improved areas are mainly open fields around the flightlines, roads, munitions areas, and antenna fields that require periodic maintenance. Unimproved grounds represent the forest, shrub and wetland areas of the base.

The active duty military assigned to the base totals approximately 6,772 personnel. They are accompanied by approximately 10,370 dependents. The civilian work force is approximately 1,153 individuals (Richmond 1993). The base also provides support to approximately 6,485 military retirees living in and around the Anchorage area. The number of people associated with Elmendorf AFB exceeds 25,000 (Pacific Air Forces 1998).

Located to the south of Elmendorf AFB, the Municipality of Anchorage influences much of the planning on Elmendorf AFB. Anchorage, as of 1998, had an estimated population of 258,782 and an annual growth rate of 11% (Anchorage No date). Elmendorf AFB is in a critical travel corridor for movement between Anchorage and the towns to the north namely Eagle River, Eklutna, Wasilla, and Palmer. The Glenn Highway, a major north-south highway, cuts through a portion of Elmendorf AFB. The railroad and various utility lines bisect Elmendorf AFB.

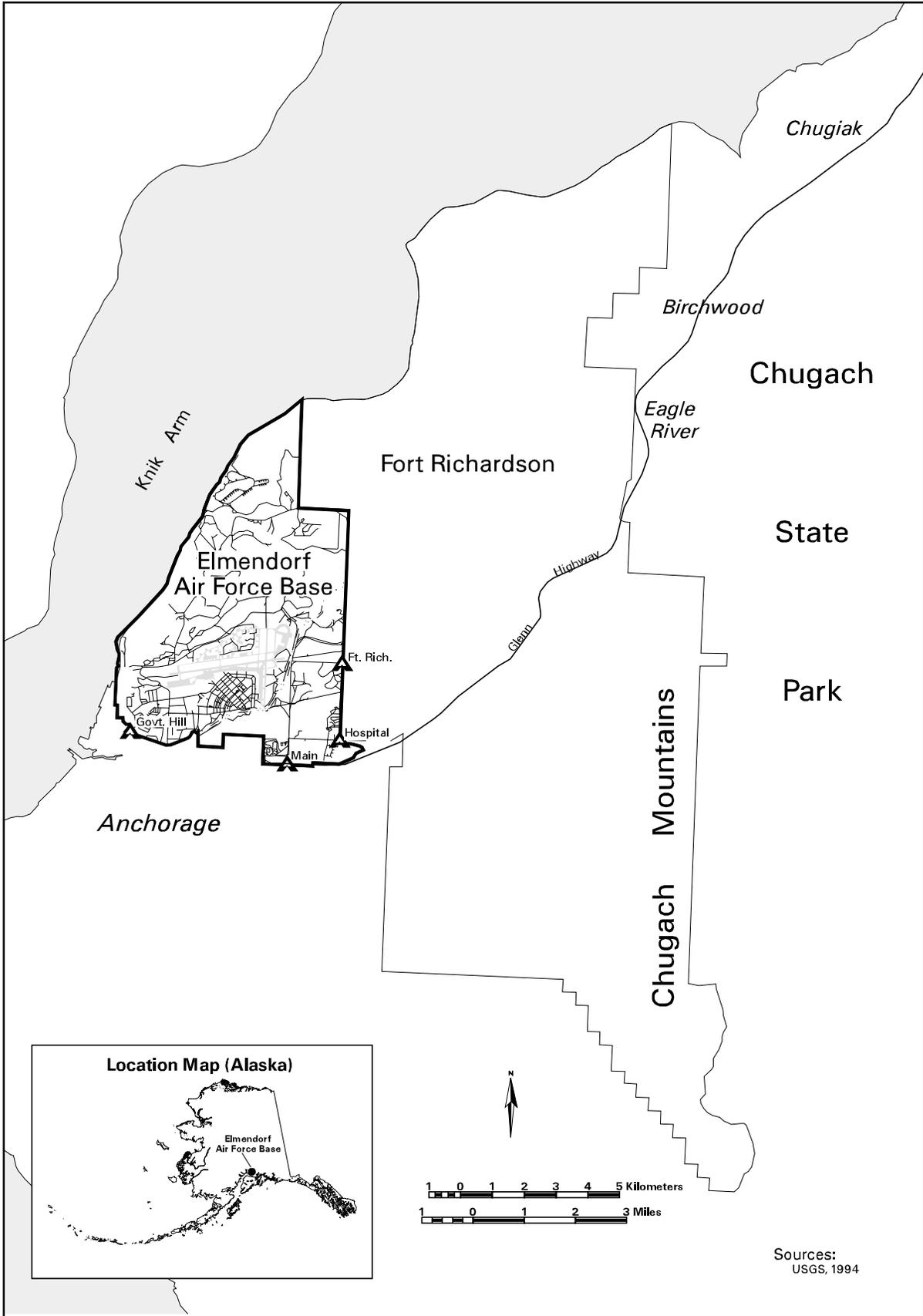


Figure 2-1. General Location of Elmendorf Air Force Base, Alaska.

2-2 Mission

Elmendorf AFB's proximity and access to Asia, Europe, and North America provide a strategic location yielding significant importance to global military operations. The base's location is ideal for deploying aircraft, troops, and equipment around the world, and air defense and superiority, with some units on alert 24-hours a day, year-round.

In addition to air defense and superiority, Elmendorf AFB is both expanding its mission and shifting emphasis to encompass greater contingency support functions. Elmendorf AFB has evolved into the main northern hub for Continental United States (CONUS)-based resources moving westward; during contingencies, over half of all CONUS-based resources will transit the base. This growing mission is being supported through several capital improvements, such as POL (Petroleum, Oil, and Lubricants), airfield pavement, and other mission-related facility projects. The maintenance/repair/refueling mission will emerge gradually as Elmendorf AFB continually redefines itself. The 3rd Wing is Elmendorf AFB's host unit, with responsibilities for maintaining daily operation of the base and furnishing quality services and support to Elmendorf AFB's military personnel, civilian staff, family members, and the surrounding community.

As Elmendorf AFB's host unit, the 3rd Wing provides administrative and logistical support to 11th Air Force, 632nd Air Mobility Support Squadron, 381st Intelligence Squadron, 6th Light Infantry Division (Mobility), and 611th Air Operations Group (AOG) and 611th Air Support Group (ASG).

The 3rd Civil Engineer Squadron's Natural Resources Office manages natural resources on the installation in a wide variety of areas, including forestry, fish and wildlife, outdoor recreation, and land management.

2-3 Facilities

The facilities support the mission of the Air Force in Alaska (Figure 2-3). The main facility is the airfield located in the south part of the base, which is made up of two runways with associated taxiways and parking aprons.

The cantonment area, which surrounds the airfield, is made up of various services and administration buildings, dormitory and housing for base personnel, and industrial and recreation facilities.

The northern part of the base includes a munitions storage area, an Explosive Ordnance Disposal (EOD) range, a small arms range, recreation areas, Mad Bull (Combat Engineer) Training Center, and various communication facilities.

2-4 History of Natural Resources Management

Prior to 1950, the War Department managed the land. There are limited records of land management or wildlife management activities occurring prior to 1950. The Air Force has managed the base with a multi-use philosophy with the major uses being forest management, fish and wildlife management, land management, and outdoor recreation (Richmond 1993).

2-4a History of Forest Management

2-4a(1) Past Forestry Practices

Clearing of the forest occurred throughout the 1940-1950s during the initial homesteading and building eras of the military base. The clearings were restricted, for the most part, to the southern and western part of the base.

A personal-use woodcutting program was started in the early 1970s (Figure 9-2e). The removal of dead and downed wood from designated areas averaged less than 100 cords per year prior to 1987. No fees were charged during this time. In 1987, a fee schedule was initiated for the sale of personal-use forest products. In December of the same year, a trial personal-use Christmas tree cutting program was undertaken. The response to the program was favorable, with 550 permits sold for \$5 a piece. Overstocked stands of young spruce provided the source for the trees, and the cutting program served as a thinning/release of the remaining trees. Both the woodcutting and Christmas tree programs have grown. In 1989, two areas (in need of clearing for mission-related construction) were made available for removal of green timber through a \$10 permit.

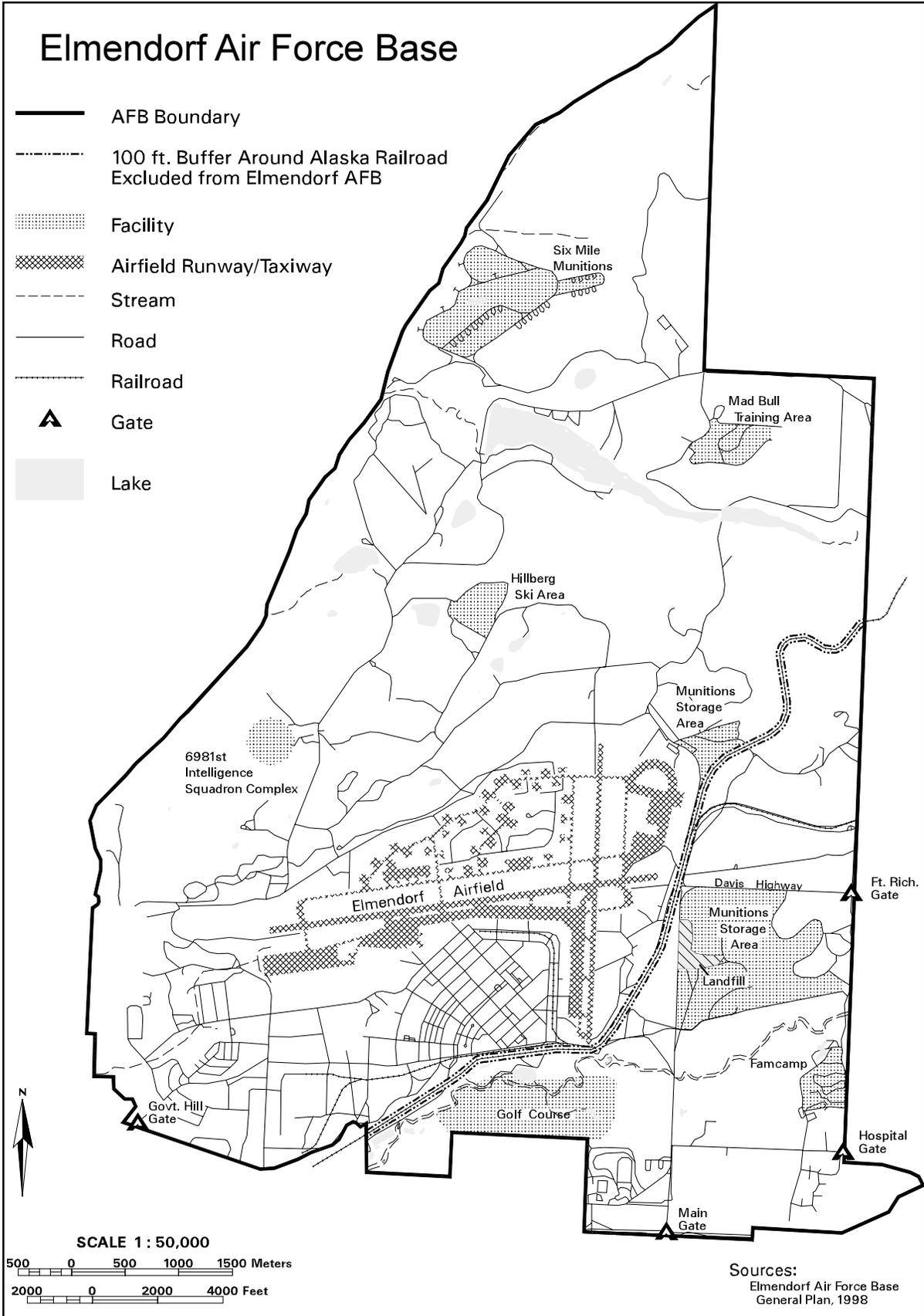


Figure 2-3. Facility Map of Elmendorf Air Force Base, Alaska.

Through this program, 295.5 cords of salvage wood were purchased. The initiation of these programs has been well supported by base personnel.

Commercial logging started in 1992 with approximately 31 acres being logged on the bench land above Upper Six-Mile Lake (Figure 9-2e). The second timber sale occurred in 1995, which consisted of approximately 38 acres. The sale area was out of sight of the ski area and about 1/4-mile north of Oval Lake, just below the ridgeline. A third sale, located near Green Lake (approximately 40 acres), was initiated in 1997. Because there were no bidders on this contract, the sale never occurred. All three sales were located in old growth, mixed spruce-hardwood forests. Limited personnel and budget have restricted the number of sales.

In support of the Bird Aircraft Strike Hazard (BASH) program, Elmendorf has cleared 335 acres of various timberlands since 1995. Wood was salvaged and sold as personal-use firewood. These areas act as extensions of the runways in emergency situations.

2-4a(2) Historical Timber Surveys

A timber survey involving an initial timber cruise, using point sampling of all commercial timber types, occurred as part of a 1982-1983 Natural Resources Inventory. Point sampling, pre-sale timber cruises were conducted in 1992, 1995, and 1997. Another timber survey occurred on approximately 20 acres on the East Side near the all terrain vehicle (ATV) trailhead.

2-4b History of Fish and Wildlife Management

2-4b(1) Historical Fish Stocking

The stocking program on Elmendorf AFB began in 1953 when rainbow trout (*Salmo gairdneri*) fry were stocked in Green Lake. The following two years, other fish species, including cutthroat trout and steelhead (*Salmo* spp.), were stocked in both Green Lake and Lower Six-Mile.

The emphasis in the 1950s stocking procedures was on stocking fry and/or fingerling trout to create a viable self-supporting fishery. This was eliminated when ADF&G decided that the absence of natural

salmonid (*Oncorhynchus* spp.) reproduction in most Anchorage lakes and periodic winter overkill problems necessitated the use of a put-and-take program to maintain area fisheries. Prior to 1981, fingerlings available for stocking were used in remote lakes outside of the Anchorage basin. This preempted the option of planting fingerlings in Elmendorf AFB lakes with the expectation that they would grow to a sufficient size to be caught during the next few fishing seasons.

Dissatisfaction with hatchery-reared rainbows from the lower 48 states, and possible disease importation problems, led to the initiation of a study by ADF&G in 1974 to investigate the use of hatchery brood stock obtained from Alaskan strains of rainbows (Havens 1979). The findings from this study resulted in the use of Swanson River strain rainbow trout from the Kenai Peninsula to meet the needs of Elmendorf AFB's stocking program. Currently, the ADF&G Elmendorf fish hatchery located on Ship Creek produces fish for stocking lakes in the Anchorage Bowl area.

2-4b(2) Past Wildlife Surveys

Wildlife habitat, as well as an in-depth species survey, was documented in the 1982-1983 Natural Resources Inventory (Rothe et al. 1983). The U.S. Fish and Wildlife Service (USFWS) did this inventory for the 21st Combat Support Group/DEEV (Engineering Design Section), Elmendorf Air Force Base, under an Interagency Support Agreement. The following surveys were done to gain more information on habitat, movements, and numbers of specific species.

Bears. A cooperative study of black bears (*Ursus americanus*) on Elmendorf AFB and Fort Richardson, involving Air Force, Army and ADF&G personnel, was initiated in 1989 with wildlife funding obtained from HQ USAF and U.S. Army Alaska (USARAK). The objective of the six-year study was to identify seasonal migration patterns, ranges, and den areas, as well as obtain information on animal size, age and general health. Capture and radio collaring began in June 1990, and resulted in a total of five bears being collared. Trapping continued in 1991 through 1995 with a total of 23 bears collared by January 1996 (Bostick 1997). During the moni-

toring phase, each bear was located once per week during the spring, summer and fall to gain information on their movements. During the winter, monitoring took place on a monthly basis once the bears entered their dens. Beginning in 1995, selected dens were visited for productivity information and cub counts. A secondary objective of the study was to try different methods of discouraging bears from frequenting areas of the base where they are not wanted, such as housing areas and garbage dumpsters. The study resulted in recommending management changes, which are detailed in Chapter 10.

Wolves. A wolf (*Canis lupus*) study, occurring between February 1996 and December 1997, showed that two wolf packs (the Ship Creek and Eagle River Flat packs) utilized Elmendorf AFB. The purpose of the study was to:

- ▶ Estimate the base wolf population
- ▶ Identify packs
- ▶ Chart pack movement patterns
- ▶ Gain an understanding of seasonal distribution patterns
- ▶ Develop an understanding of the reproduction status of the pack
- ▶ Delineate boundaries between territories of the Ship Creek pack, and the Elmendorf/Fort Richardson pack

Five wolves (4 females and 1 male) were captured and radio collared for the purpose of the study. However, the study temporarily came to an untimely end with the death of four of the five animals within months of capture.

Fish. In an effort to obtain better information on the size of salmon runs returning to the Six-Mile Creek drainage, annual salmon counts were initiated in 1988. Counts were conducted by establishing a weir in the creek that blocked salmon migration. The fish behind the weir were netted, counted and passed to the upstream side on a daily basis at the height of the run. Counts were conducted every other day when the number of fish in the trap averaged less than 20 fish per day. In 1998, the weir was moved to the Six-Mile Lake outlet into Six-Mile

Creek where reds continue to be counted, however, pinks are counted now by stream walks, instead of at the weir.

2-4b(3) Historical Habitat Manipulations

Moose. In the initial Wildlife Management Plan (Richmond 1993), 150 acres were scheduled for moose habitat improvement; however, due to the lack of financial support needed to rent the necessary equipment, only 15 acres were actually completed. Moose habitat improvement can occur from other activities such as timber sales that remove the vegetation overstory. The two timber sales, mentioned in Section 2-4a, added an additional 69 acres to moose habitat.

Fish. Salmon habitat has been improved through the removal of obstacles such as beaver dams and flood debris that occur in base streams, mainly Six-Mile Creek and Ship Creek. A 'splash pool' on Six-Mile Creek was installed on the advice of ADF&G to raise the water level on the downstream end to the lower lip of the culvert. A new culvert/fish ladder was installed in the summer of 1996. Prior to 1996, another fish ladder was installed at the point where Six-Mile Creek exits Six-Mile Lake.

Birds. Since the 1970s the population of Canada geese (*Branta canadensis*) has risen significantly in the Anchorage area, causing an increase in the potential for deadly clashes between aircraft and geese (Crowley et al. 1997). In response to the 1995 aircraft accident and the increased geese population, the Air Force, in conjunction with other agencies such as USFWS, and ADF&G, have developed the Bird Aircraft Strike Hazard (BASH) plan. This plan is discussed in detail in Chapter 10. Following this plan, the Air Force has allowed grasses around the airfield to grow higher, leveled airfields to remove standing water, controlled broad-leaf plants, removed any edge effects that may have existed, fertilized, and implemented other procedures as outlined in the BASH Plan (3rd Wing (PACAF) 1997).

Habitat for cavity-nesting birds such as loons (*Gavia* spp.) was improved in 1987 through installing four nesting boxes around Six-Mile Lake. Half of these boxes are used on an annual basis. As needed, the boxes have been replaced or repaired, usually by volunteers.

Bears. As both the population and public recreational use have increased at Elmendorf AFB so have the potential problems between bears and people. The base has attempted to minimize bear problems by scheduled dumpster collection combined with a public education program. This was accomplished with coordination from the Sanitation Shop within the 3rd Civil Engineering Squadron and presentation of information on preventing bear problems at the monthly newcomers' briefing.

Beaver. Beavers (*Castor canadensis*) cause damage by plugging culverts and waterways, and cutting trees. Areas where beavers have become problems have been around the Eagleleglen Golf Course and along Six-Mile Creek. Beaver problems have been handled on a case-by-case basis, with removal of the individual animals as a last resort option. When it is imperative that the animals be removed, depredation permits are obtained, and the base conservation agents do the actual trapping of the beavers. In the past 10 years, approximately 5 to 15 beavers have been removed annually.

2-4c History of Soil Management

Soil management efforts have been concentrated in the cantonment or built-up areas. Stabilization of the stream bank along Ship Creek has occurred throughout the last 10 years. An area of concern is where removal of the natural vegetation along Ship Creek within the golf course has reduced the stability of the stream bank. Efforts are currently being made to introduce more soil holding vegetation along this area.

2-4d History of Outdoor Recreation

The outdoor recreation program on Elmendorf AFB is extensive, covering at least the northern one-third of the base, and has been a part of the Air Force mission since the early 1950s. Elmendorf AFB supports a variety of recreational activities including, fishing, hiking, off-road vehicles (ORV), winter sports, wildlife viewing, camping, boating, hunting, swimming, and weekend chalets for retreats, meetings, and parties (Figure 11-4a).

2-4d(1) Historical Fishing

Fishing is the most popular year-round recreational activity taking place on the base. The fishing pro-

gram started in 1950s. To maintain the fishery, managers in the 1950s restricted fishing to military female dependents and children under 16 years of age. These restrictions were removed in 1958 when ADF&G decided that the fish populations in Green and Six-Mile lakes were sufficient to withstand increased fishing pressure. As the demand for fishing areas increased, more lakes have been stocked. Fishing along Six-Mile Creek for ocean salmon (pinks (*Oncorhynchus gorbusha*) and reds (*Oncorhynchus nerka*)) started in 1983. To improve the ice fishery, landlocked salmon were stocked in 1995, 1996 and 1997.

The base has tried to alleviate pressure on the trout fishery by manipulating stocking schedules. However, this did not work since the base relies heavily on ADF&G hatchery scheduling. The base has helped remove some of the pressure by changing the distribution of the stocking allotment among the lakes based on the fishing pressure identified through angler surveys.

To get a better understanding of the needs of those who fish the lakes on Elmendorf AFB, surveys were taken using three different techniques. Natural resources staff and volunteer conservation agents conducted interviews with anglers to collect information. Additionally, a survey was printed in the local newspaper, and the museum had copies for people to fill out and send in. Lastly, creel surveys were taken from those fishing the lakes.

2-4d(2) Historical Moose Hunting

At the request of the ADF&G, an archery hunt for moose was undertaken on a trial basis in 1990. The normal permit hunts on Fort Richardson alone were not effective in reducing moose numbers, due to movement of the moose onto Elmendorf AFB lands during the hunting periods. A total of 15 permits were issued during the annual drawing for the state permit hunts, eight for bulls and seven for cows, with the hunt taking place from 5 to 30 September. The hunt was extremely successful, with 14 of the 15 moose being taken. Control of the hunters was maintained by the base security officers, who required them to sign on and off the base through the main gate. In addition to providing control, this procedure yielded excellent information on the time required for each hunter to make his kill. Due to the

success of the hunt, the state established it as a permanent addition to their drawing hunts, with the annual harvest averaging 12 animals from 1990 to 1997. This hunt is extremely popular with archers and boasts the highest archery success rate (90%) in the state.

2-4d(3) Past/Present Winter Activities

Winter activities include skiing (cross-country, and downhill), snowmobiling, snowshoeing, ice fishing, ice skating, and dog sledding. Skiing facilities are provided by Moral, Welfare, and Recreation (MWR), with a downhill ski slope located at Hillberg Lake. Cross-country skiing trails are maintained by MWR at Hillberg Lake as well as at the golf course. Approximately 45 miles of snowmachine trails are available throughout the base. The snowmobile club, made up of volunteers, helps to set up training and inspections that need to

occur to get a snowmobile permit. The snowmobile club maintains trails with limited support from the Natural Resources Office. Snowshoeing, ice fishing, and ice skating occur sporadically throughout the winter, and there is only a slight demand for these activities. Dog sledding, allowed along the Knik Bluff trail, is by permit, which is obtained from the Natural Resources Office. There has been little demand for this winter activity.

2-4d(4) Past/Present Summer Activities

By far, fishing is the most demanded summer activity, with fishing occurring at most of the base lakes. Other summer activities include All-Terrain Vehicle use (with approximately 4 miles of trail), boating, hiking, wildlife viewing, horseback riding, biking, berry and mushroom gathering, archery, and limited camping.



Photo: D.D. Wilcox

3. PHYSICAL ENVIRONMENT

3-1 General

Elmendorf AFB is a roughly triangular-shaped installation located within the Municipality of Anchorage in south-central Alaska (latitude/longitude: 61 degrees 15 minutes N/149 degrees 18 minutes W). It is bordered on the east by Fort Richardson, on the south by residential, industrial, and business districts of Anchorage, and on the north and west by the Knik Arm of Cook Inlet (See Figure 2-1). The base is strategically located at the air cross-road connecting the United States with the Pacific Far East and Europe. The Glenn Highway to the north and the Seward Highway to the south connect Elmendorf AFB to other roaded portions of Alaska. The base also is served by the Alaska Railroad that passes through the installation as it runs from Seward to Fairbanks. Along both the Glenn Highway and the Alaska Railroad, critical utilities lines run between Anchorage and the areas to the north.

3-2 Climate

3-2a General

Elmendorf AFB lies within a lowland area, which is part of the Cook Inlet-Susitna Lowlands, a physiographic province within the Pacific Mountain System. Elevations range from sea level to 110 meters. The base is situated in a transitional zone between the maritime climate effects to the south, and the interior or continental climate zone to the north. The principal factors affecting the climate of the base include terrain, latitude, and proximity to oceans. The coastal mountains to the south act as a barrier to the maritime influences of the northern Pacific Ocean, while the Alaska Range to the north and west protects the area from the extreme cold air masses of the interior region. The proximity of Cook Inlet also provides additional temperature effects on the climate. A summary of temperature, precipitation, and surface winds averages for the period 1941 through 1991 are presented in Table 3-2a.

Table 3-2a. Temperature, Precipitation, and Surface Wind Summary Data from March 1941 to December 1991 for Elmendorf AFB, Alaska (Data from Elmendorf AFB Airfield).

Month	Temperature (°F)					Precipitation Snowfall (in)		Surface Wind (MPH)	
	Averages			Extremes		Mean	Mean	Speed	Directions
	Mean	High	Low	Max	Min				
Jan	12	19	5	49	-38	0.9	10	4	NNE
Feb	18	25	10	58	-33	0.9	11	4	NNE
Mar	24	32	15	51	-24	0.9	10	4	NNE
Apr	35	43	28	65	-20	0.6	5	4	N
May	47	54	39	80	12	0.6	#	4	W
Jun	55	62	47	86	33	1.2	0	5	W
Jul	58	65	51	83	35	2.1	0	4	W
Aug	57	63	49	82	29	2.2	0	3	W
Sep	49	55	42	74	20	2.5	#	4	W
Oct	35	41	29	63	-6	1.7	8	4	W
Nov	21	27	15	57	-20	1.2	12	4	NNE
Dec	13	19	7	53	-34	1.3	16	4	NE
Annual	35	42	26			16.1	72	4	

3-2b Temperature

Seasonal variations in temperature at Elmendorf AFB are exaggerated due to the reduced number of daylight hours during winter. However, daily fluctuations in temperature are relatively slight. Average monthly high temperatures range from 43 to 65 degrees Fahrenheit (°F) in the summer, with the highest monthly average of 58 °F occurring in July. Low average monthly temperatures range from 5 to 29 °F, with the lowest monthly average of 12 °F occurring in January.

When 28 °F is used to define a “killing frost,” the average last occurrence is 2 May and the average first occurrence is 30 September, providing a growing season of 124 days.

3-2c Precipitation Patterns

Average annual precipitation for the Elmendorf AFB area is 16.1 inches. Most of this precipitation (9.7 inches or 60% of the annual total) falls from June through October as rain. Snow with minor amounts of rain is prevalent from October through April. Average snowfall is 72 inches or 6.0 inches of water, and accounts for 37% of total precipitation. Rainfall during the winter averages 0.4 inches or 3% of the total.

3-2d Wind

High altitude airflow in the Elmendorf AFB area is generally toward the northeast and northwest. Surface flow is more variable. During summer, surface

winds blow from the west onto the base from Cook Inlet. In winter, these winds are more likely to blow south along Knik Arm. Surface wind velocities average about four knots, although wind velocities of 70 knots have been recorded in the Anchorage area. Channeling of the winds near Ship Creek is common with gusts reaching 53 knots.

3-3 Geology/Topography

3-3a Geological/Seismological History of Area

Elmendorf AFB lies within a lowland area that is part of the Cook Inlet-Susitna Lowlands, a physiographic province within the Pacific Mountain System. The Cook Inlet-Susitna Lowlands cover an extensive area, part of which is submerged by the waters of Cook Inlet. The area is bordered on the west by the Alaska Range, on the east by the Kenai and Chugach Mountains, and on the north by the Talkeetna Mountains. The Pacific Mountain System runs in an arc from southeastern to south-central Alaska and includes the Alaska Peninsula and Aleutian Islands to the west. The Anchorage area is also bordered by two fault systems: the Bruin Bay-Castle Mountain fault system to the west, and the Border Ranges fault system running parallel to the base of the Chugach Mountains to the east. Elmendorf AFB is in a tectonically active region that has experienced numerous earthquakes (nine seismic events exceeding 8.0 on the Richter scale within the last 85 years) and volcanic eruptions (in-

cluding Mount Spurr, Mount Augustine, and Mount Redoubt) since 1954.

Regional bedrock does not outcrop within the base, but is exposed along the flanks of the Chugach Mountains, where the bedrock generally consists of a consolidated, complex mixture of metamorphosed sedimentary and igneous rocks deposited during the late Paleozoic and Mesozoic Eras. A unit of moderately consolidated sedimentary rocks (the Kenai Group) overlies these rocks, up to 20,000 feet thick, that filled a gradually sinking trough in the Cook Inlet-Susitna Lowlands during the Tertiary Period of the Cenozoic Era. The Kenai Group is found extensively throughout the lowlands, but is covered by unconsolidated deposits on the base. The Mesozoic and Cenozoic deposits form the bedrock underlying the base. By definition, bedrock must consist of consolidated deposits; at Elmendorf AFB, it is characterized by low permeability.

3-3b Topography

Regional landforms in the Cook Inlet-Susitna Lowlands are largely the result of glacial or glacier-related processes. On Elmendorf AFB these consist of a terminal moraine, an area of ground moraine, and a large outwash plain (See Figure 3-4a).

3-3b(1) *Elmendorf Moraine*

This system of ridges running northeast to southwest across the center of the base marks the terminus of the last glacial advance in this area. The moraine is one half to one mile in width, and reaches an elevation of 389 feet at its highest point on the base. In most places the south-facing slopes are steep and the north slopes gentle. Much of moraine is covered by kettles (steep-sided depressions) and kames (conical hills or short irregular ridges) created by melting blocks of ice during the glacial retreat. Many of the kettles on the moraine contain ponds and lakes while others contain bog deposits, and still others remain unfilled. None of the ponds or lakes are drained by streams. Additionally, these areas may have glacially deposited Eocene fossils from the Wishbone Formation.

3-3b(2) *Ground Moraine*

Landform features formed under or adjacent to glacier ice are part of a ground moraine, which under-

lies roughly the entire northern third of the base, beginning on the north side of the Elmendorf Moraine. Along the Knik Arm, the moraine is almost continuously exposed, forming bluffs ranging in height from 20 to 100 feet. Away from the Knik Arm, the surface is pitted with kettles and many drumlins (elongated gravel hills parallel to glacial movement) that are oriented towards the southwest. The entire ground moraine is an area of relatively low relief, seldom varying more than 75 feet in elevation. Drainage of the ground moraine is not well integrated, although small streams occupy channels cut during the glacial retreat. Six-Mile Creek occupies a 125-foot deep, abandoned channel cut by Eagle River, which now is three miles farther north. Most of the channels are oriented towards the southwest and give the area a distinctive, striated appearance from the air. Most of the kettles on the ground moraine are shallow depressions forming bog lakes or unfilled depressions. Streams do not drain them.

3-3b(3) *Outwash Plain*

This landform, found south of the Elmendorf Moraine, is a broad, gently sloping surface composed of sand and gravel. It covers approximately the southern third of the base and was formed from alluvial deposits placed down in layers by Eagle River during glacial advances and by Ship Creek in modern times. Ship Creek has cut a flood plain channel varying in depth from 20 to 50 feet below the surface of the plain. The plain's low relief, combined with deep gravel, provides perfect conditions for construction of buildings and runways. The cantonment area and flightline are built almost entirely on the outwash plain.

3-4 Hydrology

3-4a Watersheds

The four major watershed or drainage systems on Elmendorf are Ship Creek, Six-Mile Creek, EOD Creek, and the Cherry Hill Ditch. Watersheds are shown in Figure 3-4a.

3-4b Surface Waters

3-4b(1) *Freshwater Rivers and Streams*

Ship Creek. This is a fourth-order stream, which empties into the Knik Arm. From its headwaters in

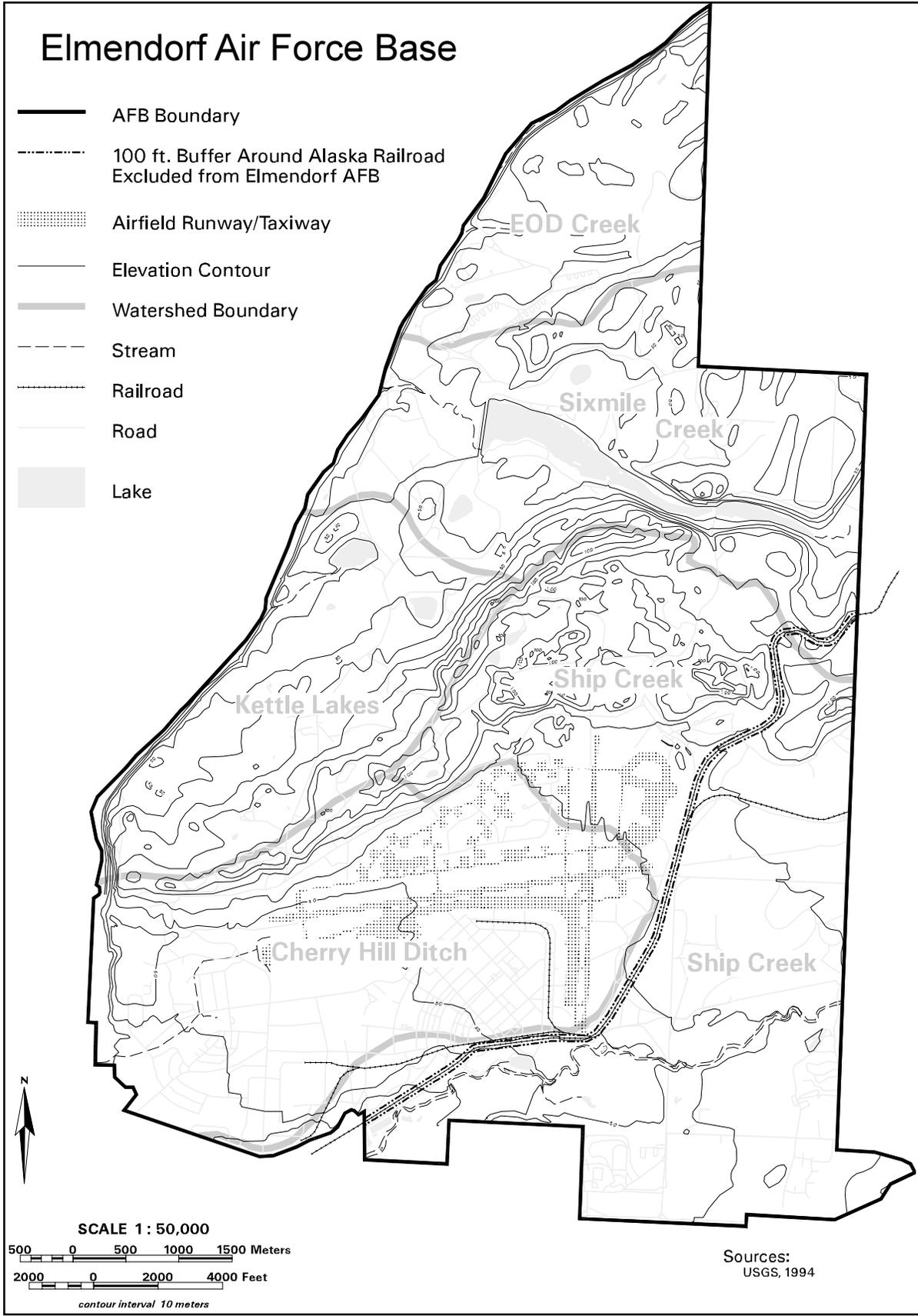


Figure 3-4a. Watersheds, Surface Waters and Topography of Elmendorf Air Force Base.

the Chugach Mountains east of Elmendorf AFB, Ship Creek flows through the southern edge of the installation for a distance of 4.2 miles, draining approximately 5,000 acres. The golf course is the only improved ground along the creek as it flows through the base. The channel is approximately 20 feet wide, 2 feet deep, with an average three percent fall over a rocky/gravelly bottom. The average stream flow is 144 cubic feet per second (cfs), but varies greatly over the year, with highs occurring in the spring and lows in the late winter. Due to the porous nature of the gravel substrate, portions of the channel show no surface flow during winter low flow periods. The creek loses water over some stretches and gains water over others, with most of this gain taking place on the lower stretches before leaving the installation. Flooding has occurred twice in recent years. Both times it has resulted in extensive damage to channelization structures along the installation golf course. Flooding normally occurs in early June in years when rapid snowmelt combines with late spring or early summer rains, and in September, the wettest month of the year. In the last five years, a 50-year flood event occurred during September rains. Ship Creek is the only stream on base with an identified 100-year flood plain.

Six-Mile Creek. This is the second largest drainage system on the installation, draining approximately 2,000 acres. It consists of one mile of creek channel and two miles of man-made lakes, all originating from springs on the boundary with Fort Richardson. Average flow of the system is 3 cfs and varies more than 0.5 cfs between winter and summer. The stream is 5 feet wide and 10 inches deep, with an average three percent fall over a rocky/gravelly bottom. A portion of the stream channel flows through a marsh and has a substrate of peat and silt in this area.

EOD Creek. This is the third largest drainage system on the installation, draining approximately 1,000 acres. It consists of one mile of stream channel, originating from seeps in a bog wetland area. The summer flow rate has been estimated at approximately 0.75 cfs. The stream substrate alternates between silt, gravel, and organic peat deposits.

Cherry Hill Ditch. This is a storm drainage system that receives flow from the developed portions of

the main base, including the flightline. It has a maximum flow of 3 cfs after heavy rains, but is normally under one cfs. Flow is year-round, but minimal during the winter.

3-4b(2) Freshwater Lakes and Ponds

There are a total of 12 natural and man-made lakes and ponds on the installation, ranging in size from one acre to 123.9 acres in surface area. Ten of these are managed for their wildlife or recreational value and will be discussed in more detail later in this INRMP. There are numerous ponds on the installation less than one acre in size and others that are only seasonally flooded. They provide varying amounts of wildlife habitat but are not actively managed.

3-4b(3) Wetlands

There are numerous wetlands on base, with most measuring less than one acre in size and occupying circular kettle depressions on the moraine areas of the base. These wetlands differ slightly from other Anchorage area wetlands. Plant species compositions are similar, but peat depths appear to be shallower on the young parent materials of Elmendorf AFB than on wetlands south of the Elmendorf Moraine. Forested wetlands on Elmendorf AFB are similar to Anchorage-area wetlands in structure, species composition and drainage, but there are fewer sphagnum bogs and more graminoid-meadow wetland types on the base. Open shrub-scrub and wet graminoid types have a larger component of blue joint grass with occasional alder patches. Alder types on saturated soils are not major wetland types. Base wetlands were classified and mapped in 1979 by the USFWS National Wetlands Inventory team. This inventory identified 428 acres of Palustrine and Lacustrine wetlands. A re-inventory of wetlands was conducted in 1995 by the USFWS. This inventory identified 1,534 acres of wetlands (Section 8-2b).

3-4b(4) Salt Water

The Knik Arm of the Cook Inlet borders Elmendorf AFB on the west and north. Elmendorf AFB has eight miles of saltwater shoreline. Water is generally shallow and murky, and tides in this area are extreme, creating a tidal zone with minimal vegetation.

3-4c Sub-Surface Water

There are two principal ground water aquifers identified on Elmendorf AFB, including a shallow unconfined aquifer and a deeper confined aquifer. Between these two aquifers the Bootlegger Cove formation acts as the confining layer. There seems to be no interconnection between the two aquifers.

The shallow aquifer ground water movement follows, for the most part, that of the surface topography. Flow is to the northwest along the north limb of the moraine, and to the southeast along the south limb. The ground water divide coincides with the crest of the moraine. This aquifer is not used for drinking water.

The deeper confined aquifer is found under the entire base and generally flows west, from the Chugach Mountains to the Knik Arm. Elmendorf AFB does not use this aquifer for its main source of drinking water, but as standby drinking water supply when surface water supplies cannot meet the demand. The Municipality of Anchorage, bordering Elmendorf AFB, uses water from this aquifer for various services including industrial, commercial, domestic, and public supply.

3-5 Soils

Anchorage area soils were mapped in 1979 by the U.S. Soil Conservation Service for the Corps of Engineers as part of the Metropolitan Anchorage Urban Study. The original survey was incomplete, as only the portion of the installation south of the Elmendorf Moraine was mapped. Soils were re-inventoried by the Natural Resources Conservation Service in 1997, and details of that survey may be found in their interim report (Wikgren 1997). In general, however, the soils of Elmendorf AFB and the surrounding area are dominated by three types of unconsolidated deposits based on grain size, sorting, permeability, and depositional method. Soil types include the following:

- (1) Coarse-grained deposits consisting of sand and gravel deposited by streams (glacial outwash) in the outwash plain and along modern stream

channels, lakes, or estuaries. This material is generally well-layered and well-sorted with moderate to high permeability. This type of deposit also consists of sand placed by streams, wind, or in still water ponds, lakes, and estuaries. These are generally well-stratified and sorted with moderate to high permeability. Coarse-grained deposits are also composed of sand and gravel deposited mainly by moving water within, or adjacent to, glacier ice. This material is generally moderately well-stratified and well-sorted, but less homogeneous than stream deposits, has moderate to high permeability, and is represented by ground moraine features such as kames and eskers.

- (2) Fine-grained deposits consisting of silt and clay deposited in still water such as former lakes and ponds in the ground moraine, former marine estuaries, and tidal zones. These deposits are often found interbedded with sand and gravel, and with till. The silts and clays are usually saturated with water, but transmit it so slowly they can be, and commonly are, impermeable in a practical sense. Fine-grained materials also include the distinctive Bootlegger Cove clay. This material may contain interbeds of fine sand and is also usually saturated with water, but is classified as impermeable because of slow transmittal time.
- (3) Till, a mixture of coarse and fine-grained material consisting of boulders, gravel, sand, silt, and clay, is found in well-sorted interbeds or poorly-sorted single beds. It originated as the result of glacial deposition; however, it is found on Elmendorf AFB intermixed as part of a combination of glacial, marine, and lacustrine deposits. Till deposited by glaciers includes long ridges marking the margins of former glaciers; Elmendorf Moraine is an example. Till of mixed origins includes elongate hills such as drumlins. Till, although saturated with water, can be relatively impermeable because of slow transmittal time; however, water-yielding sand and gravel are commonly present in shallow till.



Photo: Staff

4. FLORA AND FAUNA

4-1 Flora

4-1a Overview

Elmendorf AFB lies within the Cook Inlet Lowlands section of the Coastal Trough Humid Taiga Province of Bailey's eco-regions of the United States. Flora in this region closely resembles that of the boreal forest of interior Alaska, with some species that are typical to the coastal spruce-hemlock forest. There are three physiographic zones of vegetation and plant habitat found on the base.

- (1) Coastal Halophytic Zone: Comprised of the shoreline and intertidal flats along Cook Inlet.
- (2) Lowland Interior Forest Zone: Lowland boreal forest found to 1500 feet elevation. Mesic to dry forest types include birch (*Betula papyrifera*) forest, white spruce (*Picea glauca*), quaking aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*), and mixed birch-spruce forest. Wetlands include black spruce (*Picea mariana*) and tree-less bogs with graminoid forbs. Alder (*Alnus spp.*) is the dominant shrub community.
- (3) Artificially Cleared or Disturbed Area Zone: Includes main cantonment area and airfield, roadsides, rights-of-way, pipelines, etc.

Two additional zones, the alpine and sub-alpine zones, are found just east of the base on Fort Richardson and in the Chugach Mountains.

4-1b Vegetation Types

4-1b(1) General Description of Vegetation Types

Natural vegetation in the region is a transition between the Pacific Coast, western hemlock-sitka spruce forest (*Tsuga heterophylla* and *Picea sitchensis*) and the interior boreal forests of white spruce, paper birch, and aspen (See Figure 4-1b). The species associations of base forests are similar

to those of the Interior, but are less modified by fire due to the wetter maritime climate of the area. Of the 476 vascular plant species known to occur in the Anchorage area, 221 are found on Elmendorf AFB. Fifteen major lichens and mosses also have been identified to genus and/or species. No species that have been proposed as candidates for listing as threatened or endangered are present on the base. Vegetation types are listed below in Table 4-1b.

Table 4-1b. A Summary of Vegetation Types for Elmendorf Air Force Base, Alaska.

Type No	Class	Vegetation Type	Vegetation Description	Percent Cover	Area (Acres)
1	Forest	Black spruce	Closed needleleaf forest	9.1	972
2		White spruce	Closed needleleaf forest	3.6	384
3		Black spruce	Open needleleaf forest	2.8	299
4		Birch	Closed broadleaf forest	5.3	566
5		Balsam poplar	Closed broadleaf forest	3.3	352
6		Birch	Open broadleaf forest	.3	32
7		Upland Forest Regeneration	Broadleaf woodland	3.0	320
8		Old-growth birch-white spruce/alder	Closed mixed forest	7.4	790
9		Old-growth birch-white spruce	Closed mixed forest	17.0	1858
10		Young birch-white spruce	Closed mixed forest	16.6	1815
12		Floodplain black cottonwood-white spruce	Closed mixed forest	.3	32
13		Aspen-white spruce	Closed mixed forest	.6	64
14		Old-growth birch-white spruce/alder	Open mixed forest	2.1	224
15		Aspen-white spruce	Open mixed forest	2.0	214
16		Flood plain black cottonwood-white spruce	Open mixed forest	2.1	224
17		Aspen-white spruce	Mixed woodland	.2	21
18	Dwarf tree	Black spruce	Open dwarf tree scrub	1.0	107
19		Black spruce	Dwarf tree scrub woodland	.9	96
20	Tall shrub	Alder	Closed tall shrub-scrub	13.9	1485
21		Alder/upland forest regeneration	Open tall shrub-scrub	1.3	139
22	Low shrub	Ericaceous shrub or sweet gale	Open low shrub-scrub	.7	75
23	Moss	Spagnum	Bryoid moss	.8	85
24	Sedge-Grass	Bog bean-marsh fivefinger	Wet forb	.3	32
25		Sedges - blue joint grass	Mesic graminoid herbaceous	1.8	192
26		Sedges - blue joint grass	Wet graminoid herbaceous	.8	85
27	Rooted floating aquatic		Freshwater Aquatic Herbaceous	.1	11
28	Coastal mud			1.1	117
OW	Open water			2.4	256

Note: As adapted from Rothe, et al. 1983.

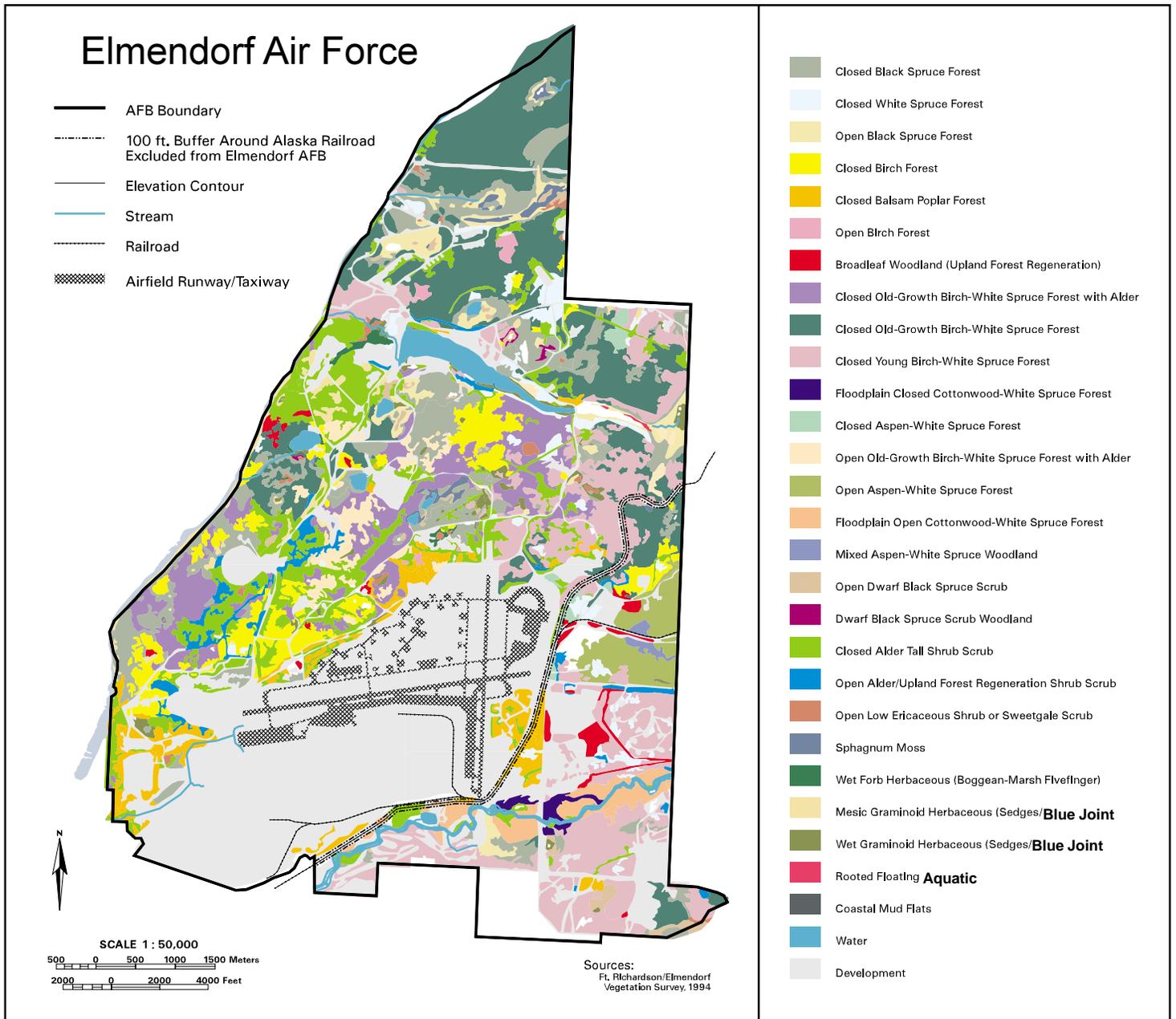


Figure 4-1b. Vegetation Classifications for Elmendorf Air Force Base,

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4-1b(2) General Description of Forest Vegetation Types

Paper birch, white spruce, quaking aspen and balsam poplar dominate upland forests. Forest stands of these species range in age from 25 to 225 years. The older stands are an indication of the historic lack of fire in this forest system. Black cottonwood (*Populus trichocarpa*) in association with willow species (*Salix spp.*) is common in areas bordering base streams. Black spruce is the dominant tree in wetter areas, with a stunted form present on bogs. The following forest types include six tree species that are native to the base, although western hemlock and sitka spruce are found within 20 miles to the south.

Mixed Spruce Hardwood Type. This is the predominant forest vegetation type on base, characterized by mixed stands of white spruce, paper birch, quaking aspen, and balsam poplar. It occurs primarily on well-drained, level to sloping sites.

White Spruce Type. Occurring primarily on well-drained uplands, this type represents the climax type for suitable sites.

Black Spruce Type. Found as pure stands or in association with white spruce. Pure stands are found on poorly-drained soils, often close to, and interspersed with, bogs and other wetlands.

Paper Birch Type. This common type is characterized by nearly pure stands of even-aged birch. Birch is often the primary tree species to invade disturbed sites. It represents a transitional stage in the development of spruce forests. Stands are found on well-drained, level to sloping sites, which have been disturbed by man or natural disturbances such as fire and windthrow. Many of the former homestead sites in the Knik Bluff area have reverted to this vegetation type.

Quaking Aspen Type. This type is uncommon, but does occur on a few sites on the east and southeast portion of the base. Characterized by pure, even-aged stands of quaking aspen, sometimes found in association with black cottonwood on wetter sites, and balsam poplar on upland sites.

Cottonwood and Balsam Poplar Type. These types are found on poorly-drained soils especially in the flood plain areas (cottonwood) or in certain

upland areas (poplar). It can occur as an early stage in the development of white spruce forest.

Ground Cover. Associations of devil's club (*Echinopanax horridum*), cow parsnip (*Heracleum lanatum*), and blue joint grass (*Calamagrostis canadensis*) are the most common ground cover types found in base forest stands. Older stands have large components of devil's club and cow parsnip, while young stands have a larger proportion of grass. Several edible berries are also present in the ground cover, including bunchberry (*Cornus canadensis*), American red current (*Ribes triste*), high bush cranberry (*Viburnum edule*), and lowbush cranberry (*Vaccinium vitis-idaea*). Detailed descriptions of understory plant components can be found in the 1983 Natural Resources Inventory (Rothe, et al. 1983).

4-1b(3) Description of Non-Forested Vegetation Types

Shrub Types. Thirteen species of willows and two species of alder make up this category of vegetation. They are generally found in association with the major tree species, occupying open sites and the upper level of the forest understory. Both are pioneers and aggressively occupy disturbed sites, particularly the alders. Several abandoned antenna fields that were not artificially regenerated have been taken over by alder, to the almost complete exclusion of birch, aspen and poplar. The alders are more shade tolerant than the willows and can persist under relatively shaded conditions. Willows are more prevalent along streams on alluvial deposits, occupying openings or forming the understory of open spruce-hardwood stands. Willows are the preferred winter browse for moose, while alders are relatively unused except in severe winters, due to the presence of natural digestive inhibitors in the bark.

Wetlands. Wetlands on Elmendorf AFB include freshwater marshes, bogs, lakes and ponds, and riparian areas. Wetland vegetation types include open water, emergent vegetation, aquatic bed, and shrub types. Wetland types include wet herbaceous forbs, mesic and wet graminoid forbs, bryoid moss, and freshwater aquatic herbaceous types (See Table 4-1b). A re-inventory of base wetlands was conducted in 1995 (See Chapter 8-2b). Details of this inven-

tory are discussed in Chapter 8, and wetlands management is discussed in Chapter 9.

Disturbed areas. Disturbed areas include abandoned and in-use antenna fields, power-line and railroad rights-of-way, the main cantonment area, and the area adjacent to the airfield. Antenna fields in particular have been largely taken over by alder, and to a lesser extent, blue joint grass, to the exclusion of other tree and shrub species. The area around the airfield is in the process of being converted from current grass types to beach rye and blue joint grass.

4-1c Specialized Vegetation Components

4-1c(1) Old Growth Forest

Old growth forests are defined as forest ecosystems dominated by old trees and later stages of succession. They are often characterized by stands with large trees, snags, large downed woody material, canopy gaps, and associated shrub and grass components. Primary tree species in old growth stands on upland sites in the Elmendorf AFB area include paper birch and white spruce. Paper birch is relatively short-lived (80-120 years), while white spruce is relatively long-lived (over 250 years). Lowland old growth sites include cottonwood and cottonwood-aspen mixes. For the purposes of this plan, old growth forest types will be those with the dominant trees being over 175 years of age. In general, these forests have low reproductive potential, and disease and windthrow are often common. The spruce bark beetle in particular is prevalent in both pure and mixed stands of white spruce.

Stands range in age from 25 to 225 years, with age classes unevenly distributed. Nearly half of the stands (2,860 acres) are over 175 years of age and are in an advanced state of decline. The remaining stands are broken down between two age classes, those less than 50 years old (1,348 acres), and those 50 to 100 years old (1,843 acres). There are no stands in the 100 to 175 year age class. Most of the 50 to 100-year-old stands were established after natural or man-caused fires, which burned between the turn of the century and the mid 1930s. The stands less than 50 years old were established after site disturbances during World War II and the early years of installation development.

Old growth stands are concentrated in the mid to northern portions of the base (Figure 4-1c). Virtually all upland areas north of Six-Mile Lake are comprised of old growth stands. Significant old growth also occurs in the Knik Bluff area. Most old growth areas are in an advanced state of decline, due to age as well as mortality due to bark beetle attack in the case of white spruce. Canopies are open, and understories and openings are largely composed of alder and blue joint grass

4-1c(2) Rare and Endangered Plants

Although no comprehensive survey of rare and endangered plants has been conducted on Elmendorf AFB, such a survey was completed on Fort Richardson in 1995. This report indicated that no federally listed endangered or threatened plants existed on Fort Richardson at the present time. (Lichvar and Racine 1995). The results of this survey can likely be extrapolated to include the airbase, with the exception of the alpine and sub-alpine areas that do not occur on Elmendorf AFB. Further details may be found in the report.

4-1d Fish and Wildlife Habitat

4-1d(1) General

Information on wildlife habitat is contained in the 1982-1983 Natural Resources Inventory (Rothe et al. 1983), supplemented by information obtained through observation since then. Copies of this report are available at the Natural Resources Office as well as the Fish and Wildlife Service's library in Anchorage. Additional information and guidance is obtained from the ADF&G as required.

4-1d(2) Terrestrial Physiographic Types

Forestlands. Because forest lands on Elmendorf AFB are a mixture of small stands of various timber types and age classes, they have been broken down into two categories for wildlife management purposes: uplands and lowlands. This classification relates more to the understory that develops on these different soils than to elevation, as topographic relief differences on base only range from sea level to 389 feet. The understory vegetation has a greater influence on the quality of a site for the featured wildlife species than the overstory. Maps of vegetation types are found in Figure 4-1b.

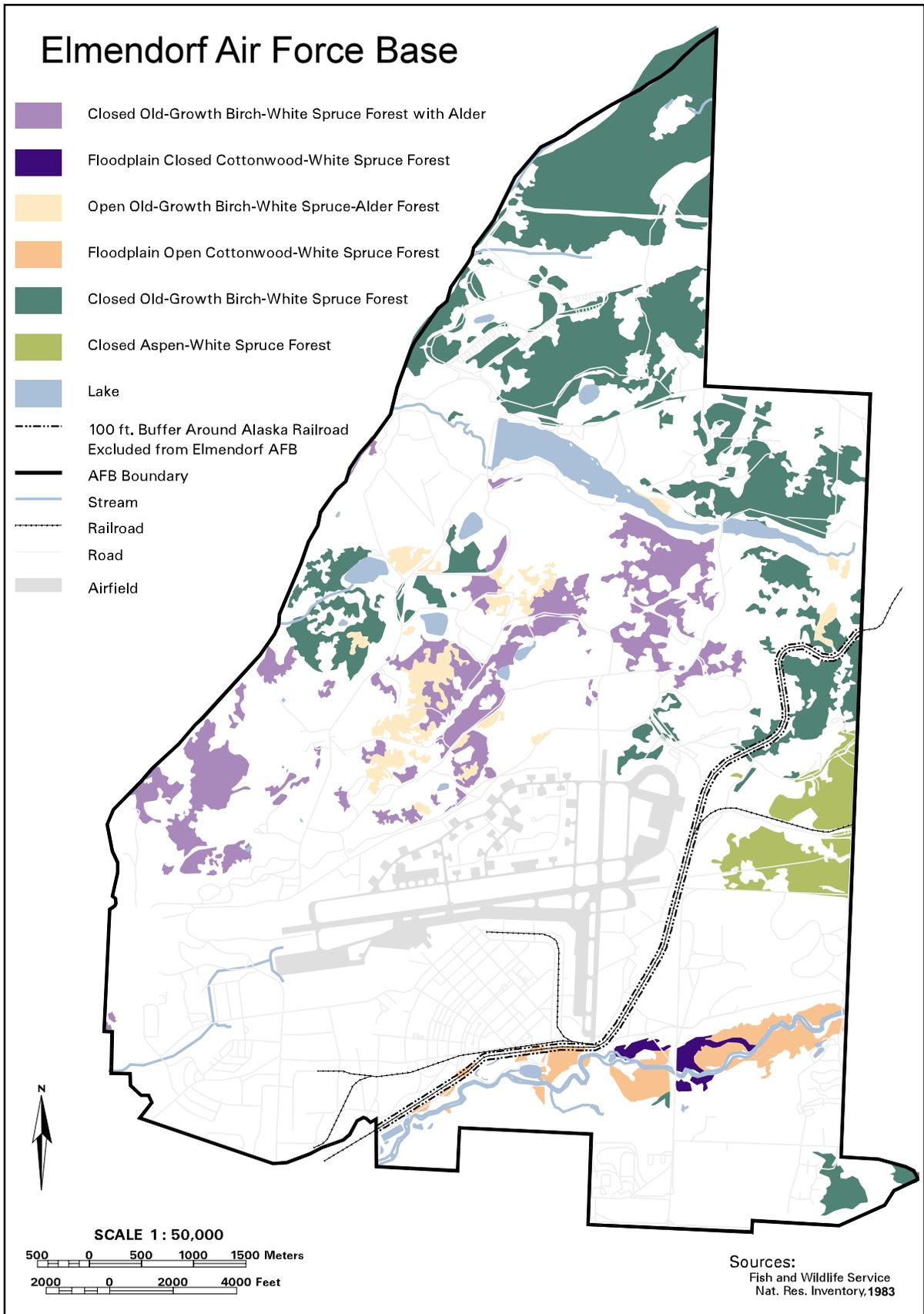


Figure 4-1c. Areas of Old Growth Located on Elmendorf Air Force Base, Alaska.

Uplands. The 5,212 acres in this category are found on the northern two-thirds of the installation where the dominant landforms are the ground and terminal moraines. Paper birch, quaking aspen, balsam poplar, black spruce and white spruce dominate these stands. The understory consists of shrub alder, blue joint grass and devil's club. These lands provide excellent summer habitat for moose and black bear, as well as a variety of small game and non-game wildlife species such as coyotes (*Canis latrans*), red squirrels (*Tamiasciurus hudsonicus*) and great horned owls (*Bubo virginianus*).

Lowlands. The 2,304 acres in this category are dominated by the same tree species as the upland areas, but the understory consists primarily of willows and alder. The availability of willows makes these areas a primary wintering range for moose. Snowshoe hares (*Lepus americanus*), spruce grouse (*Dendragobus obscurus*), and ptarmigan (*Lagopus lagopus*) are also heavy, year-round users of these areas. Also included in this category are 310 acres of flood plain lands along Ship Creek, which are dominated by black cottonwood, paper birch and white spruce. This flood plain provides both summer and winter habitat for a portion of the moose population.

Shrublands. The 1,510 acres in this category are found primarily on upland sites, interspersed among the various timber types. For the most part, they occur in small patches less than 10 acres in size, although there are three that exceed 100 acres each. The primary vegetation on these sites is blue joint grass and thin leaf alder (*Alnus tenuifolia*). These

areas provide some spring and summer habitat for moose, but produce only small quantities of winter browse.

4-1d(3) Semi-Aquatic Habitat Types - Wetlands

The 1,534 acres of inventoried wetlands on base consist primarily of open water, aquatic beds, emergent plants, shrub-scrub, and forested vegetation types. They are wettest in spring and early summer, but tend to dry toward the end of summer, depending on the amount of rain received. These areas are important habitat for the wood frog (*Rana sylvatica*) as well as spring and summer feeding areas for moose. Use of these areas by waterfowl is limited to those sites having open water throughout the summer.

4-1d(4) Aquatic Habitat Types

Lakes and Ponds. Various species of migratory waterfowl make use of these bodies of water [Table 4-1d(4)] as breeding habitat, primarily loons (*Gavis* spp.), grebes (*Podiceps* spp.) and Canada geese (*Branta canadensis*). Seven of the ponds and lakes support a variety of fish species, which include rainbow trout, salmon and sticklebacks (*Gasterosteus aculeatus*). Beavers, muskrats (*Erethizon dorsatum*), and an occasional river otter (*Lutra canadensis*) also make their homes on the lake shores.

Streams. A total of six miles of the base streams are rated as anadromous fish waters [Table 4-1d(4)]. The streams provide spawning habitat for trout as well as salmon.

Table 4-1d(4). Aquatic Habitat Summary for Elmendorf AFB.

Lakes/Ponds/Creeks	Acres/Miles
EOD Pond	2.5 Acres
Fish Lake	4.2 Acres
Cooling Pond	7.0 Acres
Green Lake	8.7 Acres
Hillberg (Tuomi)Lake	11.2 Acres
Lower Six-Mile Lake	123.9 Acres
Oval (Beeche) Lake	6.1 Acres
Spring Lake	10.1 Acres
Triangle Lake	3.7 Acres
Upper Six-Mile Lake	41.4 Acres
EOD Creek	0.8 Miles
Ship Creek	4.2 Miles
Six-Mile Creek	1.0 Miles
Saltwater Shoreline	8.0 Miles

Ship Creek. Due to the installation of a fish barrier dam at the downstream edge of the base, most spawning activity takes place off base. A small number of salmon are able to jump the dam during periods of high water, and have been seen spawning on base. The success of this spawning activity is low, due to the fact that portions of the creek become dry during late winter. Trout spawning in the creek occurs primarily in small side streams and channels. Ship Creek and its side channels provide ideal habitat for beaver, which are present throughout the length of the stream.

Six-Mile Creek. This stream presently has only one mile of channel from its origin at the outlet of Lower Six-Mile Lake to the Knik Arm of Cook Inlet. Prior to the construction of the earth dams, which formed Lower and Upper Six-Mile Lakes, the stream was three miles long. The creek has approximately 900 feet of excellent spawning habitat, and another 2,000 feet of marginal spawning beds. Though the remainder of the creek has no useable spawning areas due to a muddy-sandy bottom and weed growth, it does provide excellent rearing habitat for trout and salmon. Development of the lakes in the Six-Mile drainage is the reason red salmon have entered the system and increased in numbers. This species of salmon requires a lake in its spawning stream in order for fry to survive, as they spend up to three years in the lake before going to sea.

EOD Creek. Although not rated by ADF&G as anadromous, this stream is included since salmon fry have been found in it (Rothe et al. 1983), indicating some level of spawning activity. It has only three-quarters of a mile of channel from its source in a wetlands area to the point where it empties into the Knik Arm. The extent of spawning areas is unknown, but juvenile silver salmon (*Oncorhynchus kisutch*) have been found in the stream, indicating spawning does occur.

Saltwater Shoreline. Although Elmendorf AFB has eight miles of saltwater shoreline, the inter-tidal areas located along it are not significant wildlife habitat due to a lack of vegetation below the high tide line. The extreme differential between high and low tides and the heavy silt load of water act together to keep the gravel and mud bottom well scoured. It receives only limited use by shorebirds. It is, however, used by marine mammals such as the

beluga whale (*Delphinaterus leucus*) and seals (*Phoca* spp.), and is a critical travel corridor for brown bears (*Ursus arctos*) and wolves. Wildlife management on inter-tidal areas in Alaska falls under the jurisdiction of the ADF&G.

4-2 Fauna

4-2a Large Mammals

4-2a(1) Moose

As the largest member of the deer family, moose are the most visible wildlife species found on base. Because of their size and the frequency with which they wander through the housing areas, moose are the first major wildlife species newly-arrived personnel are likely to see. Elmendorf AFB shares the North Anchorage Moose Herd with neighboring Fort Richardson and portions of Chugach State Park. Of this total herd of 500 animals, an estimated 70 to 120 animals live on Elmendorf AFB, depending on the time of year, with highs occurring in the late spring and early summer calving season (See Chapter 8 for annual inventory results). Moose calving areas are shown in Figure 4-2a. Portions of this herd are migratory and spend only part of the year on Elmendorf AFB. The population trend is generally stable. For more details on populations, see Chapter 8.

4-2a(2) Black and Brown Bears

Elmendorf AFB and Fort Richardson are home to 35-40 black bears, not including cubs of the year, and 3-5 brown bears (*Ursus spp.*) (Bostick 1997). Bear numbers are highest during the early to late summer, when salmon runs attract bears from inland areas. They are likely lowest in the fall, when some bears move to higher elevations to take advantage of berries. Between eight to twelve black bears are estimated to be present on the airbase at any given time during the summer. They are most frequently seen around the base lakes, but also wander through the cantonment area on a regular basis. Most resident bears are thought to be females and young. Three to five active bear dens are found on base each year. A radio-telemetry study of nuisance bears on base was completed in 1997 (Bostick 1997), and further studies in the Anchorage area are being

Elmendorf Air Force Base

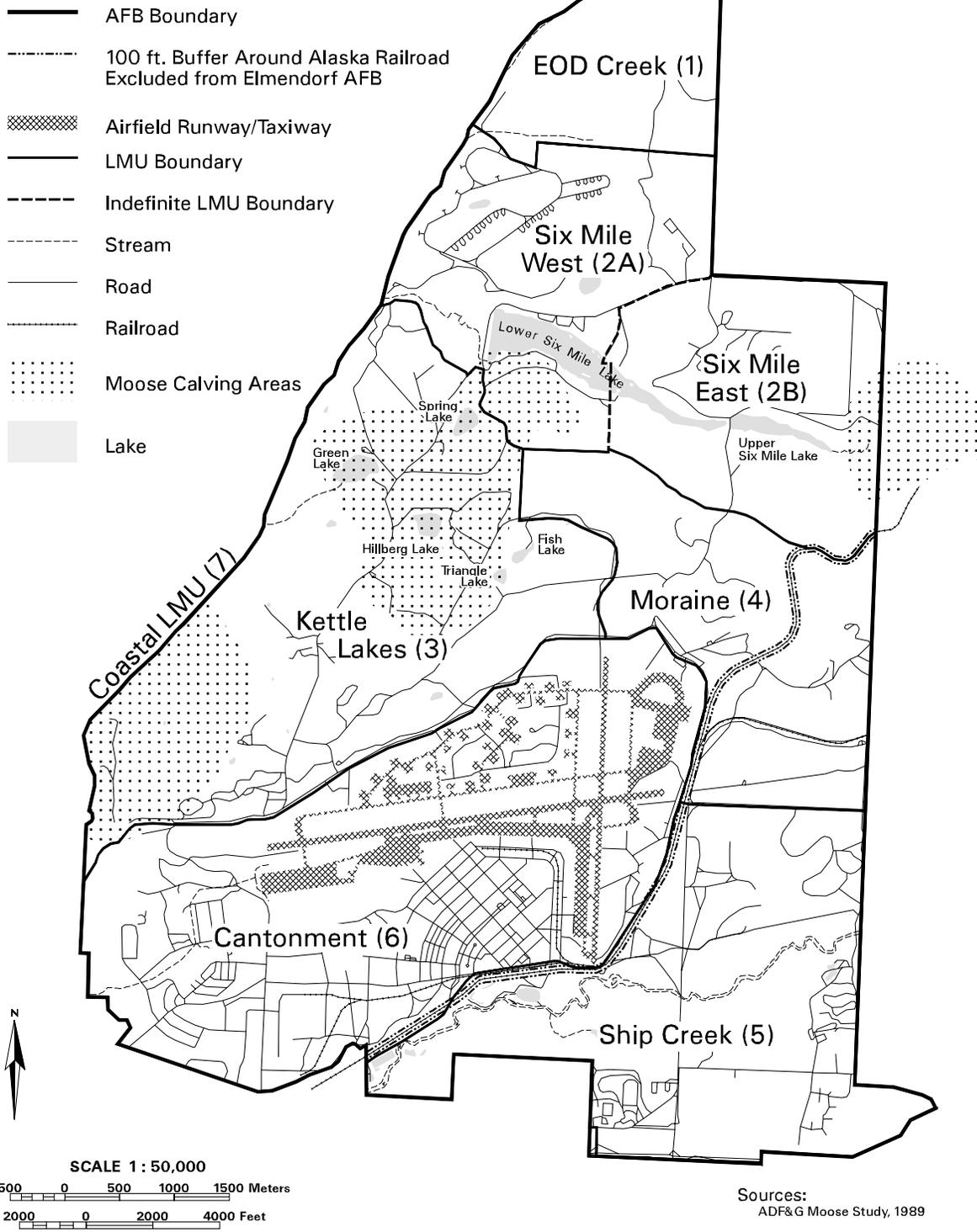


Figure 4-2a. Moose Calving Areas Located on Elmendorf Air Force Base, Alaska.

done by a graduate student from University of Alaska, Anchorage.

4-2a(3) Wolves

Elmendorf AFB and Fort Richardson are home to about 15 wolves, organized in two distinct packs. The Ship Creek pack occupies the eastern portion of Fort Richardson, and is occasionally reported on Elmendorf AFB. The Elmendorf AFB or Eagle River Flats pack occupies all of Elmendorf AFB, the western portion of Fort Richardson, and ranges as far north and west as Palmer Hay Flats (40 miles north of the base) and the Point Mackenzie area on the west shore of Cook Inlet. Wolves are known to have denned and raised pups on Fort Richardson. No denning sites have been confirmed on Elmendorf AFB to date. In addition to the two organized packs, there have been regular reports of lone wolves or pairs, particularly since 1995.

4-2a(4) Marine Mammals

Beluga whales (*Delphinaterus leucus*) are common in Cook Inlet adjacent to the air base, and are frequently seen in the summer at the mouth of Six-Mile Creek. Harbor seals (*Phoca vitulina*), bottle nosed dolphins (*Tursiops truncatus*), and orca or killer whales (*Orcinus orca*) are uncommon, but are sighted occasionally. These species are all protected under the Marine Mammal Protection Act, and the National Marine Fisheries Board has proposed the beluga whale for listing as a threatened species.

4-2b Small Mammals

4-2b(1) Furbearers

Furbearers found on Elmendorf AFB include beaver (*Castor canadensis*), river otter (*Lutra canadensis*), muskrat (*Ondatra zibithica*), ermine or short-tailed weasel (*Mustela erminea*), red fox (*Vulpes vulva*), coyote (*Canis latrans*), gray wolf (*Canis lupis*), lynx (*Lynx canadensis*), mink (*Mustela vison*), and possibly wolverine (*Gulo luscus*), and marten (*Martes americana*). Red fox are relatively common throughout the base, including the cantonment areas. Coyotes exist primarily near housing areas and the airfield, probably due to wolf predation. Beavers are found in virtually all the base lakes except Fish and Triangle, as well as Ship and Six-Mile creeks and the cooling pond at

the golf course. Muskrats and river otter are uncommon, but are occasionally sighted in the Six-Mile Lake system. Marten have not been verified on Elmendorf AFB, but are relatively common in some portions of Fort Richardson and probably exist on Elmendorf AFB as well. Wolverines are found on Fort Richardson and may stray onto Elmendorf AFB from time to time.

4-2b(2) Small Mammals

Small mammals found on Elmendorf AFB includes snowshoe hare (*Lepus americanus*), porcupine (*Erethizon dorsatum*), arctic ground squirrel (*Spermophilus parryi*), red squirrel (*Tamiasciurus hudsonicus*), northern redback vole (*Clethrionomys rutilus*), masked shrew (*Sorex cinereus*), tundra shrew (*Sorex arcticus*), vagrant shrew (*Sorex vagrans*), little brown bat (*Myotis lucifugus*), and possibly northern flying squirrel (*Glaucomys brinus*).

A small mammal survey was done as part of the 1982-1983 Natural Resources Inventory, but no further collection work has been done.

4-2c Birds

A partial inventory of birds was conducted as part of the 1982-83 Natural Resources Inventory (See Chapter 8). Birds found on Elmendorf AFB are listed in Appendix E. A more detailed discussion of the various groups follows below.

4-2c(1) Waterfowl

Loons and Grebes. Red necked grebes (*Podiceps grisegena*) are the most common type of waterbird on the base lakes. Two species of loons, common (*Gavia immer*) and arctic (*Gavia arctica*), successfully nest on three of the base lakes (Green Lake, Upper Six-Mile Lake, and Lower Six-Mile Lake). The total population of loons at the beginning of the breeding season has been observed to be as many as six common loons and two arctic loons. The best nesting season was 1990 when two common chicks and one arctic were reared. Nesting success is highly variable from year to year. Some years have seen 100% mortality of hatched chicks. These losses are attributed to predation by bald eagles (*Haliaeetus leucocephalus*) and gulls (*Larus* spp.).

Ducks. Mallards (*Anas platyrhynchos*) are the most common species on Elmendorf AFB. Nesting occurs primarily on the Six-Mile Lake system. Some mallards spend the winter on Ship Creek as well. American widgeon (*Anas americana*), pintail (*Anas acuta*), ring necked ducks (*Aythya collaris*), and blue and green winged teal (*Anas discors/crecca*) are uncommon but present. Northern shoveler (*Anas clypeata*), Barrow's goldeneye (*Bucephala islandica*), scaup (*Aythya spp.*), and white winged scoters (*Melanitta fusca*) are sighted rarely.

Geese. Canada geese (*Branta canadensis*) are common on Elmendorf AFB, particularly during the spring and fall migration seasons. Snow geese (*Chen spp.*) are uncommon, but seen occasionally.

4-2c(2) Shorebirds

Shorebirds are most abundant in Lower and Upper Six-Mile lakes. Most abundant species include yellowlegs (*Tinga spp.*) and common snipe (*Gallinago gallinago*). Spotted sandpipers (*Artitus macularia*), red-necked phalaropes (*Phalaropus lobatus*), and semi-palmated plovers (*Charadrius semipalmatus*) are common. Gulls and terns include mew gulls (*Larus canis*), which are common, Bonaparte's gulls (*Larus philidelpia*), which are uncommon, and Arctic (*Sterna paradisaea*) and Aleutian terns (*Sterna aleutica*), which are rare. Gulls are found along the saltwater shoreline in the summer, as well as the landfill, airfield, and golf course. Sandhill cranes (*Grus canadensis*) are common at Eagle River Flats on Fort Richardson, and over-fly the northern portions of Elmendorf AFB regularly.

4-2c(3) Raptors

Common raptors include red-tailed hawk (*Buteo jamaicensis*), sharp-shinned hawk (*Accipiter striatus*), and Swainson's Hawk (*Buteo swainsoni*). Bald eagles (*Haliaeetus leucocephalus*) and Northern goshawks (*Accipiter gentilus*) are also present.

Eagles and Ospreys. Bald eagles are year-round residents of the base, with the highest numbers and visibility occurring between May and October. The eagles make heavy use of the lakes during summer feeding on fish, and the Ship Creek drainage in the winter, feeding on ducks. One eagle nest has been identified northwest of Lower Six-Mile Lake, a sec-

ond northwest of Green Lake, and a third near Ship Creek on the golf course. The Green Lake and Ship Creek nests appear to be active, and the Ship Creek nest successfully reared a fledgling in 1996. Golden eagles (*Aguila chrysaetos*) are sighted regularly on Fort Richardson, and presumably fly over Elmendorf AFB as well. Ospreys (*Pandion haliaetus*) are uncommon, but have been seen in the Anchorage area.

Hawks and Falcons. Hawks include the northern harrier (*Circus cynaeus*), red-tailed hawk, sharp-shinned hawk, Swainson's hawk, and the northern goshawk. The first three are common. At least one goshawk nest has been found on Elmendorf AFB. A major migration corridor passes through the Elmendorf AFB area. Peregrin falcons (*Falco peregrinus*) have been seen flying over the Anchorage area, but there are no verified sightings on Elmendorf AFB.

Owls. The great horned owl (*Bubo virginianus*) is common. An owl survey conducted on Fort Richardson included the great horned, saw-whet owl (*Aegolius acadicus*), and boreal owl (*Aegolius funereus*). Great gray owl (*Strix nebulosa*) sightings also occur from time to time, but this species is probably uncommon.

4-2c(4) Passerines and Other Small Birds

Spruce grouse (*Dendragobus obscurus*), as well as about 40 species of passerines and neotropical birds, are common. Common passerines and neotropicals include the boreal chickadee (*Parus hudsonicus*), pine grosbeak (*Pinicola enucleator*), common redpoll (*Carduelis flammea*), and others. Townsend's warbler (*Dendroica townsendi*) is believed to be present, as well as the Downy, Hairy and Three-toed woodpeckers (*Picoides spp.*) but these species are probably not common. Ruffed grouse (*Bonasa umbellus*) are not believed to be present at this time, however, populations on Fort Richardson are expanding and ruffed grouse will likely occupy pockets of suitable habitat on Elmendorf AFB in the future. Surveys for passerine birds were conducted on Elmendorf AFB in 1983 and annually on Fort Richardson as part of the Army's Land Condition Trend Analysis program. A bird species list developed during the 1982-1983 Natural Resources Inventory is found in Appendix E of this document.

4-2d Reptiles and Amphibians

No reptiles are known to occur on Elmendorf AFB. One species of amphibian, the wood frog (*Rana sylvatica*), exists, and is common in bogs, wetlands, and fresh and saltwater marshes.

4-2e Fish

4-2e(1) Pacific Salmon

All five Pacific Salmon species return to base streams to spawn. Ship Creek has enhanced runs of king or chinook salmon (*Oncorhynchus tshawytscha*) and silver or coho salmon (*Oncorhynchus kisutch*), with natural returns of chum (*Oncorhynchus keta*) and pink salmon (*Oncorhynchus gorbuscha*). Although red or sockeye salmon (*Oncorhynchus nerka*) return in small numbers each year, they are probably pioneer fish from runs in other streams, as there is no lake in the stream system required by this species for rearing fry. Salmon return to the creek beginning in early June, with different species present through the end of September. Six-Mile Creek has natural runs of all salmon species, with reds and pinks comprising the bulk of the returning fish. The viability of the run of kings is suspect, as it is small and only males have been observed in the past three years. This may mean the species is present only as a pioneer. The runs of silvers and chums are both small, with less than 200 fish in each. Reds begin returning in late July and are present through the end of October, with the other species returning between July and September. EOD Creek has some silver salmon, but the extent and viability of the run is unknown.

4-2e(2) Rainbow Trout

This trout (*Salmo gairdneri*), is characteristically a cold water fish of northern temperature regions. Rainbows are found in seven base lakes, either as naturally occurring populations or as the result of past stocking programs. The majority of stocked fish are caught during their first summer in the lakes,

but those that survive can reach substantial size after several years. The base record for rainbow trout is 11 pounds and 4 ounces. The Six-Mile Lake system is a native trout fishery with no stocking. Some spawning does occur in this system, but the extent is unknown.

4-2e(3) Landlocked Salmon

Landlocked salmon (king, silver, or kokanee, *Oncorhynchus spp.*) are stocked in Green, Spring, Fish, Triangle lakes, and occasionally Upper Six-Mile Lake. Ice fishermen take most of the stocked fish during the winter. Some survival may occur in Green and Upper Six-Mile lakes.

4-2e(4) Other Small Fish

The threespine stickleback (*Gasterosteus aculeatus*) is common in most base lakes, and is a major source of food for rainbow trout. The ninespine stickleback (*Pungitius pungitius*) and slimy sculpin (*Cottus cognatus*) also occur. The 1983 inventory also found occasional dolly varden (*Salvelinus malma*) in the Six-Mile Lake system.

4-2f Threatened or Endangered Species and Species of Concern

No federally listed threatened or endangered species inhabit Elmendorf AFB. A former threatened species, the peregrine falcon, is known to pass through the area during migrations. A former federally listed threatened species, the bald eagle, is common locally. It receives protection under both federal (Bald Eagle Protection Act) and state law. The Cook Inlet sub-population of the beluga whale has been proposed for federal listing, but does not occur on the base itself. The Canada lynx (*Lynx canadensis*), which has been listed as threatened in the Lower 48 states, is uncommon on Elmendorf AFB, although its population is believed to be increasing based on sightings.



Photo: D.D. Wilcox

5. ECOSYSTEM MANAGEMENT

5-1 Ecosystem Management

5-1a Ecosystem Management Goals

Ecosystem management is not easily accomplished. It often takes a high degree of manpower, time, money, education, and analysis. The benefits of managing natural resources by ecosystem management are enormous, affecting all biological systems within the parameters of the ecosystem. The DOD has clearly stated its reasons for moving toward managing natural resources through ecosystem management. These reasons include:

- (1) Restoring and maintaining ecological associations of local and regional importance
- (2) Restoring and maintaining biodiversity
- (3) Restoring and maintaining ecological processes, structures, and functions
- (4) Adapting to changing conditions
- (5) Managing for viable populations
- (6) Maintaining ecologically appropriate perspectives

Additionally, the DOD has stated its goal with regard to ecosystem management is, *“To ensure that military lands support present and future training and testing requirements while preserving, improving, and enhancing ecosystem integrity. Over the long term, that approach shall maintain and improve the sustainability and biological diversity of terrestrial and aquatic (including marine) ecosystems while supporting sustainable economies, human use, and the environment required for realistic military training operations”* (Leslie et al. 1996).

5-1b Ecosystem Management General

Ecosystem management is not easily defined, it is as complex as ecosystems are, with all the variability and uncertainty. Many definitions of ecosystem management have been put forth by various agencies, and all are different in their approach to management. However, these definitions do have several things in common: they emphasize large-scale, system-wide perspectives; the focus is on the composition and processes of ecological systems and their complexities; and there is recognition of the need for integration across multiple scales of concern—ecological, economic, and cultural (Leslie et al. 1996).

The DOD defines ecosystem management as “*A goal-driven approach to managing natural and cultural resources that supports present and future mission requirements; preserves ecosystem integrity; is at a scale compatible with natural processes; is cognizant of nature’s timeframes; recognizes social and economic viability within functioning ecosystems; is adaptable to complex and changing requirements; and is realized through effective partnerships among private, local, state, tribal, and federal interests. Ecosystem management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are a part of the whole*” (Leslie et al. 1996).

Directions from DOD state that within the context of ecosystem management, natural resources management will include the following:

- (1) A shift from single species to multiple species management
- (2) Consider the formation of partnerships necessary to assess and manage ecosystems that cross political boundaries
- (3) Use the best available scientific information in decision making and adaptive management techniques in natural resources management
- (4) Include associated cultural values
- (5) Use principles and guidelines defined by DOD instructions and enclosures

5-1b(1) Multiple Species Management

Generally in the past, it has been easy for managers to get involved in single species type management. Ecosystem management puts the emphasis on multiple species management where a variety of habitats, species viability, species interactions, community structure, mutualistic relationships, edge effects, and connectivity are all taken into account.

Elmendorf AFB has selected several species that it will monitor and manage (See Table 8-3b). There are several categories these species fall into, including key species, featured species, indicator species, and species with legal constraints.

Key species are those species that play a disproportionately large role in community structure. Their significant role in the community may be because they are important to the feeding structure, provide a critical process in the system, provide necessary interactions, or generally have a significant impact on the ecosystem.

Indicator species are those species managers choose to track ecosystem health or status, or specific management programs. These species may or may not be key species or featured species. Featured species, unlike the key species, are chosen based on human values instead of ecosystem values. These species may or may not be key or indicator species.

Species with legal constraints are those species that have been listed as endangered or threatened by the USFWS. Additionally, this group could contain species that are of concern from a base, regional, or state perspective.

5-1b(2) Partnerships

Partnering is a process by which two or more organizations with shared interests act as a team to achieve mutually beneficial goals. These partnerships can range from very informal to very formal. Partnerships provide support for ecosystem management, allowing the base to look at a broader picture. Elmendorf AFB is a small part of the ecosystem in the Anchorage Bowl area, and will be able to glean, as well as contribute, information on the ecosystem as partnerships are built and strengthened.

Partnerships also allow the abilities of Elmendorf AFB’s natural resources managers to increase by

being able to work with surrounding natural resources managers who may have expertise in different areas. These skills can include Geographical Information System (GIS), knowledge of biodiversity conservation and ecosystem management, strategic planning, biological expertise on a particular species or community type, ecological expertise on linkages, processes, landscape relationships, statistics/modeling/computer analysis, ecological monitoring and experimental design, fire management, technical writing, public outreach/education, and community participation.

Partnerships that Elmendorf AFB has formed or will form in the next five years are listed in Section 5-3 (Responsible and Interested Parties). The Sikes Act (PL 105-85) requires the military to establish partnerships with major landowners such as the BLM, and other interested agencies including the USFWS, and ADF&G.

5-1b(3) Adaptive Management & Decision Making

Adaptive management is a way for managers to address and handle the uncertainties and complexities inherent in natural systems by treating ecosystem management as an experiment (Leslie et al. 1996). In an adaptive management mode, resource managers monitor the results of management activities, observing and recording the outcome. The Natural Resources Office recognize that the current management is an experiment and will use control treatments to accurately measure the effects and efficiency of management techniques. The results of monitoring management activities can change future management both for the base and/or other natural resources managers. More emphasis will be placed on monitoring activities to help facilitate adaptive management.

This plan, which forms the guidelines and outlines the programs that will be followed for the next five years, will be reviewed yearly, and changes to the program will occur as needed. Substantial revisions of the INRMP will occur at least every five years as mandated by AFI 32-7064. This adaptive type management will allow managers to have a plan that is flexible and adaptive to current knowledge, resources, and needs. Yearly reviews and revisions

will allow managers to adapt the plan to consider the following:

- ▶ Changes to funding and staffing resources
- ▶ Integrate new information from inventories, monitoring, and research
- ▶ Changes in military mission
- ▶ Changes in laws and mandates
- ▶ Changes in the status of abiotic or/and biotic components of the ecosystem
- ▶ To address additional issues from stakeholders

5-1b(4) Cultural Values

The values of those using and managing the base cannot be ignored. Human values are an integral part of ecosystem management. These values will establish priorities and activities that occur on Elmendorf AFB. Because of the variety of human values, ecosystem managers will be required to make difficult choices. According to the Natural Resources Handbook for Managing Military Lands (Leslie et al. 1996), “*In an ideal world, managers would be able to conserve all populations and species, protect or restore all habitats, re-connect all landscapes, and still serve all human needs and desires. Choices have to be made as to the most effective and efficient use of limited resources, including staff time, funding, and available expertise. Because of these limitations, not every problem can be addressed immediately and thoroughly; some are elevated to immediate concern while others must be relegated to lower status. How these choices are made is critical to the futures of species, biological communities, and ecosystems, as well as to the condition of military lands and the sustainability of training and operations. Fortunately, there are principles, guidelines, and precedents that help us make intelligent and thoughtful choices.*”

This INRMP outlines many of the values that have been expressed concerning Elmendorf AFB. Objective sections in each of the management chapters reflect the values that have been chosen at this time as highest priorities. These values may change in time, in which case, this plan will also change to show the new values.

5-1b(5) Integrated Natural Resources Management

This planning document provides the framework for an ecosystem-based management of natural resources on Elmendorf AFB. The plan is designed to give background information (Chapters 1-6), and then focus on current and future management (Chapters 7-13). Instead of focusing individually on wildlife management, forest management, and land management, this plan has integrated all areas into the different types of management such as inventory, monitoring, habitat manipulations, and protection. Although this integrates the plan, it also makes it hard to follow management for one species. For example, moose is mentioned as being monitored in Chapter 8, habitat manipulations are discussed in Chapter 10, and hunting of moose is mentioned in Chapter 11.

5-2 Ecosystem Status

5-2a General

Although information is continually being collected on Elmendorf AFB's natural resources, it is difficult to quantify the status of the ecosystem. Most conclusions regarding current and future status, along with the ability of the ecosystem to support the military mission and the public, are subjective. It is believed that eventually the proper tools and information will be available to more accurately evaluate ecosystem components, health, and trends.

5-2b Water Quality

The quality of surface water on Elmendorf AFB appears to have remained in good condition. There is no reason to suspect that these waters have either degraded (beyond temporary, localized sedimentation) or improved.

From ground water monitoring data, there is contamination in portions of the shallow aquifer on-site. However, the deeper confined aquifer has not been impacted by any contaminants from sources on Elmendorf AFB. The Bootlegger Cove formation seems an effective barrier between the aquifers (Brabets 1998).

A precipitation-runoff, suspended-sediment, and flood-frequency characteristic study for Elmendorf

AFB took place from 1996 to 1998. This study focused mainly on the developed portion of the base, and samples of water quality were taken from three areas. Results indicated increased sediment flow during rainfall, and snowmelt runoff. These increases are more significant during rainfall than snowmelt but are still not considered a problem. Most of the sediment load is believed to originate from natural erosion from stream banks (Brabets 1998).

5-2c Soil Productivity

There have been no indications that the productivity of the soil has been reduced. Some areas may have been improved due to additives, such as topsoil or fertilizers, to create lawns and gardens in the built-up areas. However, the soil productivity of undeveloped areas will have remained relatively unchanged. The general productivity of soils in the Anchorage area is low, with soils that are inherently shallow, immature and deficient in many of the primary plant nutrients, including nitrogen and phosphorous (USARAK 1998).

5-2d Biodiversity

It is difficult to quantify the status of biodiversity on Elmendorf AFB without more data from the past. It is believed that Elmendorf AFB has a reasonable level of biodiversity. Habitat type, distribution, abundance, and species richness are examples of parameters that could be utilized to determine biodiversity. In terms of aquatic systems, the combination of non-self-sustaining fish populations in kettle lakes and the exclusion of salmon from upper Ship Creek could represent a decrease in aquatic biodiversity. In terrestrial systems, the high percentage of old growth forest and declining stands is one possible indicator of declining biodiversity. More study needs to be conducted in this area. Other possible indicators of declining biodiversity are the increasing development and resulting loss or degradation of habitat caused by fragmentation.

With the present trend of collecting and storing data, and having the tools to analyze that data (such as a Geographic Information System (GIS)), a better understanding of biodiversity can be attained in the future.

5-2e Support of the Military Mission

The natural resources on Elmendorf AFB are critical in supporting the military mission. The military mission at Elmendorf AFB relies on natural resources to provide relaxation and recreation opportunities for those training and working on Elmendorf AFB. Additionally, the Air Force uses the natural areas of the base as a buffer for the airfield and other military activities. Implementation of an ecosystem-based management plan will ensure that natural resources will provide the proper arena for supporting the military mission and personnel.

5-2f Production of Renewable Resources and Recreation Opportunities

5-2f(1) Forest Management

Forest products are available on Elmendorf AFB if a market or need arises. The base has been able to support several small timber sales and has the potential to support other timber sales if needed. There will be areas outlined in this plan that will maintain some of the old growth while timber harvesting in other areas will promote a wide variety of age classes and tree sizes.

5-2f(2) Hunting and Fishing

Hunting has not been a priority at Elmendorf AFB due to its small size and limited opportunities. The base has recently opened up for a small moose hunt, which the ADF&G has determined is needed to keep the moose population of the herd that roams both Elmendorf AFB and Fort Richardson within sustainable and manageable limits. Moose numbers are monitored, and there is no reason to believe that Elmendorf AFB will not be able to support small limited hunts in the future. Fishing opportunities on Elmendorf AFB have increased greatly in the past ten years. This is due to annual stocking of lakes and the development of a salmon run on Six-Mile Creek.

5-2f(3) Other Recreational Opportunities

Elmendorf supports a variety of recreational opportunities besides hunting and fishing. These activities include wildlife viewing, boating, snowmo-

biling, snowshoeing, skiing, hiking, biking, and horseback riding. To many of the members of the military stationed on Elmendorf AFB, outdoor recreation is an important benefit to living in Alaska. The demand and use of the recreational areas on Elmendorf AFB has remained consistent or increased over the past several years. Improvements to the recreational facilities will occur as needed and as funding allows.

5-3 Responsible/Interested Parties

5-3a 3rd Wing

The 3rd Wing is the host unit at Elmendorf AFB, with responsibilities to maintain daily operation of the base and furnish services and support to Elmendorf AFB's military personnel, civilian staff, family members, and the surrounding community.

5-3a(1) Vice Wing Commander

The Vice Wing Commander chairs the Bird Hazard Working Group (BHWG) as initiated by OPLAN 91-202 appendix 1 to annex A. The commander also has approval authority for recommendations of the BHWG.

5-3a(2) 3rd Wing Safety/BASH Officer

The 3rd Wing Safety/BASH Officer has primary responsibility in regard to OPLAN 91-202 or BASH plan. The 3rd Wing Safety office works with newly arrived personnel making sure that all are briefed on Elmendorf AFB's BASH program, and that squadron safety officers have an established briefing on bird hazards and know the report procedures. Additionally, 3rd Wing Safety schedules BHWG meetings, takes minutes and attendance at these meetings, and maintains the BHWG minutes for at least three years. The 3rd Wing Safety office provides any additional information on bird activities through contact with state, federal and Elmendorf AFB wildlife agencies.

5-3a(3) Public Affairs

Public Affairs is required, upon request, to provide base personnel, dependents and the general public, information on the hazards of uncontrolled bird activity and the measures being taken to minimize

them. Additionally, the Public Affairs office provides the public with information concerning activities occurring on base dealing with natural resources or the outdoor recreation program. The Public Affairs Office is also involved in any public awareness programs.

5-3a(4) 3rd Operations Group

The 3rd Operations Group and its entities are involved in the BASH program. They do the day-to-day coordination, monitoring, briefing, and reporting of hazardous bird activities to maintain the safety of those flying in and out of Elmendorf AFB.

5-3a(5) 3rd Support Group

The 3rd Support Group provides most of the natural resources direction for Elmendorf AFB. Figure 5-3a shows the organizations within the 3rd Support Group that are involved with natural resources management.

All four of the listed squadrons of the 3rd Support Group are involved in some aspect of Elmendorf AFB's BASH program. The 3rd Security Police

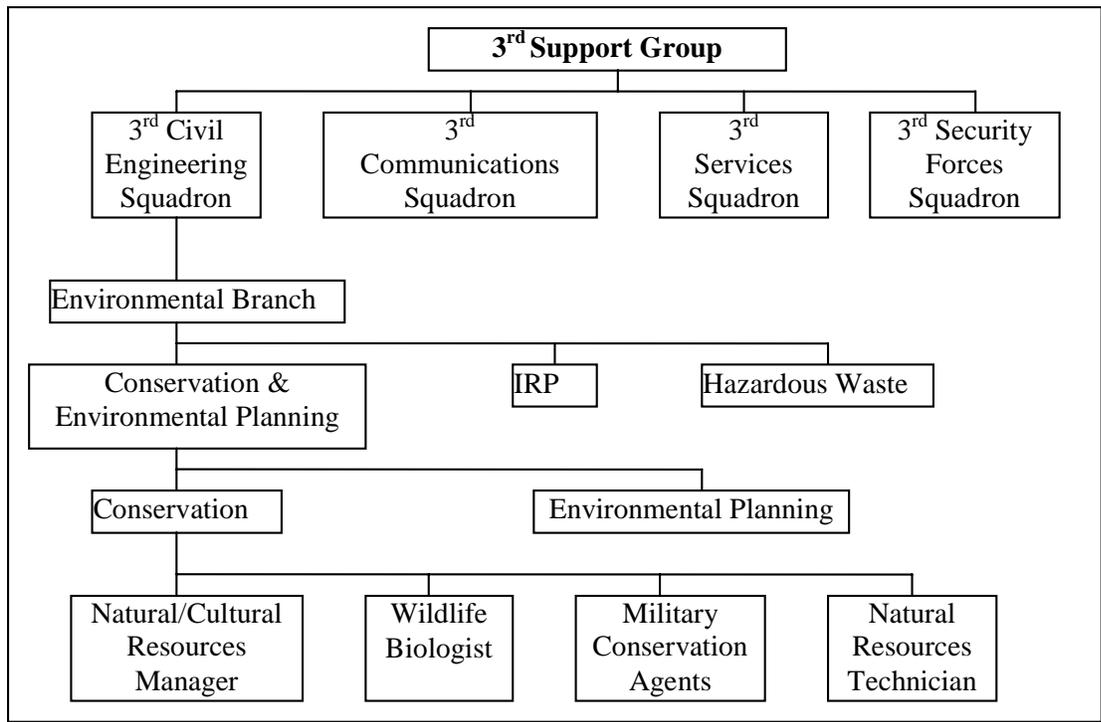
Squadron also assists with wildlife enforcement. Many of the Law Enforcement Officers have received the required wildlife enforcement training and work part time for the Natural Resources Office as Military Conservation Agents (Chapter 12).

Much of the day-to-day natural resources related activities are handled by the Natural Resources side of the Environmental Flight. More information on staffing and responsibilities is included in Chapter 13.

5-3a(6) 3rd Logistics Group

The 3rd Logistics Group Commander is part of the BHWG. Responsibilities toward the BASH program include giving guidance to maintenance personnel and fuels personnel for reporting hazardous bird activity to proper channels and the procedures for the preservation of bird remains found on aircraft during maintenance. Also, the 3rd Logistic Group provides munitions, vehicles and equipment to support the bird dispersal efforts when necessary.

Figure 5-3a. A simplified organizational chart for the 3rd Support Group that emphasizes the Conservation Office of the 3rd Support Group.



5-3b Tenant Organizations

There are several tenant organizations on Elmendorf AFB. These organizations include the 11th Air Force, the 632nd Air Mobility Support Squadron, the 381st Intelligence Squadron, the 611th Air Operations Group, the 611th Air Support Group, and the Utility Aircraft Detachments. All tenant organizations have some responsibilities in supporting the BASH program. The 632nd Air Mobility Support Squadron and the Utility Aircraft Detachments provide a representative on the BHWG.

The Military Conservation Agents have assisted, and may in the future assist, the 11th Air Force's Cultural Resources Manager with cultural resources enforcement issues for various remote properties that the 11th Air Force manages.

5-3c Fort Richardson U.S. Army Alaska

Fort Richardson originally held the land that Elmendorf AFB currently occupies, and is Elmendorf AFB's neighbor to the east. Fort Richardson encompasses approximately 61,000 acres and shares much of the same wildlife and habitat (USARAK 1998). The two installations have maintained close ties and have a number of management activities that are undertaken cooperatively. The most intensive areas of cooperation deal with the management of moose, bears, and Canada geese. Elmendorf AFB utilizes many of the facilities found on Fort Richardson. These include the Malamute Drop Zone and the short field assault aircraft landing strip. In the event of deployment, the Commanding General of Alaska Command serves as supreme commander of all military forces in Alaska.

5-3d Corps of Engineers

The U.S. Army Corps of Engineers (COE), Alaska District, is responsible for issuing wetland permits in accordance with Section 404 of the Clean Water Act.

5-3e Other Federal Agencies

5-3e(1) U.S. Fish and Wildlife Service

In accordance with the Sikes Act, the USFWS is a signatory cooperator in the implementation of this plan. Coordination with USFWS in regard to BASH

has been maintained throughout the planning process. Due to the potential take of dusky goose, a threatened species, during BASH activities, incidental take permits are acquired by the USAF from the USFWS.

5-3e(2) U.S. Bureau of Land Management

The BLM is the Secretary of Interior's authorized delegate for jurisdiction responsibilities regarding vegetative and mineral resources on all lands that were acquired through various PLOs and EOs (approximately 7,727 acres or 58% of the total area). The Secretary of Interior, through BLM, reserves authority to change use and grant various rights with the concurrence of the Air Force so others may use the land for such things as rights-of-way, utility lines, gas, water, electric, cable, TV, sewer, telephone, and fiber optics. The BLM is a signatory and partner in the implementation of this plan in accordance with the Sikes Act (PL 105-85) and the Department of Interior and Related Agencies Appropriations Act of 1991 (para 101-512) as amended. The Alaska Fire Service (AFS) could be utilized in any prescribed fire activities such as planning and/or operations.

5-3e(3) U.S. Environmental Protection Agency

The Environmental Protection Agency (EPA) will be involved in any remedial actions taken to rehabilitate contaminated areas. The EPA also is involved with air and water regulations.

5-3e(4) U.S. Forest Service

The U.S. Forest Service may be called on to provide technical assistance in managing forest resources on Elmendorf AFB. They can provide information and technical advice on forest pests, timber sales, timber management, and wildfires.

5-3e(5) Natural Resources Conservation Service

The Natural Resources Conservation Service can provide technical assistance in identification and conservation of soils.

5-3e(6) National Park Service

As one of the largest landholders in Alaska, the National Parks Service may have some interest in sections of this plan dealing with outdoor recreation and cultural resources. The National Park Service

(NPS) is the lead agency on IAW, Antiquities Act, ARPA, and NAGPRA.

5-3e(7) U.S. Geological Survey

The USGS will support the development of Elmendorf AFB's Geographic Information System (GIS). This federal agency is a good source for remotely-sensing imagery and terrain, hydrology and vegetation data.

5-3e(8) Office of Aircraft Services

The Office of Aircraft Services, Department of Interior, has made both fixed-wing and rotor aircraft available to the military for wildlife surveys. Fort Richardson has used them for surveying for moose and waterfowl. Elmendorf AFB may use them for wildlife surveys if needed.

5-3f State Agencies

5-3f(1) Alaska Department of Fish and Game

As required by the Sikes Act, the ADF&G is a signatory and partner in this plan. It is also the primary state agency for fish and wildlife management at Elmendorf AFB. The base is part of the Cook Inlet Management Area for fisheries, and Game Management Unit 14C for wildlife. The ADF&G has assisted in most areas of fish and wildlife management. Its most active roles are in the fish stocking program, and with moose and BASH management.

5-3f(2) Alaska Department of Natural Resources

Division of Forestry. The Forestry Division of Alaska, Department of Natural Resources, is responsible for fire suppression on all lands, regardless of ownership, in the southern half of the state. Elmendorf AFB, along with Fort Richardson, falls into the Coastal Zone Management Unit. The Forestry Division will be interested in Elmendorf AFB's management programs that deal with fire suppression, forest pest management, general forest management, and forest inventories.

Division of Parks and Outdoor Recreation. The Division of Parks and Outdoor Recreation may be involved with Elmendorf AFB on the issues of public access and how Elmendorf AFB's recreation plans affect tourism within the Anchorage area.

Plant Materials Center. The Plant Materials Center has the skills to assist or advise Elmendorf AFB on any enhancement, rehabilitation, or maintenance of habitats on Elmendorf AFB. The Plant Materials Center, in the past, has grown seedlings from seeds collected on Elmendorf AFB for revegetation projects.

5-3f(3) Alaska Department of Commerce and Economic Development

The ADCED is interested in Elmendorf AFB's role in supporting tourism within the Anchorage area.

5-3f(4) Alaska Department of Environmental Conservation

The Alaska Department of Environmental Conservation (ADEC) is the state's primary agency for regulation of contaminated areas, water quality, and wetlands. Elmendorf AFB will need to coordinate with the ADEC on some of these issues. ADEC also guides and provides help in spills, disposal of hazardous waste and provides Environmental Flight Response.

5-3f(5) Alaska Division of Governmental Coordination

The ADGC acts as a clearinghouse for the review of projects and other actions for the state agencies. This agency also enforces compliance with the Coastal Zone Management Act.

5-3g Municipality of Anchorage

The outdoor recreation program, fisheries, and wildlife management in general will be of interest to the Municipality of Anchorage. Additionally, Elmendorf AFB will need to coordinate with Anchorage, which controls air quality permits, for any planned prescribed burns on Elmendorf AFB.

5-3h Universities

Universities can provide expertise in areas of natural resources management that go beyond what the personnel at Elmendorf AFB can provide. The University of Alaska, in Anchorage and Fairbanks, are the base's closest resources for academic research, and can be easily accessed for technical knowledge. Other universities will be used to assist in research,

information, or for other resources as needed. The Center for Ecological Management of Military Lands (CEMML) at Colorado State University has provided support in the areas of natural resources planning and geographic information systems.

5-3i Private Contractors

As DOD continues to scale back the number of federal employees, private contractors are becoming more important in all facets of base management. Elmendorf AFB will use contractors to answer specific needs that cannot be met by the base's present staff. Such needs could include planning and NEPA documentation, cultural resources surveys, water quality studies or GIS.

5-3j Non-Governmental Organizations

The Air Force has a Memorandum of Understanding with Coastal America. Coastal America has a three-fold purpose:

- (1) to protect, preserve, and restore the nation's coastal ecosystems through existing federal capabilities and authorities
- (2) to collaborate and cooperate in the stewardship of coastal living resources by working together and in partnership with other federal programs
- (3) to provide a framework for action that effectively focuses expertise and resources on jointly

identified problems to produce demonstrable environmental and programmatic results that may serve as models for effective management of coastal living resources (Coastal America 1992)

Conservation groups have often been involved in voicing problems or concerns with management of natural areas. These organizations, although not directly involved with Elmendorf AFB at this time, may in the future have input that Elmendorf will need to address. The following is a list of non-governmental organizations who may become involved.

- ▶ Nature Conservancy
- ▶ Trustees for Alaska
- ▶ Wildlife Federation of Alaska
- ▶ The Wilderness Society
- ▶ Alaska Center for the Environment
- ▶ Alaska Conservation Foundation
- ▶ The Audubon Society
- ▶ National Wildlife Federation
- ▶ Sierra Club



Photo: D.D. Wilcox

6. LAND MANAGEMENT UNITS

6-1 Land Acquisition and Ownership Issues

The area currently known as Elmendorf AFB was acquired by the War Department through Executive Orders (EO), Public Land Orders (PLO), and land bought outright from private landowners and homesteaders from 1939 through 1945 (Appendix C). In 1950, through a General Order, the area was transferred from the Department of the Army to the Air Force and was named Elmendorf AFB. Elmendorf AFB was the original headquarters for the Army before it moved to its present location on Fort Richardson.

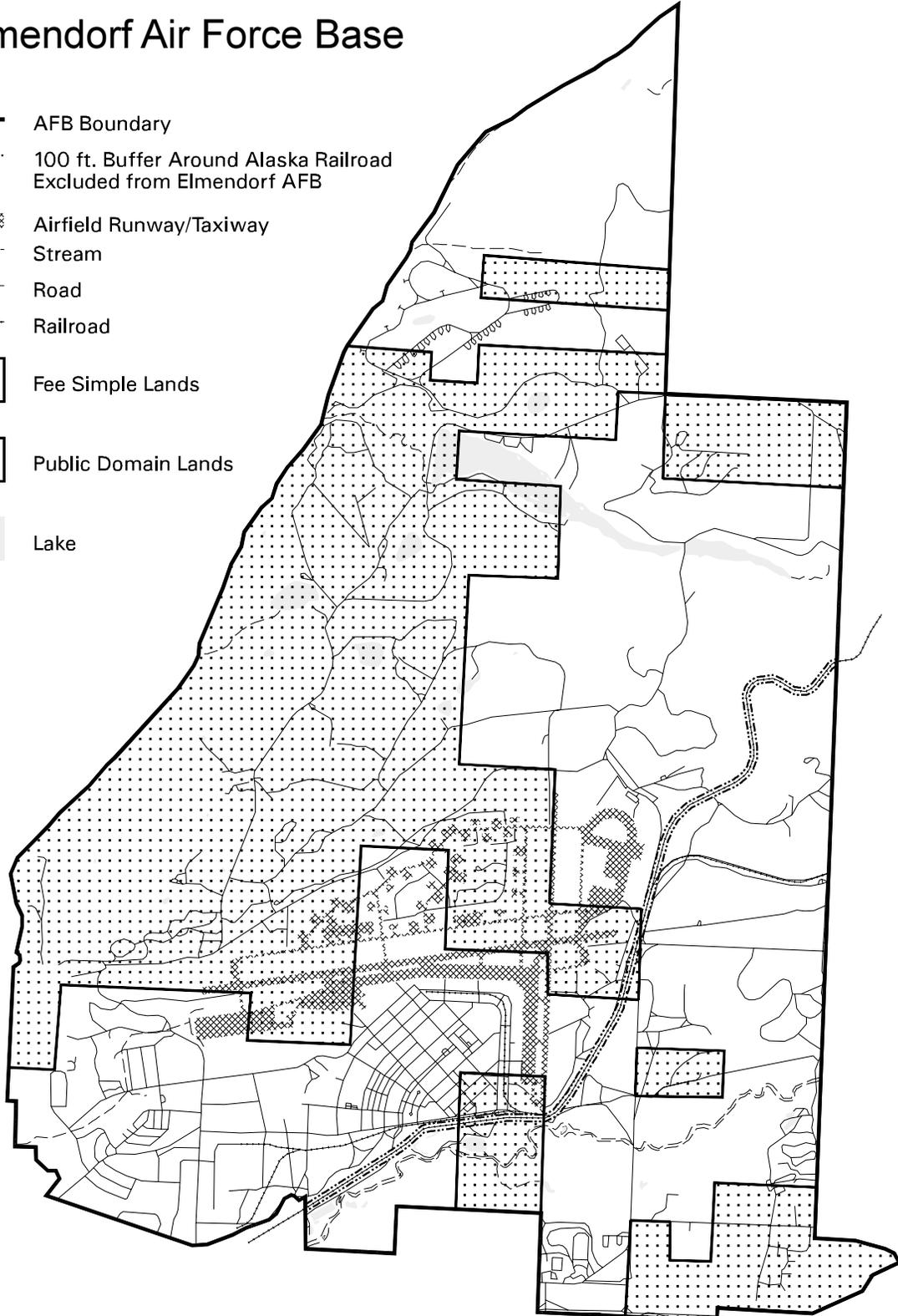
Lands acquired through EOs or PLOs are still public domain lands retained by the Department of Interior under the management of the BLM. Lands acquired from private landowners and homesteaders, or what is called Fee Simple areas are considered the property of the Air Force (Figure 6-1). For details on land acquisition, see Appendix C.

6-2 Management Units

Management units for Elmendorf AFB are based loosely on watersheds with consideration to topography, land use patterns, ownership, roads and physical features. In some cases, compromises and minor adjustments were made to produce a boundary that could be physically found on the ground to make operations and enforcement easier (Figure 6-2). These management units may have areas within them that will require special considerations or unique management activities. Seven management units have been recognized. These units are listed and described in Table 6-2.

Elmendorf Air Force Base

-  AFB Boundary
-  100 ft. Buffer Around Alaska Railroad Excluded from Elmendorf AFB
-  Airfield Runway/Taxiway
-  Stream
-  Road
-  Railroad
-  Fee Simple Lands
-  Public Domain Lands
-  Lake



SCALE 1 : 50,000
 500 0 500 1000 1500 Meters
 2000 0 2000 4000 Feet

Sources:
 Various Public Land Orders

Figure 6-1. Jurisdictional Map for Elmendorf Air Force Base, Alaska.

6-2a Unit 1 or the EOD Watershed

Unit 1, or the EOD watershed, is found in the northern part of the base. It is composed of old growth forest with trees reaching 225 years of age, wetlands, and some shrub areas. Unit 1 is the least disturbed old-growth forest in the Anchorage Bowl, having received little human alterations. The area surrounding Unit 1 was extensively burned during the time the railroad was put in, but Unit 1 was not burned. Unit 1 is an essential travel corridor for wildlife species, most notably, bear and wolf. It is adjacent to Fort Richardson and is next to Eagle River Flats. Access to this area is difficult in that military off-limit areas, such as the EOD range and the munitions storage area, are between the populated area of the base and unit 1. Eagle River Flats Impact Area to the east of unit 1, is also off-limits, and the topography restricts movement into the area from Fort Richardson. Because of the limited ability to access this area, recreational use also is limited. Main recreational use is moose hunting in the fall. The military uses this area as a buffer to protect sensitive activities and facilities such as the munitions storage area and EOD range.

6-2b Unit 2a or Six-Mile West

Unit 2a, or Six-Mile West, is south of unit 1 and surrounds the lower portion of Six-Mile Lake. Vegetation consists of mainly closed young birch and alder stands with a mixture of old growth, shrub lands, and wetlands. This area is a travel corridor for moose, bear (brown and black), and wolf. A small portion is considered as moose calving area. Six-Mile Creek supports salmon runs through June and July during which it is often used by bears. Loons have been observed in the Lower Six-Mile Lake. Access to this area is easy, with numerous maintained unpaved roads and a floatplane landing strip on Lower Six-Mile Lake. This area supports a high degree of recreation use, from boating, fishing, moose hunting, and snowmobile trails. MWR maintains several rental lodges along Six-Mile Lake. The Air Force maintains a munitions storage area, EOD range, and various communication facilities within this management unit. The small arms range is also found within this area.

6-2c Unit 2b or Six-Mile East

Unit 2b, or Six-Mile East, is south of unit 1 and surrounds the upper portion of Six-Mile Lake. Vegetation consists mainly of old growth, closed young birch and alder stands, with a mixture of various shrub lands, and wetlands. The area is a travel corridor for moose, bear, and wolf. Access to this area is open with maintained unpaved roads, hiking trails, cross-country ski trails, ATV trails, and snowmobile trails. Recreational use in this unit is fairly high, including boating, fishing, moose hunting, and snowmobiling. The Air Force has a Mad Bull combat engineer training facility located north of Upper Six-Mile Lake.

6-2d Unit 3 or Kettle Lakes

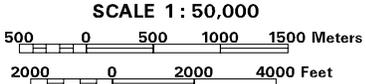
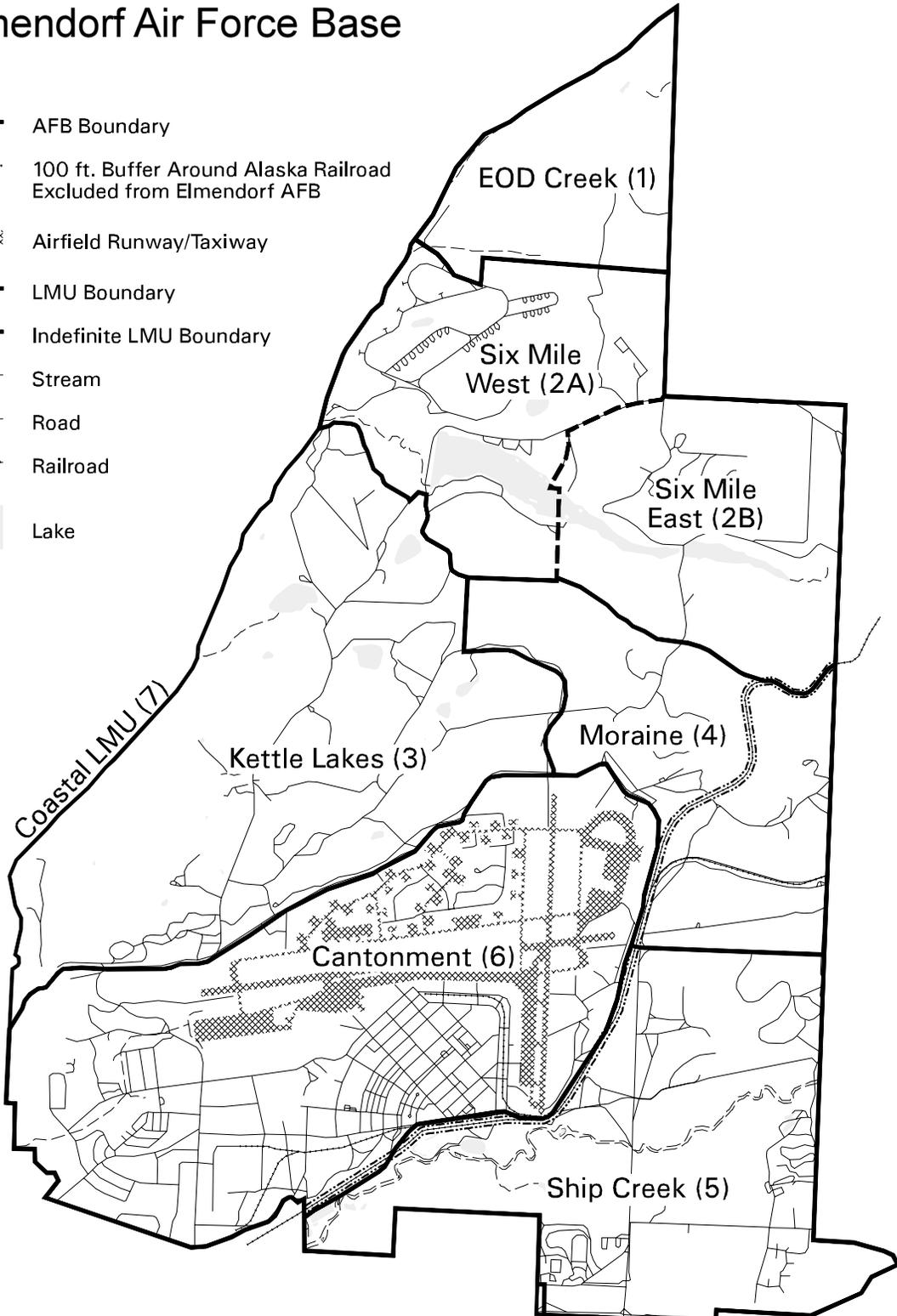
Unit 3, or the Kettle Lakes management unit, is south of the Six-Mile Lake management units and contains the other lakes on base including Spring Lake, Green Lake, Hillberg Lake, Triangle Lake, and Fish Lake. Dominant vegetation types in unit 3 include alder with areas of old growth birch, and wetlands. Again, this area is a travel corridor for bear, moose, and wolf. Moose calving occurs in this area. The area has easy access with several maintained graveled roads and some trails. Unit 3 is used extensively for recreation with fishing being the predominant activity. The MWR maintains several chalets in this area as well as a ski area. The Knik Bluff Trail is a developed hiking trail that offers scenic views of Cook Inlet and the opportunity to view wildlife and cultural resources. The military maintains a large communication center in this area.

6-2e Unit 4 or Moraine

Unit 4, or Moraine, is east of unit 3 and south of unit 2b. The south boundary is the Davis Highway and the north boundary is the ridgeline south of Six-Mile Lake. Vegetation for unit 4 is a mix of alder and birch. Besides being a corridor for bear movement, this area is highly used by moose for browse. Access is easy with several maintained unpaved roads. Unit 4 is used for snowmobiling and other ATV activities. Moose hunting is also allowed in this area. Clearing of trees and brush is occurring

Elmendorf Air Force Base

- AFB Boundary
- · - · - 100 ft. Buffer Around Alaska Railroad Excluded from Elmendorf AFB
- ▨ Airfield Runway/Taxiway
- LMU Boundary
- - - Indefinite LMU Boundary
- - - Stream
- Road
- · - · - Railroad
- Lake



Sources:
Sample Source, 1999

Figure 6-2. Land Management Units Designations at Elmendorf Air Force Base, Alaska.

Table 6-2. Descriptions of Management Units, Including Watersheds, Ownership, Acres and Main Uses.

Area #	Description	Watershed	Ownership/ Jurisdiction	Acres (est.)	Main Use
1	EOD Creek	EOD Creek	BLM – 100%	779	Natural Area
2a	Six Mile West	Six-Mile Creek	AF – 65% BLM – 35%	1,373	Recreation, Military Use
2b	Six Mile East	Six-Mile Creek	BLM – 76% AF – 24%	1,289	Recreation, Wildlife Habitat
3	Kettle Lakes	Kettle Lakes	AF – 92% BLM – 8%	2,917	Recreation, Wildlife Habitat
4	Moraine	Ship Creek	BLM – 99% AF – 1%	1,428	Woodlot, Wildlife Habitat
5	Ship Creek	Ship Creek	BLM – 68% AF – 32%	2,183	Hospital & Housing, Golf Course
6	Main Cantonment Area	Cherry Hill Ditch & Ship Creek	BLM – 70% AF – 30%	3,348	Airfield & Main Base
7	Coastal	EOD, Six-Mile, & Ship Creek	State – 50% AF – 50%	130	Recreation, & Wildlife Habitat

near the edges of this unit where it joins with unit 6, due to safety considerations for the flightlines. Some development is occurring north of Davis Highway.

6-2f Unit 5 or Ship Creek

Unit 5, or Ship Creek management unit, is located south of unit 4 and southeast of unit 6. This management unit is slowly being developed. Birch and alder, with some aspen and white spruce, dominate undeveloped areas. Access to this area is easy with several paved and unpaved roads. The fish hatchery, located near Ship Creek and run by ADF&G, provides the fish that are used to stock many of the base's lakes. Moose and bear are often seen in this management unit, along with beaver and fox. Moose use this area heavily in the winter. Although this area has portions developed or cleared of natural vegetation, it remains a heavily used movement corridor for wildlife. Wildlife are often seen along the golf course and the bluff area, which are fully developed and have a lot of human activity. The high density of people and wildlife often leads to a high number of wildlife conflicts in this management unit.

Conflicts include moose or bear confrontation with humans, beaver and fox interfering with facilities, moose killed by vehicle collisions (car, trains, etc.) and other similar conflicts. Recreational activities included in this management unit are golf, camping (RV), fishing, and boating. Most of the military activities in this area consist of the supporting facilities, such as the hospital complex, munitions storage area, housing, and other support buildings and facilities.

6-2g Unit 6 or Main Cantonment Area

Unit 6 is the main cantonment area, which is mostly developed, having little wildland remaining. The pockets of wildland remaining are important in reducing human/animal conflicts by giving wildlife a safe place to retreat. The loss of these pockets near in-flight and 90th, as well as extending the clear zones, has the potential for increasing conflicts. The airfield, supporting buildings, housing and recreation areas dominate the unit. It is not uncommon for wildlife to be seen in this area. Conflicts with

wildlife are common and policies have been created to reduce conflicts and set precedents for handling conflicts when they occur.

6-2h Unit 7 or Coastal Mudflats

Unit 7, or the Coastal Mudflats unit, is a long narrow area that follows the coast. Beach area that is below the mean tide is state land, which leaves approximately 150 acres of shoreline that is managed by Elmendorf AFB. This unit was created because management in this area is different from other areas and is under specific regulations including the Marine Protection, Research and Sanctuaries Act, the Coastal Zone Management Act, the Marine Mammal Protection Act of 1972, and the Rivers and Harbors Act of 1899. Additionally, the Air Force Instruction 32-7064 directs bases with coastal or marine properties to enter into an agreement with the Coastal America National Implement Team to coordinate and cooperate in the restoration and protection of coastal areas. Vegetation is limited with the ground being heavily graveled in some areas and extremely muddy in others. This area is the least disturbed of the land management units and is a critical travel corridor for many wildlife species. Bears often come down to feed during salmon runs at the

mouth of Six-Mile Creek. Beluga and killer whales are often sighted off shore especially during the salmon runs. A variety of birds use the gravel along the shore for nesting. Access can be gained through the EOD Creek, Six-Mile Creek and at Cherry Hill ditch. Conservation officers and others often use this area for ATV use; however, ATV use is discouraged in this area because of the strong and fast moving tides. Fishing at the mouth of EOD Creek and Six-Mile Creek occurs during salmon season.

6-3 Special Interest Areas

There are some areas within the above management units that will need to be recognized as special interest areas to protect these areas and set them apart from normal management practices occurring in the unit. These areas are: (1) EOD Creek (Unit 1), (2) Six-Mile Lake System (Units 2a, and 2b), (3) Ship Creek Riparian Zone (Units 5), (4) other riparian areas of interest, (5) Hillberg/Green Lake Recreation Area (Unit 3), and (6) other determined areas. These areas and their management are discussed in 7-5.



Photo: D.D. Wilcox

7. PROTECTION AND DAMAGE MANAGEMENT

Preventing environmental damage is easier and less costly than trying to restore a degraded environment. Many problems can be prevented or lessened with a little effort before the problem escalates. Total protection is not the aim here, but the ability to foresee potential problems and minimize them with preemptive measures.

7-1 Wildfires

Wildfire potential does exist, but wildfires are rarely a significant problem. High wildfire potential conditions, caused by severe drought, occur about once every 20 years (USARAK 1998). A few fires occur at Elmendorf AFB and Fort Richardson each year; however, in most cases these fires are small and easily suppressed.

7-1a Wildfire Prevention

The main causes of fires are military activities, railroad, and recreation. Much of the military activity occurring on Elmendorf AFB in the wildland areas is non-combustible. Military activities on the airfield and other built-up areas will follow guidelines and procedures that are in place to prevent fires from occurring. Fort Richardson, which has a few fires that start from tracer rounds and pyrotechnics fired from ranges, has an active fire prevention program that is followed. This program stipulates that the Fire Department at Fort Richardson takes weather readings twice daily during fire season (June-September). This information is then used to calculate a Fine Fuel Moisture Content (FFMC), which is forwarded to Fort

Richardson's Range Control. Based on the FPMC, Range Control then restricts types of ammunition and pyrotechnics allowed when fire danger is deemed high. Elmendorf AFB maintains a weather information station at the Madbull training facility, whose data also is used to determine fire potential. Additionally, the Alaska Department of Forestry also distributes a fire danger rating for the area.

The other potential sources of wildfires are recreational activities. During times of high fire danger, all fires are restricted to designated fire pits or barbecue areas found mostly around Green Lake, Lower Six-Mile Lake, and the family camp area. At other times, such as during the winter, campfires are not restricted due to the low danger of wildfire. Fires caused by catalytic converters from some vehicles are occasionally a problem. Off-road restrictions, which are described in Section 11-5, will reduce the potential of fires from off-road vehicles.

Trains have started fires as they travel along the track. These fires have been small and easily controlled. The railroad has reduced vegetation around the tracks to reduce the fire's rate of spread should a fire occur.

Increasing fuel loads on Elmendorf AFB is a concern and could lead to large fires, which would be difficult to control. In some areas, dead and dying timber and a build-up of understory and associated litter, has increased the wildfire potential. The Natural Resources Office will check into getting a fuel assessment and map done by the Alaska Fire Service. Timber harvesting or prescribed burns can help reduce the fuel load. Timber harvesting is discussed in Chapter 9 under vegetation management. Planned burns are difficult to organize. The prescribed burning window (which occurs between loss of snow cover and green-up) is very narrow and, in some years, does not occur. Additionally, air quality permits must be obtained from the Municipality of Anchorage that limit when prescribed burns can occur to certain days based on air quality. If these days of clear air quality do not occur within the prescribed burning window, or the area is too wet during this time, a prescribed burn cannot be implemented. Prescribed burns also are discussed in Chapter 9 under vegetation management.

7-1b Wildfire Suppression

According to O-Plan 93-2, fire suppression responsibility lies with the Elmendorf AFB Fire Department. If the fire exceeds the capabilities of the base fire department, the fire chief or senior fire official has the authority to initiate the mutual aid agreement with Fort Richardson or other area fire departments. Fort Richardson Fire Department and some Army personnel are specially trained in fighting forest fires, and can be dispatched to provide suppression assistance. The Alaska Department of Forestry also may be called to assist in fire suppression activities, as they have wildfire suppression responsibilities for all areas in the southern part of the state regardless of ownership.

Elmendorf AFB Fire Department maintains fire fighting equipment including portable pumps, hoses, shovels, chainsaws, water tanks with pumps, pulaskis, hoes, rakes, brush kits, Indian packs, and swatters. Firebreaks have not been created on Elmendorf AFB. The many wetland areas, major roads, military facilities, and Cook Inlet will help minimize fire spread of most wildfires.

7-2 Soil Conservation

Soil is damaged through compaction and erosion. Compaction is not a concern on Elmendorf AFB for the most part since most traffic (foot or vehicle) is limited to roads and trails. Erosion is a much bigger concern, especially in connection with roads and disturbed stream banks.

During road maintenance, efforts will be made to correct drainage problems that may lead to erosion along roads. Stream banks will be taken on a case-by-case basis. Banks that show signs of sloughing will be high priority for bank stabilization through creation of bulkheads or revegetation efforts.

An Erosion Control Work Plan will be developed to identify and evaluate sites in need of erosion control on Elmendorf AFB and strategies to repair them. The plan also will include methodologies, techniques, equipment and personnel requirements, area location and sizes (GIS mapping), time schedules, and budget estimates. It also will include the roles

and responsibilities of all partner agencies and/or groups participating in those activities.

7-3 Water Quality

Water quality reflects environmental pollution, including erosion. Maintaining clean water is an important objective of this INRMP and a critical part of ecosystem management. Pollution of water from sources other than erosion is tracked and managed by the Environmental Branch.

Drinking water is provided to Elmendorf AFB by Fort Richardson (USARAK). The Fort Richardson water treatment plant draws surface water from Ship Creek and filters and treats the water before delivering it to Elmendorf AFB through four water mains (Pacific Air Forces 1998). To maintain the water quality Fort Richardson restricts development along Ship Creek, and training is restricted in the vicinity of both Ship Creek and the north fork of Campbell Creek (USARAK 1998). Fort Richardson's Land Rehabilitation and Maintenance (LRAM) program is used to prevent problems with water quality.

7-4 Wetlands and Riparian Areas

Description of wetlands/riparian areas can be found in Sections 4-1b(3) and 4-1d(3). Wetland/riparian management is discussed in Sections 9-3 and 9-4.

Wetlands/riparian areas are protected at Elmendorf AFB through compliance with all regulatory requirements. Under AFI 32-7064, the Air Force is instructed to comply with all federal and state regulatory requirements, as well as to inventory and monitor wetlands. Federal regulations include Executive Order 11900, which stipulates that "*federal agencies shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities.*" Additionally, DOD Instruction 4715.3 states that "*DOD operations and activities shall avoid the net loss of size, function, or value of wetlands. Additionally, the DOD will preserve the natural and beneficial values of wetlands in carrying out its activities. The development of mitigation 'banks' is encouraged as sound conservation planning.*" Other regulations regarding

protection of wetlands include Section 10 of the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act, and U.S. Army Corps of Engineers (COE) regulations 33 CRF Parts 320-220. State regulations include 18 AAC 70 Alaska Water Quality Standards permits issued by the State of Alaska Department of Environmental Conservation (ADEC). The State of Alaska Department of Natural Resources, Division of Land requires a land use permit when any activity occurs near or on state lands or stream beds under AS 38.05.850.

Any impact to wetland/riparian areas due to building of structures, roads, or trails or habitat modification will go through the NEPA process so that the impacts are properly evaluated and mitigated for as needed.

Natural resources staff will monitor recreational use of wetland and riparian areas. Changes to recreational use will occur if there are signs of degradation occurring at these sites.

7-5 Special Interest and Protected Areas

7-5a EOD Creek Natural Area

The Munitions and EOD areas to the south and Eagle River Flats marsh to the east effectively isolate the EOD Creek area composed of approximately 1200 acres. Only one road enters the area and it is not suitable for large vehicles. Most of the acreage is under the jurisdiction of BLM. Currently, only authorized personnel such as work parties and munitions personnel are allowed in this area, with the exception of a handful of moose hunters during the September season. The 1982 Resource Inventory made the following comments concerning this area: "*This area presently supports a unique, 200-250-year-old, old-growth mixed forest which is probably the least disturbed piece of forest land left in the Anchorage area. It is perhaps the last vestige of this vegetation type which covered much of the Anchorage area prior to arrival and subsequent disturbance by white men.*"

In addition to the unique nature of the forest community, this area has numerous wetlands and two streams, EOD Creek, and Six-Mile Creek, which is

the southern boundary. It is also critical wildlife habitat. Additionally, the area is a critical travel corridor for brown bears and wolves in summertime, and is close to wolf denning and rendezvous areas on Fort Richardson. Both black and brown bears and bald eagles heavily use its anadromous streams and saltwater shoreline. It is a population center for spruce grouse, and has an eagle nest near the mouth of EOD Creek that is sporadically active.

It is probably too far north of the traditional moose winter ranges on the base to make moose habitat improvement effective, and there are enough other areas on the base in need of silvicultural work that it should not be necessary here. Due to the anadromous stream buffer areas and extensive wetlands, only about 500 acres would be available for logging. Current market conditions and the need to improve access roads would make logging uneconomical. Motorized access should be restricted to work vehicles only, with the possible exception of fall moose hunters, whose time frames and numbers are limited enough to cause little impact.

This area will have limited access and could be designated as a Research Natural Resource Area (a state and federal land management agencies program). Its location, facing a similar protected area (Eagle River Flats) on Fort Richardson, would effectively double the size of the protected area, and protect critical travel corridors, wildlife habitat, and a unique vegetation type.

7-5b Ship Creek Riparian Zone

Ship Creek riparian areas run through both undeveloped and developed lands on the south side of the installation. Ship Creek is an anadromous stream, and because of its location and importance in maintaining drinking water quality, is of highest priority. It is also a wildlife travel corridor connecting Elmendorf AFB with Fort Richardson and Arctic Valley, and is heavily used by bears in the summer and wolves in the winter. Recreational facilities include the MWR Campground Overflow Area as well as the Eagleleglen golf course. Current management concerns include water quality, soil and bank erosion in the golf course area, and protection of wildlife habitat and salmon spawning areas. A possible future concern is the removal of an upstream dam



Photo: Staff

Ship Creek Riparian Zone

on Fort Richardson. This removal would increase water flow and allow salmon to spawn the length of the creek on Elmendorf AFB.

7-5c Other Riparian Areas and Wetlands

Other riparian areas on base include Six-Mile Creek, EOD Creek, and the unnamed creek that connects Green Lake to Cook Inlet. Wetlands are interspersed throughout the base. These areas are protected by limited access. No motorized vehicles are allowed, and logging is limited to selective cutting in the wintertime.

7-5d Six-Mile Lake System

The Six-Mile Lake system is a critical biological and recreational resource on Elmendorf AFB. It is an anadromous system, with large numbers of salmon migrating to Upper Six-Mile Lake each year

to spawn. A Watchable Wildlife salmon spawning area is located at the head of Six-Mile Creek, and interpretive sites are planned for Upper Six-Mile Lake as well. It appears to be a very productive system biologically, and is managed as a trophy trout fishery, with rainbow trout to 27" present in the system. It is also home to beaver, loons, grebes, and numerous other types of waterfowl. Bald eagles are regularly seen here. From a recreation standpoint, numerous lodges and chalets dot the shores of Lower Six-Mile Lake, and canoeing and boating (10 horsepower limit) are popular in the summer time. Lower Six-Mile is also home to the Elmendorf AFB floatplane base in the summer, and ice fishing and snowmobiling on the ice are popular in the winter.

Current management concerns include fuel leakage and spills from floatplanes, the possibility of a railroad spur being built on the south shore, and significant problems with salmon poaching during the summer.

7-5e Green Lake/Hillberg Lake Recreation Areas

These recreation areas are managed primarily by MWR, with some assistance from the Natural Re-

sources Office. Green Lake has two active chalets, both of which are historical sites. Fishing and canoeing are popular in the summer, and ice fishing and snowmobile races in the winter. The north trailhead for Knik Bluff Trail is here, and a one-mile loop trail is being developed as a nature trail. A small picnic area is found on the north side. This area is primarily used by Boy and Girl Scout groups. Future plans include development of a primitive type campground on the west shore. Wildlife resources include an active bald eagle nest, loons, and an active beaver colony.

Hillberg Lake Recreation Area is located directly across the road from Green Lake. It is the home of the Hillberg Area, with a large chalet and two ski lifts. It also has a cross-country ski trail (maintained by MWR) and is a major trailhead for the snowmobile trail system. Hillberg Lake is stocked annually and is a popular summer fishing spot for families. Management efforts for these two areas focus on development of further recreational facilities and maintenance of current ones.

*Photo: Staff*

8. INVENTORY/MONITORING AND RESEARCH

8-1 Introduction

8-1a Importance of Inventory and Monitoring Programs

Inventory and monitoring programs are an important component of ecosystem management. They lie at the heart of the concept of adaptive management, and provide much of the information in the “feedback loop” that is used to make decisions about and modify management practices. There are a number of different types of monitoring including baseline monitoring, trend monitoring, and effectiveness monitoring.

Baseline monitoring is usually some type of initial inventory of resources. Monitoring in general, and trend monitoring in particular, is thought of as periodic checks of a resource or community, which is then compared with some standard in order to determine trends. Effectiveness monitoring is designed to provide direct feedback about specific management issues or programs. All three types of monitoring listed here will be used in Elmendorf AFB’s inventory and monitoring program.

8-1b Monitoring Priorities

Monitoring priorities should be established based on the criteria listed below (Leslie et al. 1996).

- ▶ Biological rarity

- ▶ Evidence of decline
- ▶ Immediacy of threats
- ▶ Actively managed populations
- ▶ Invasiveness
- ▶ Importance of a species or community across its range

Additionally, monitoring priorities must also consider cost and practicality of monitoring methods and whether the species selected to be monitored will be directly affected by the management activities proposed.

With all the above in mind, monitoring at Elmendorf AFB will focus on:

- ▶ Long-term changes to ecosystems
- ▶ Forest health
- ▶ Management indicator species trends
- ▶ Management activities and their effects on the ecosystem
- ▶ Water and air quality
- ▶ Quality and quantity of habitat
- ▶ Mitigation

8-1c Objectives

- (1) Inventory Elmendorf AFB's natural resources, including soils, flora, and fauna, to provide baseline information on ecosystem integrity and health, status of renewable resources, and status of threatened or sensitive species or communities.
- (2) Provide the means to implement adaptive management by providing both current information and predictions (based on trend analysis) concerning natural resources status and future management strategies.
- (3) Ensure that monitoring is done in a scientific fashion, with measurable pre and post treatment results and experimental controls.

8-1d General Biological Inventory

An extensive biological inventory of Elmendorf AFB was conducted by the USFWS from 1 March, 1982 to 30 Sept, 1983 (Rothe et al. 1983). This survey included a complete vegetation resource inventory, floristics, and a complete inventory of birds, mammals, fish, and amphibians. Details from each of these areas will be discussed in their respective sections below.

8-2 Inventory And Monitoring of Soils And Flora

8-2a Soils

As mentioned in Chapter 3, Anchorage area soils were mapped in 1979 by the U.S. Soil Conservation Service for the Corps of Engineers as part of the Metropolitan Anchorage Urban Study. The original survey was incomplete, as only the portion of the installation north of the Elmendorf Moraine was mapped. Soils were re-inventoried by the Natural Resources Conservation Service in 1997, and details of that survey may be found in their interim report (Wikgren 1997). In general, the soils of Elmendorf AFB and the surrounding area are dominated by three types of unconsolidated deposits based on grain size, sorting, permeability, and depositional method. Details may be found in the respective soil survey reports.

8-2b Wetlands

8-2b(1) Wetlands Inventory

Wetlands were classified and mapped in 1979 by the USFWS National Wetlands Inventory (NWI) team. At that time, Elmendorf AFB had 428 acres of palustrine wetlands, including open water, aquatic bed, emergent, shrub-scrub, and forested types. Many of these wetlands were small (less than 1 acre) and could not be mapped at the standard scales. There were also 103 acres of lacustrine and 878 acres of estuarine (intertidal) wetlands.

Wetlands were re-inventoried in 1995, again by USFWS's NWI team, as part of an Air Force-wide contract to re-delineate wetlands. Plots were located

and locations documented by Global Positioning System (GPS). Plots were classified using Classification of Wetlands (FWS/OBS-79/31, December 1979). A report and map were produced and forwarded to the installation. This re-survey found a total of 1534 acres of wetlands, including all the types previously noted, but also including larger areas of forested wetlands, primarily black spruce bogs, than the original survey.

In addition to wetland inventories, riparian area and buffer zone inventories may be needed. Such inventories would complement existing inventories and, if done, should use procedures consistent with such inventories on non-Air Force public lands.

8-2b(2) Wetlands Monitoring

Wetlands will be re-inventoried every 10 years, funding permitting.

8-2c Flora

8-2c(1) Inventory

An extensive initial survey of Elmendorf AFB vegetation and vegetation types was conducted as part of the 1982-1983 biological survey. Vegetation types were mapped from aerial photography and were then ground-truthed. Sample plots were established, and all trees, shrubs, and herbs found were identified. Plant cover and abundance were described, and physical characteristics of the site such as site and soil moisture, presence and depth of peat and organic layers, presence of fire scars, and level of disturbance were recorded by written and photographic record. A low intensity timber survey was also conducted as part of this survey. All photos, data, and collected material are on file at the USFWS Herbarium in Anchorage. A vegetation map and report were produced describing vegetation types, trends, and vegetation analysis. A somewhat improved version of the vegetation map is included in this plan (See Figure 4-1b).

A re-inventory of vegetation was initiated in 1999 [See Section 8-2c(2)], with the results expected in 2000. This inventory will include establishment of permanent plots. This new inventory should provide additional baseline data and reflect the changes which have occurred since the 1983 inventory, in-

cluding vegetation trends, under/overstory changes, effects of the bark beetle infestation, etc.

8-2c(2) Monitoring

A re-survey of plant vegetation was contracted to the Alaska Natural Heritage Program in 1999. Rather than conducting a complete re-survey, the intent of this project was to establish a long-term plot system to monitor vegetation changes and to conduct the initial collection of data from these plots. 30 plots will be established, three in each of the 10 vegetation types of over 300 acres. Establishment and characterization of these plots will include a botanical inventory, the collection of satellite plot data, and micro-plot data on trees, shrubs, moss, lichens, and graminoids. Tree mortality information will also be collected. Each site will be located by GPS, permanently marked, and site conditions recorded by written and photographic record.

These permanent plots will be re-sampled at varied intervals, depending on what is being sampled. The intent is to provide clear information and trends in vegetation changes over time in response to succession, bark beetle and other forest health problems, fire, man-caused disturbance, status of old growth components, and climate changes. This permanent plot system will also serve as the basis for a future wildlife plot sampling system that will include breeding bird surveys, moose browse surveys, microtine or small mammal surveys, and possibly snowshoe hare pellet counts. A future survey of rare plants will also be based on this plot system.

8-3 Inventory and Monitoring of Fauna

8-3a General Inventory of Fauna

The 1982-83 biological survey conducted field sampling for birds, mammals, and fish, and their habitat. The final biological survey report (Rothe et al. 1983) described Elmendorf AFB's natural resources, survey methods and results of analysis, and made specific management recommendations. The following methods were used and information obtained.

8-3a(1) Birds

Plots and driving transects were used for terrestrial bird census. Waterbird and shorebird nesting surveys were conducted. No formal raptor survey was conducted, however. A bird species list was completed and bird species richness was calculated for four common cover types. This data did not address migratory periods as the field work was completed during two summers only. Further details on methods can be found in the Inventory Report (Rothe et al. 1983). Copies are found at the Natural Resources Office as well as the USFWS's Anchorage office.

8-3a(2) Mammals

Small mammals were sampled, and canid presence checked using scent-baited stations. Moose habitat plots were sampled, and browse quantity and quality was assessed. No formal inventory of larger mammals was done, but a species list was developed. Further details may be found in the Inventory Report (Rothe et al. 1983).

8-3a(3) Fish

Lake mapping was conducted, and temperature and oxygen levels were checked. Lakes were surveyed, as well as some streams, and described in detail in the final report. Lakes and streams were sampled, and fish identified, measured, and scale-sampled. Fish population sizes were estimated and a fish species list developed. Finally, a limited survey of angler success was conducted.

8-3b Selection of Species to be Monitored (Management Indicator Species)

The concept of using selected indicator species as overall indicators of ecosystem health and integrity is an accepted and established technique, and has been used by many agencies, including the U. S. Forest Service. The Forest Service selects Management Indicator Species (MIS) based on the criteria below.

- ▶ Ecological indicators including sensitivity to successional stages and to man's impacts on the system

- ▶ Endangered or threatened species on federal or state lists
- ▶ Species with special habitat needs that may be affected by proposed management activities
- ▶ Species commonly hunted or trapped, or of economic importance to man

In selecting indicator species for Elmendorf AFB, the basic Forest Service process was used as an example. It was then expanded and modified somewhat to reflect the much smaller scale and different policies and management activities on a military base. Eight to ten species are considered optimum in terms of a combination of adequate coverage and economics (Sidle and Suring 1986). Species were not selected through numerical analysis, but subjectively, with the following criteria used in weighing selections:

- ▶ Broad range of ecosystems and successional stages represented
- ▶ Species importance within its ecosystem (keystone species)
- ▶ Current status as featured species
- ▶ Listed as Endangered, Threatened, or Species of Concern at federal or state level
- ▶ Economic and social importance to man
- ▶ Sensitivity to disturbance and management activities
- ▶ Is management and habitat under our control?
- ▶ Species associated with specific management activities
- ▶ Species can be monitored with the manpower and funds likely to be available

The species shown in Table 8-3b were considered, and the species indicated were selected to serve as management indicator species for Elmendorf AFB.

Table 8-3b. Species Considered/Selected for Management Indicators Species.

Ecosystem/Habitat Type	Species considered	Species Selected
Forested Early Succession	Snowshoe hare, moose, lynx, wolf, moose	Snowshoe hare, moose
Forested Late Succession	Black bear, brown bear, lynx, Townsend's warbler, three-toed woodpecker, spruce grouse, bald eagle, northern goshawk	Black bear, Townsend's warbler, northern goshawk
Riparian/Wetlands	Beaver, wood frog, passerines	Beaver, selected passerines
Aquatic	Sockeye and pink salmon, rainbow trout, common/arctic loon, beluga whale, sculpin	Lakes: Sockeye salmon, common/arctic loon, Streams: Macro-invertebrates

Moose, beaver, black bear, and sockeye salmon were selected largely on the basis of their importance to the ecosystem (keystone species) or to man (e.g. economic, wildlife conflict issues) and their sensitivity to management activities currently underway.

Goshawks, loons, and Townsend's warbler were selected due to regionally decreasing populations, listings as sensitive species, or utility as indicators of ecological integrity. Snowshoe hare was selected due to its close relationship with lynx, as well as other furbearers, and its ease of monitoring.

8-3c Monitoring of Management Indicator Species (MIS) and Other Selected Species

8-3c(1) Moose

The Elmendorf AFB moose population is aerially surveyed each fall after the hunting season as part of the Fort Richardson moose herd census conducted by Fort Richardson natural resources staff in conjunction with the ADF&G. Annual surveys of this herd, whose range includes Fort Richardson, Elmendorf AFB, and Ship Creek, have been conducted since the 1960s. Written reports in the form of data summaries and Memoranda of Record dating back to the early 1980s are available in the Fort Richardson Natural Resources Office. Surveys are

divided into 14 sub-units, with 2 sub-units comprising Elmendorf AFB. Data taken by aircraft observers includes bulls by size (small/medium/large), cows with calves, and cows without calves. Observed numbers are adjusted using Sightability Correction Factors supplied by ADF&G, and data analysis follows procedures described in Gasaway (1986). Bull:cow and calf: cow ratios are calculated. These two ratios are excellent indicators of overall herd health and productivity, as well as response to management activities. This information is then used to modify management activities and establish seasons and harvest levels. In addition to fall surveys other periodic monitoring will be investigated to evaluate use patterns, this is because fall surveys do not provide data on crucial winter distribution. Since this moose herd has a great deal of seasonal movement, data for Elmendorf AFB versus Fort Richardson is not currently calculated. Moose harvest statistics for the two bases are kept separately, and are found in files at the Natural Resources Office.

Little information exists on locations of critical winter habitat, and moose habitat quality is not currently monitored, at least quantitatively. This is an area for possible improvement. One possibility would be to monitor browse use of preferred species such as willow. The percentage of willow leaders browsed

in a given area is one measure of moose numbers in relation to carrying capacity. Such a survey could be easily implemented in conjunction with the long-term vegetation survey, using the existing permanent plots or basing a new plot grid on the permanent plot grid. Fort Richardson has begun a program involving GIS analysis and modeling of moose habitat. The Elmendorf AFB Natural Resources Office will consider whether to participate in this process.

8-3c(2) Black Bear

Black bears as a species are difficult to monitor. Possibilities for monitoring include scent stations, photographic scent stations, mark and recapture using traps to capture and dogs or camera scent stations for recapture, and track counts. Levels of nuisance bear activity cannot be used as a reliable indicator of bear populations, as many other factors such as natural food availability or habituation levels of bears can have an effect on nuisance bear activity levels. The bear study report completed in 1997 recommended that several types of monitoring be conducted as a check against inaccurate censuses. Currently, Elmendorf AFB's Natural Resources Office monitors both nuisance bear activity and bear sightings on base. Annual numbers of sightings are used as rough indicators of bear population trends. This can be supplemented by selected den checks of radio-collared females during the winter to determine number of cubs, sex ratios, etc. This method, however, would require a long-term commitment of 10 or more years to provide meaningful data. One possibility for future consideration would be mark-recapture calculations using camera scent stations. Since the number of collared bears at any given time is known, a ratio can be set up and calculations can be easily performed using the Lincoln-Peterson estimator.

Bear habitat also is difficult to monitor. However, bears generally do well in diverse habitats. Level of forest diversity may provide one index of bear population status. Other possibilities include monitoring food sources such as berry production levels or salmon and moose calf production. Information from the bear food habits and habitat study being done in the Anchorage Bowl by University of Alaska, An-

chorage (UAA) could also be very useful in this regard.

8-3c(3) Beaver

Beaver are censused every two to three years through inventory of caches and lodges. This survey is conducted in the fall, and is usually conducted from the air with supplemental ground checks, but it can be conducted entirely by foot. Once lodges are counted, an estimated number of beaver per lodge is applied to get an overall population estimate (Sinnott 1995a). Beaver harvest statistics can also be used as a rough trend indicator of population levels from year to year. This data is available through the Anchorage office of ADF&G.

8-3c(4) Lynx/Snowshoe Hare

Lynx and snowshoe hare are not currently inventoried. Lynx may be inventoried through use of track counts, track plates, or camera bait stations (Zielinski 1995). Snowshoe hares can be inventoried through track counts or pellet counts. A common practice is to conduct both types of inventories for snowshoe hare, and to use inventories for snowshoe hare levels to support, or even replace, lynx population censuses. A winter lynx/furbearer census project has been submitted for funding. This project would provide baseline data on species such as hare, lynx, martin, etc. A second possibility is to conduct winter track counts using volunteers. Procedures are detailed in Golden (1993).

Future permanent-plot or transect sampling of snowshoe hare pellets should be accomplished. Snowshoe hare populations are known to be cyclical and most directly affect lynx populations, but are also known to affect populations of other furbearers such as coyotes and foxes. Snowshoe hare are closely tied to early forest successional stages and can also serve as an ecological indicator in this respect.

8-3c(5) Loons

Common and arctic loons are visually monitored each year, including nesting success. However, little written data exists. A more formal monitoring process using ADF&G loon survey methods will be implemented.

8-3c(6) Raptors

Eagles. Bald eagles are monitored each summer, and conservation agents and field crews report nest locations to the Natural Resources Office. No information on nesting success rates is available, and little written data exists. A database of known active and inactive nesting sites is being developed.

Other Raptors. Other raptors will be inventoried as part of a funded contract. This will provide baseline data on raptor populations that is currently unavailable.

8-3c(7) Geese

Fall counts of feeding Canada geese on Elmendorf AFB have been conducted since 1989. Beginning in 1995, spring counts were conducted as well. These counts are used both as a rough population trend estimate and in terms of response to management activities. Since 1995, considerable data has been compiled concerning geese, dispersal, and goose habitat and taste test experimentation. Dispersal data is in the process of being analyzed by base natural resources staff to determine movement patterns and response to various management activities such as habitat change and dispersal. This effort is on going. Goose population data is kept on the GIS workstation computer at the Natural Resources Office.

8-3c(8) Sockeye Salmon

Sockeye salmon, as well as other salmon species, have been annually censused at the Six-Mile Creek fish weir since 1988. In 1998, this weir was moved to near the entrance to Lower Six-Mile Lake. Sockeye salmon are censused at this location, and pink salmon are censused by weekly stream walk counts. In addition to annual census efforts, some sampling of individual salmon has occurred, primarily scale sampling conducted by the staff and analyzed by ADF&G. Results of this analysis are still pending.

Salmon census data is kept in a database at the Natural Resources Office.

8-4 Water Quality Monitoring

Water quality testing for drinking water is taken at Fort Richardson where Elmendorf AFB's drinking

water originates. Fort Richardson has about 100 monitoring wells. Ground water levels are monitored each month, and extensive chemical testing is conducted on a quarterly basis. Fort Richardson will continue to monitor ground water for the next five years.

Elmendorf AFB does monitor stream discharge of suspended particles for storm drainage management. This function is not part of the duties of the Natural Resources Office but is done by Elmendorf AFB's Environmental Branch or the U.S. Army Corps of Engineers. Monitoring is periodic and performed as needed.

8-5 Research

8-5a BASH Studies

Canada geese were studied extensively during the first three years after the 1995 fatal crash of an Air Force plane due to geese. Studies included taste tests to determine relative palatability of local grasses for geese, as well as a urban goose movement study using telemetry to determine such things as movement patterns and timing. Both of these studies were conducted by the U.S. Department of Agriculture (USDA) National Wildlife Research Center, under contract to the Air Force. The Natural Resources Conservation Service conducted further feasibility studies concerning modifying vegetation types near the airfield. These studies collectively resulted in many changes and proposed changes to goose habitat in and near the airfield. Telemetry movement studies provided valuable insight into critical times of day and changes to operational procedures to improve aircraft safety during goose migration season.

8-5b Bear Study

A black bear ecology and management study was initiated in 1989 due to increasing problems with nuisance bears. The study objectives were to investigate black bear ecology, determine population numbers and productivity, and experiment with various methods of dealing with problem bears such as translocation and aversive conditioning. The study was completed in 1997 (Bostick 1997), although selected bears will continue to be monitored under

the MIS monitoring program. Although not habitat based, this study did provide some insight into bear use of habitat on Elmendorf AFB, as well as likely travel corridors and seasonal preferences. Study results and management recommendations are summarized in the section on bear management (Chapter 10). Copies of the study report can be obtained from the Natural Resources Office or the Anchorage office of ADF&G.

8-5c Wolf Study

A telemetry study of wolves on Elmendorf AFB and Fort Richardson was initiated in 1995 (Bostick 1995) due to increasing conflicts with humans. Several animals were collared briefly, however, most wandered off the two military bases and were killed. The study did provide a rough estimate of wolf numbers and pack territories. It is currently being revised to use global positioning system technology. This will provide much more information for the amount of management time and will reduce animal handling requirements.

8-5d Lake Stocking Study

The ADF&G is conducting a lake stocking study, under contract to the Air Force. It focuses on lake productivity, fish habitat and growth rates of stocked fish in the base lakes.

8-5e Potential or Future Studies or Inventories

- ▶ Wolf ecology study
- ▶ Raptor survey
- ▶ Winter lynx/furbearer survey
- ▶ Moose browse/HEP (Habitat Evaluation Procedures) survey
- ▶ Winter track counts for snowshoe hare
- ▶ Microtine survey
- ▶ Breeding bird survey
- ▶ Salmon predation/take study
- ▶ Fisheries habitat mapping project

8-6 Storage and Analysis of Digital Information

Too often, due to inefficient data storage, retrieval, and analysis systems, biological data are collected and stored without being used. A system of storing, retrieving, and analyzing data is critical to ecosystem management since this type of management relies heavily on data to make ecosystem based management decisions.

8-6a Storage of Inventory, Monitoring, and Research Data

Data gathered through inventory and monitoring will be stored in two ways, as digital data within a computer database, and on paper as hard copy of the digital data. All inventories and monitoring studies that are done by outside contractors will have stipulated in the contract that all data be delivered in these two forms (electronic and paper), with the electronic data being in a format compatible with current software used by the Natural Resources Office. Storage of data that is collected by base personnel will be the responsibility of those who have authority over the program.

The Natural Resources Office maintains four computers, three computers for personnel use and one that is a dedicated GIS computer. The GIS computer has enough storage space and will be used for storing data collected in inventory and monitoring programs.

8-6b Geographic Information System

8-6b(1) Natural Resources Spatial Database

GIS utilizes computer technology for efficient storage, retrieval, and analyses of spatial data. In the past few years, use of GIS has become a revolutionary tool used to assist natural resource managers in implementing ecosystem-based management, and principles of landscape ecology. Output GIS products include hard copy maps, statistical information, and a user interface that allows access to on-line digital databases for display and/or query purposes.

Elmendorf AFB's natural resources spatial or GIS database is in the process of being developed. The

layers that have been developed were completed or gathered by Elmendorf AFB Drafting Section. The Center for Ecological Management of Military Lands (CEMML), in collaboration with USARAK's GIS laboratory, developed a vegetation map.

Elmendorf AFB will use the GIS to support numerous mission objectives. The GIS will incorporate field locations and data for various inventory and monitoring activities to make the data more accessible to natural resource managers. GIS analyses will provide a variety of maps for managing and monitoring impacts of military use, recreational use, other uses, and for natural resources projects. GIS will be used to produce maps that include features such as military facilities, transportation networks, drainage, cultural sites, vegetation, wetlands, elevation, soils, and more.

GIS analyses will be used to support natural resources management. During 2000-2005, the GIS will be used to evaluate use impacts on natural resources. This type of analysis will help prioritize projects for natural resources management. As data is collected and analyzed in the GIS, impacts from uses will be documented.

Other GIS applications for natural resources management include mapping wildlife habitats and determining watersheds, flood zones, and ecosystems. In addition, the base may have site-specific research areas, which will be incorporated into the GIS. For example, the current UAA study on bears that includes spatial data could be added to Elmendorf AFB's GIS database as much of it pertains to the base.

8-6b(2) GIS Maintenance and Use

Elmendorf AFB's GIS has enormous potential to assist natural resources managers and allow them to make informed decisions. However, due to manpower considerations, Elmendorf AFB's GIS does not get the use that it could.

Initial set up of the GIS was done by a contractor. The technician position has been upgraded so that this person could dedicate time to the GIS. Additionally, this person has and will receive training in the use of the GIS. Responsibilities will include developing layers with in-house data, and producing maps and subsets of data for reports and analysis. The staff biologist will use the GIS for statistical analyses. Contracts that go to outside agencies or persons will include a clause that any spatial data developed from these studies will be incorporated into a compatible GIS format, and the Natural Resources Office will get digital and hard copies of data.

The Natural Resources Office will continue to coordinate and exchange data with Elmendorf AFB Drafting. The potential also exists for out-sourcing or contracting for additional data layers. Several options are available including setting up a contract with USARAK to use the resources that they have been developing over the last five years, as well as with universities and other contractors with GIS capabilities.



Photo: D.D. Wilcox

9. VEGETATION MANAGEMENT

9-1 Vegetation Management Objectives

- ▶ Maintain or improve plant and vegetation biodiversity
- ▶ Promote forest ecosystem health
- ▶ Maintain old growth stands and ecosystems
- ▶ Restore disturbed areas to natural vegetation
- ▶ Maintain, restore, or improve the quality/quantity of wildlife habitat for wildlife species
- ▶ Reduce fuel loads in beetle-infested stands
- ▶ Maintain or improve the aesthetic quality of outdoor recreation areas
- ▶ Conduct a sales program to dispose of forest products made available as the result of natural resources management practices and development
- ▶ Maintain, improve, and if necessary restore wetlands, riparian areas, and flood plains
- ▶ Establish cooperative agreements for forest management with the BLM and Alaska Department of Forestry (DOF)
- ▶ Manage improved and semi-improved lands in such a way as to provide an aesthetically pleasing landscape for people.

- ▶ Where feasible, convert developed lands to semi-developed, and semi-developed lands to undeveloped lands in accordance with AFI 32-7064
- ▶ Protect soils from wind and water erosion
- ▶ Minimize pollution
- ▶ Maintain landscaped grounds so as to minimize manpower, equipment, and financial resources required

9-2 Forest Management

9-2a Forest Management Overview

Forest management will emphasize compatibility with military mission requirements, ecosystem function, biodiversity and forest health, wildlife habitat requirements, fuels management, and recreational opportunities. Forest products will be produced and made available as a by-product of these management activities, but are not a goal in and of themselves.

9-2b Forest Management Objectives

- ▶ Discourage/prevent spread of the alder and blue joint grass vegetation types
- ▶ As manpower and funds permit, convert alder and other vegetation types on disturbed sites to productive forest
- ▶ Maintain old growth stands and forest types wherever possible
- ▶ Retain the option of harvesting forest lands by a variety of means including site conversion, thinning, patch-cuts for wildlife, and commercial logging.
- ▶ Harvest all areas having saleable forest products prior to conversion to non-timber land uses
- ▶ Conduct a personal-use forest product sales program and make 300 cords of firewood and 300 spruce Christmas trees available each year for personal-use by base personnel
- ▶ Provide for recreational harvesting of Christmas trees by establishing a Christmas tree farm to augment or replace Christmas tree cutting

- ▶ Conduct urban forest inventory and develop urban forestry plan to complement this plan and the base landscape plan

9-2c Biological Factors

9-2c(1) Biodiversity/Forest Health Factors

Biodiversity is defined as “*the variety and variability of living organisms and the environment or habitat in which they exist*” (The Keystone Center 1996). Forest ecosystems that have a variety of types and ages of vegetation are healthier, more resistant to attack by disease and insects, and provide better habitat for fish and wildlife. This INRMP is the primary vehicle for managing for biodiversity on Elmendorf AFB. It is believed that Elmendorf AFB has a reasonably good level of biodiversity. However, this biodiversity has not been documented or inventoried, and whether the trend is up or down is difficult to say. The high percentage of old growth forest and declining stands is one possible indicator of declining biodiversity. More study needs to be conducted in this area.

Some old growth areas should be protected under this management plan. However, the effect of declining stands on wildlife habitat for key species such as moose is significant and cannot be ignored. Old growth areas such as the area north of Six-Mile Munitions, (which has limited access and is a critical travel corridor for certain types of wildlife), should be protected. However, given the fact that almost half the forest stands on base could be considered old growth, certain areas could be targeted for forest management and some limited harvest. Management should be done with the joint objectives of preserving biodiversity while providing critical habitat for moose and other species tied to early successional stages.

9-2c(2) Role of Fire

Traditionally, fire has been present in the boreal forest system and is an important ecological process in shaping the development of that ecosystem. Because of proximity to Anchorage and mission requirements, fire has been prevented and largely excluded from the forest ecosystem on Elmendorf AFB for many years. This is likely the main reason that so much of the forest ecosystem has become old growth stands, and may be a contributing factor

to the increases in alder and blue joint grass as well. Unfortunately, due to narrow burning windows and stringent air quality standards, it will be difficult (but perhaps not impossible) to re-establish fire in this ecosystem. The Municipality Air Quality Board will issue burning permits for training of firefighters, but not for a regular burn program. Although large areas of the base could not be burned for operational reasons, it is possible that a small, carefully selected area could be burned each year as a “training burn.” However, the best option for most areas of the base is logging which has been carefully designed to mimic post-fire conditions.

9-2c(3) *Stand Ages*

The commercial timber stands ages range from 25 to 225 years, with age classes unevenly distributed. Nearly half of the stands (2,860 acres) are over 175 years of age and are in an advanced state of decline. The remaining stands are broken down between two age classes, those less than 50 years old (1,348 acres), and those 50 to 100-year-old (1,843 acres). There are no stands in the 100 to 175 year age class. Most of the 50 to 100-year-old stands were established after natural or man-caused fires, which burned between the turn of the century and the mid 1930s. The stands less than 50 years old were established after site disturbances during World War II and the early years of installation development.

9-2c(4) *Forest Disease/Insect Problems*

The primary forest insect problem on Elmendorf AFB is the spruce bark beetle (*Dendroctonus rufipennis*). This insect has traditionally been a problem in south-central Alaska, with outbreaks occurring periodically. A major outbreak began on Fort Richardson in 1991-1992, and has since spread to Elmendorf AFB and portions of Chugach State Park. Mature white spruce (over 6-8 inches in diameter) are most susceptible to infestation by this insect. Spruce beetles infest trees by boring holes and laying eggs in the inner bark. Once hatched, the larvae feed on the inner bark, causing a disruption in nutrient flow. Severe infestations result in destruction of the inner bark, effectively girdling the tree and killing it. It is estimated that over 80% of spruce stands in this age class on Elmendorf AFB are infested. Severe bark beetle infestations can cause large scale habitat changes by opening the forest

canopy. Canopy reductions of more than 40% can lead to invasion by blue joint grass and alder, and a reduction in tree seedling regeneration and other shrub species in the understory. This in turn can cause changes in animal species associated with that forest stand or habitat type. Infestations at this level do occur in nature. However, due to the lack of fire in this system, this infestation may create long-term changes in vegetation and associated animal life. Although research on these changes is on-going in south-central Alaska, in general, Elmendorf AFB can expect more open stands, increases in invasives such as alder and blue joint grass, increased fuel loading, and changes in animal communities dependent on this vegetation type.

Areas on Elmendorf AFB with particularly bad infestation levels include the north and south shores of Upper Six-Mile Lake and the north shore of Lower Six-Mile. Previously attacked areas include the Green Lake area and the area south of the 381st Intelligence Squadron complex.

The best way to prevent serious beetle outbreaks is to manage for a variety of age classes and types within the forest ecosystem. Although it is unlikely that logging alone will eradicate this problem, logging in such a way as to create this variety of stands will certainly decrease the severity of the problem. Placement of insect traps in actively infested areas is also an option, but is probably too manpower intensive to be feasible. Infestations occurring in the cantonment area can be dealt with by spraying individual trees with insecticide. It should be noted that vigorous spruce trees often survive beetle infestation without any assistance.

Common local defoliating insects include the morning cloak butterfly, spear-marked black moth, large aspen tortix, and the spruce budworm. Some minor insect defoliation problems exist, especially aspen tortix on the bluff area above the Port Facility. Fungal heart rot is common in birch over 80 years of age. This is not entirely negative, however, as this process creates most of the cavities available to cavity nesting species.

9-2d Legal Factors

The BLM retains vegetative rights for about 58% of the base’s forest lands under various Public Land

Orders (See Appendix C). Any management activity involving forest management or removal of vegetation on those lands must be coordinated through the BLM. Timber receipts from forest sales on BLM lands must be transferred to the BLM for deposit in the General Fund. A certain percentage of these funds may be returned to Elmendorf AFB in return for administering these timber sales. Proceeds of sales from lands owned by the Air Force are retained by the Air Force and deposited in DOD accounts. This money is then available for use by Elmendorf AFB for forest management activities. Negotiations have been underway between the BLM and Elmendorf AFB for several years in an attempt to resolve the issue of disposition of timber receipts without significant success. The BLM is mandated by law to retain funds from timber sales on lands under their jurisdiction.

The following procedures will be followed:

- ▶ Any commercial timber sales should be restricted to the portion of the base owned by the Air Force, with timber receipts going to the Air Force
- ▶ Two compartments will be established for personal-use wood sales. Permits for Compartment 1 would be good for Air Force Lands only and proceeds would go to the Air Force. Permits for Compartment 2 would be good for BLM lands only and proceeds would go to the U.S. Treasury
- ▶ Establish new Christmas tree farm on Air Force lands. Proceeds from these permits would go to the Air Force
- ▶ All timber sales on BLM lands will be coordinated with the BLM

The above procedures will ensure that the U.S. Treasury receives proceeds from wood product sales on BLM lands in accordance with federal regulations, while also ensuring that the Air Force receives sufficient timber receipts to fund forest management activities and regeneration costs.

9-2e Forest Management Factors and Strategies

9-2e(1) Commercial Forest Lands

Stand types. Of the 13,035 acres of land controlled by the installation, approximately 58%, or 7,561 acres, is commercial forest land (CFL). A breakdown of forest types found on base is contained in Table 9-2e(1). Timberlands cover 6,051 acres of all CFL. The remaining 1,510 acres are presently out of timber production. Most of this acreage is covered with blue joint grass and thin-leaf alder. Together, they effectively prevent the establishment of birch, aspen and poplar, and sharply reduce the establishment of white spruce. Other portions of the nonproductive CFL are kept in the shrub stage due to operational requirements such as antenna fields.

Table 9-2e(1). Commercial Forest Lands by Vegetation Type for Elmendorf AFB, Alaska.

Stand Type	Acres
Timberlands	
Paper birch-white spruce	4,027
Balsam poplar	538
Paper birch	512
Quaking aspen-white spruce	410
White spruce	293
Black Cottonwood-white spruce	271
Shrublands	
Alder/bluejoint grass	1,510
Total	7,561

Management Compartments and Stand Designation. Base forest lands have been divided into two, roughly equal compartments based on land ownership. Compartment 1 includes most of the western portion of the base, and is owned (fee simple) by the Air Force. Compartment 2 includes most of the eastern and extreme northern parts of the base. Vegetative rights in Compartment 2 are owned by the BLM (See Figure 9-2e). Stand divisions are based on topography, the dominant forest types present, and silvicultural needs.

Forest Inventory. Basic forest inventory information was obtained from an initial timber cruise using point-sampling of all commercial timber types, which was conducted as part of the 1982-83 Natural Resources inventory. An updated inventory is being conducted. Volume and growth information from the 1983 Inventory may be obtained from the Natural Resources Office.

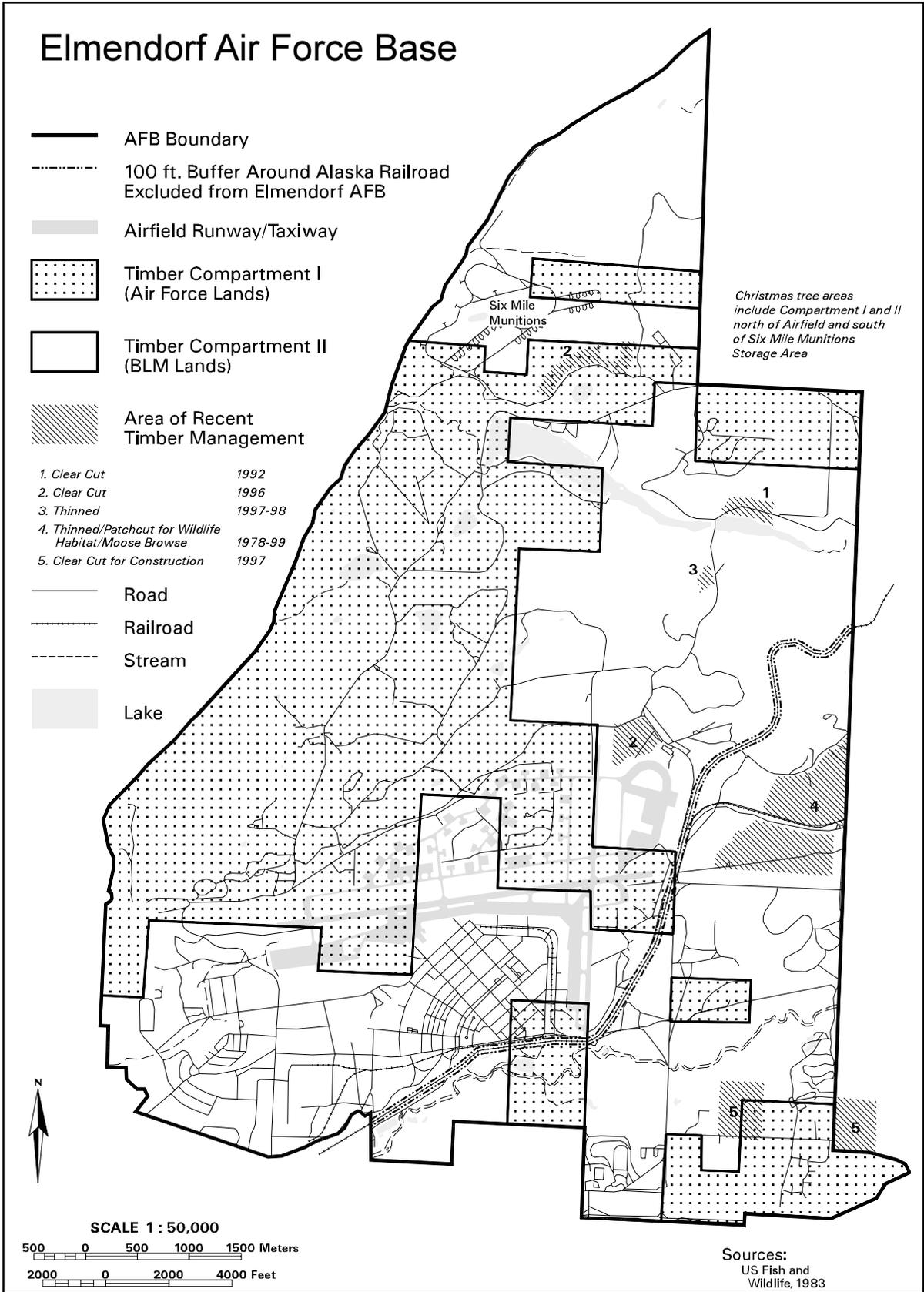


Figure 9-2e. Alaska Timber Compartments and Harvest History Map of Elmendorf Air Force Base, Alaska.

9-2e(2) Forest Management/Harvest Activities

Forest Planning. A two-year operational component plan for forest management will be completed and tier off this INRMP. This operational plan will include timber inventory and management information, as well as both short and long-term plans for Elmendorf AFB's forestlands.

Suggested Harvest Levels. Under an ecosystem management based system, harvest levels are determined by management actions, with wood products produced as a by-product of those activities. Harvest levels will normally be far below those levels allowed for maximum sustained yield. It may be desirable to harvest at these lower levels due to factors such as poor local market for firewood, status of trees damaged by the beetle infestation, funding restrictions for site prep and regeneration work, lack of manpower to conduct timber cruising and timber-stand improvement work, etc.

Forest Harvest Methods. Clearcuts, seed tree cuts, and selective cutting will be used to regenerate forests. Decisions as to methods will depend on site conditions and location. Design of treatment areas is critical. In general, treatment areas should be circular or square rather than long and narrow. This maximizes response to light and moisture regimes. Borders should appear natural. Areas should range in size from 5-40 acres. If areas larger than 20 acres are treated, islands of vegetation should be left for resting areas and escape cover. If birch is a desired regeneration species, 7-10 seed trees per acre should be left. A minimum of 8 snag trees per acre should be left, and snags and seed trees should be left in groups to prevent problems with wind-throw. Patches of mature forest should be left adjacent to ponds and wetlands as well as moose calving areas, and logging or other human disturbances should be minimized during calving season (May 15-June 15). No logging should be done within 1/4 mile of known, occupied bear or wolf den sites or 300 feet of eagle or goshawk aeries. No logging should be done within 100 feet of anadromous streams and lakes, and only selective logging should be done within 300 feet of lakes, streams, recreation areas, or main roads. Logging in wetlands should be minimized, and if necessary, should be done in the winter. Summer logging in upland areas should utilize whole-tree-logging methods to provide some site

scarification. Logging in sensitive areas should be restricted to rubber-tired or low-pressured track equipment.

Unless federal standards (including those within this document) are stricter, forest harvest activities will meet the standards used by the Alaska Department of Forestry as specified in the Alaska Forest Practices Act (AK Statute 41.17). Best Management Practices will be used.

9-2e(3) Forest Management/Harvest Programs

Site conversion. Site conversion of blue joint grass or alder on disturbed sites will be accomplished primarily by mechanical means, although use of chemicals or prescribed fire will also be considered. Site conversion may be done by hydro-axing, or by hand cutting and clearing with volunteers. Amount of acreage cleared during this planning period will depend on available funds and manpower. Sites must be kept clear of alder for three years, and then may be replanted to spruce or birch forest.

Commercial Sales. Due to the current state of the market as well as other considerations, commercial sales may or may not occur during this planning period. If commercial sales occur, they may be located on Air Force or BLM lands. Sales on BLM lands will be coordinated with the BLM. Most commercial sales will likely be done for the purpose of clearing sites for development. Where possible, sales will be timed to coincide with improved market conditions.

Personal-Use Sales Program. Personal-use sales of timber products will continue, with a goal of 300 cords and 300 Christmas trees per year. In some cases, Natural Resources Office personnel may thin sites, and the felled trees made available to woodcutters. In other cases, Natural Resources Office personnel may mark small (5 acre) stands for group selection or clear-cutting to create small openings for wildlife use. Other areas may be opened to woodcutting on an occasional basis after windstorms or accumulations of dead/downed wood occur. Although woodcutting permits are currently \$10 per cord, this is well below market value. Consideration will be given to raising the fee to \$15 or \$20 per cord. This would make up a good deal of the financial shortfall from other timber harvest programs. Fort Richardson often offers free woodcutting per-

mits, which may make the viability of a sales program on Elmendorf AFB questionable.

Christmas trees will be harvested from selected areas, which are in need of thinning. As most of these sites are under BLM jurisdictions, any proceeds from these sales should go to the U.S. Treasury. This program will eventually be replaced with an established Christmas tree farm sited on Air Force lands.

Regeneration. Artificial site regeneration should only be conducted on those sites that have been properly prepared by scarification or fire. The Alaska Forest Practices Act requires that sites show an adequate stem count within seven years of harvest. For sites cleared by woodcutters or conservation personnel, a regeneration survey must be conducted five years after harvest. If it appears that the site will not make the required stem counts, then artificial planting of white spruce seedlings or hydro-axing to encourage sprouting will be considered, depending on regeneration objectives for that Land Management Unit (LMU) and sale location.

9-3 Wetlands Management

Executive Order 11900, *Protection of Wetlands*, defines jurisdictional wetlands “to generally include swamps, bogs, and similar areas such as sloughs, mud flats, and natural pond, that are inundated by surface or ground water with a frequency sufficient to support the prevalence of vegetation and aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.”

Base wetlands include open water, emergent plant, aquatic bed, shrub, and forested types. The majority of Elmendorf AFB’s wetlands are less than one acre in size and are found on the base moraine areas left as the result of glacial activity. They are wettest in spring and early summer, tending to dry out toward the end of summer.

Base wetlands were mapped and classified in 1979 by the USFWS Wetlands Inventory Team. This inventory identified 428 acres of palustrine and lacustrine wetlands (See Chapters 4 and 8 for more detailed descriptions of wetlands). An Air Force-wide re-inventory of wetlands occurred in 1994-95. Elmendorf AFB wetlands were re-inventoried as part

of this project. A total of 1534 acres of wetlands were found.

Elmendorf AFB’s policy concerning wetlands is to protect and conserve wetlands in such a manner that no net loss of wetlands occurs. All projects, including construction projects, that may have an effect on wetlands must be coordinated with the Environmental Planner (3 CES/CEV). Construction activities that take place in or near wetlands must utilize suitable protective devices such as silt curtains to minimize silt movement as a result of construction or repair work. Elmendorf AFB complies with all regulatory requirements pertaining to wetlands, including provisions of Air Force Instructions, the Clean Water Act and NEPA. Impacts to wetlands are minimized through the Environmental Impact Assessment (EIS) process. From a natural resources standpoint, wetlands comprise critical wildlife habitat, not only for common wetlands species such as waterfowl and beaver, but as seasonally important feeding areas for both moose and bears as well as numerous smaller species. Because so much of Elmendorf AFB’s wetlands are less than an acre in size, they frequently are overlooked when conducting planning using aerial photos and GIS coverages. On-the-ground checks during the planning process are critical to ensure that protection of these wetlands is not overlooked. If wetlands are selected for logging, all activities must occur during the winter to minimize damage by heavy equipment. It is also recommended that logging be restricted to selective type cuts.

Any net loss of wetlands should be mitigated whenever possible. Buffer areas for both wetlands and riparian areas will be established. Activities in these buffer areas will be restricted or modified to ensure that no damage or degradation of habitat occurs.

9-4 Riparian Area Management

Riparian areas include Ship Creek, Six-Mile Creek, and EOD Creek. Primary efforts to protect these areas include restricting access (Six-Mile and EOD creeks), restricting logging to selective cutting, and, in the case of Ship Creek, bank stabilization efforts. Ship and Six-Mile creeks are listed as anadromous streams. Any activities occurring in the stream during salmon migration periods must be coordinated

with the Fish Habitat Division of the ADF&G, which issues a permit. Construction work is often timed so as to minimize in-stream work during these periods.

9-5 Noxious Plant/Invasive Species Management

Noxious and invasive plants include alder and blue joint grass. Blue joint grass and alder, although native, are considered both invasive and noxious species due to their tendency to take over disturbed sites. No control activities take place at the present time; however, stopping the spread of blue joint grass and alder is an objective of the forest management program, and silvicultural methods will be selected with the intent of minimizing the spread of these two species. Site conversion of disturbed areas dominated by these two species will be a top priority and will be conducted as manpower and funding permits.

9-6 Cantonment Area Land Management and Landscaping

9-6a Management Objectives

- ▶ Manage improved and semi-improved lands in such a way as to provide an aesthetically pleasing landscape for people
- ▶ Where feasible, convert developed lands to semi-developed, and semi-developed to undeveloped lands
- ▶ Protect soils from wind and water erosion
- ▶ Preserve and protect wetlands, flood plains, and wildlife habitat
- ▶ Minimize pollution
- ▶ Maintain landscaped grounds so as to minimize manpower, equipment, and financial resources required
- ▶ Emphasize natural plants for landscaping and cover purposes and do not introduce new invasive plants
- ▶ Re-vegetate flightline with species of low palatability to wildlife

- ▶ Develop urban forestry plan to complement base landscaping plan

9-6b Land Management Issues and Planning

9-6b(1) Biological/Physical Constraints

Land management practices on Elmendorf AFB are constrained by topography, soils, and climate. The majority of improved and semi-improved lands are found on the thin, gravel soils common on alluvial and outwash plains. Low annual rainfall and poor soils place great stress on new plantings. Low soil temperatures can restrict root formation to the upper 18 inches of soil. Relatively low soil fertility mandates fertilization, particular on areas such as the golf course. Lawns established on these soils are often subject to drought during mid to late summer. Transplanting works well with native species, but non-native species often require extra care, grow more slowly, and occasionally cannot survive the local conditions.

9-6b(2) Landscape Planning

Landscape planning on Elmendorf AFB has centered on the establishment of a Base Beautification Working Group, formed as a sub-group under the Environmental Protection Committee. A base-wide landscape development plan was completed in 1996. This plan contains detailed procedures, planning, and zonation type maps, and is designed to interface with the Base Comprehensive Plan as well as this INRMP and the 3rd Wing BASH Operations Plan (O Plan 127-15). The landscape development plan contains guidelines and procedures for landscaping projects, as well as a listing of recommended plants for landscaping purposes that are hardy enough to survive the harsh Alaskan climate. Native plants are the preferred species. In addition, caution will be taken so that no new noxious or invasive species are introduced to areas where they are not already found.

9-6b(3) Airfield/BASH Program

The area of improved and semi-improved lands within the Bird Exclusion Zone (Most of LMU 6) is subject to numerous special land management practices designed to reduce the possibility of bird aircraft strikes. Specific management practices in-

clude managing grass height through careful manipulation of mowing schedules, eliminating bird resting and feeding areas, reducing insects and other prey species, and planting of non-palatable species of vegetation. Further details may be found in the 3rd Wing BASH Operations Plan, or contact 3 OG/OGV, 552-2261.

9-6b(4) Golf Course

The golf course is maintained by a grounds crew funded through the MWR Office. This crew consists of a full-time supervisor and 10-15 seasonal workers who work from 15 April to 1 October. Management procedures include seeding, mowing, irrigation, fertilization, aeration, and weed and disease control. Details of these procedures can be found in the following sections, or in the Base Landscape Development Plan. Major issues include stream bank stabilization, water quality, and preservation and improvement of fish habitat in this area.

9-6b(5) Urban Forestry

Urban forestry is an area that has been in need of attention. Many previous landscaping projects occurred before the current landscape development plan was in effect. Consequently, numerous different schemes and plant associations have been used. A comprehensive inventory of the landscaped areas will be considered, so that managers know what is already in place and where. This survey will be used to develop a comprehensive urban forestry plan that complements the existing base landscaping plan. The urban forestry plan will address recommended species, locations of projects, tree maintenance, and urban forest inventory. Once this plan is completed, future projects will adhere to the rules and guidelines set forth in the plan.

9-6c Management Strategies for Vegetation Establishment

The following procedures may be found in more detail in the landscape development plan. Species selected will be in compliance with the Base Landscape Plan as well as other directives.

9-6c(1) Grass

The best time for lawn establishment is from 15 May to 15 June, with 20 June being the latest possible

date for successful seeding. Fertilizers must have N-P-K ratios of at least 8-12-6. Soil preparation is critical to success. Disturbed sites will have the soil tilled to a depth of four inches, and four inches of topsoil should be used to cover the sub-grade. Fertilizer will be thoroughly mixed in, and final grades and elevations will make allowance for the placement of the sod.

Vegetation may be accomplished by seeding, sodding, or sprigging. Seeding may be accomplished by hand spreader, mechanical drill, or hydro-seeder. Sowing will take place at a rate of ½ pound per 1,000 square feet. Sowing will not take place when winds exceed 5 MPH, and sowed areas should be protected. Sodding can be accomplished by rolling or plugging. Sod will be laid within 24 hours of being cut, and will not be done when the ground is frozen or the sod itself was cut in the dormant stage.

9-6c(2) Trees and Shrubs

Planting can be successful throughout the growing season, however, spring and fall have the highest success rate. Nursery-grown seedlings or saplings will be planted before 15 June. Wild seedlings can be planted in the spring or fall. Cuttings may be planted as late as 1 July, provided adequate moisture exists. Fertilizers used for trees and shrubs must have N-P-K ratios of at least 5-10-5.

Quarter's occupants can get a free permit from the Natural Resources Office to dig wild seedlings for planting. This permit is good for Air Force lands (Compartment 1) only. Roads and Grounds section maintains its own nursery on base, but also digs and transplants some wild trees and saplings, primarily conifers, which are more resistant to transplant shock. Saplings will have a root /burlap ball, and excavations should be at least 50% greater than the root ball and equal in depth.

9-6d Vegetation Maintenance Programs

The following procedures may be found in more detail in the Base Landscape Development Plan.

9-6d(1) Mowing

Base lawn areas are mowed from 1 May to about mid September. Mowed areas total 2462 acres. 3rd

Civil Engineer Squadron mows common areas, parade grounds, athletic fields, and the airfield area. Airfield procedures are detailed in 3rd Wing BASH O Plan. MWR personnel mow the golf course and recreation areas. Areas are mowed weekly or as required. The golf course is mowed twice weekly, except for the greens that are mowed daily. Mowing schedules for areas near the airfield have been modified due to BASH considerations. These areas are mowed once per summer and then left to grow, with the objective of growing grass tall enough to deter use by geese.

9-6d(2) Chemical Control

Chemical control is performed on Elmendorf AFB, focusing primarily on dandelion and broad leaf weed control. Herbicides include KROVAR I and WEED-B-GON. All herbicides are applied as a ground spray, with areas being treated including airfield over runs, dikes, lawns, and a small portion of the antenna fields. In addition to dandelion and weed control applications, the golf course is also sprayed with a mix of fungicides to control snow mold. The mix is varied to prevent development of resistance. No fungicides are sprayed on the fairway itself.

Chemical control operators come from the CES Pest Management section, and must be trained and certified in accordance with Air Force standards. Personnel within the Environmental Management section monitor this program.

9-6d(3) Irrigation and Fertilization

Irrigation is performed primarily at the Eagleleglen golf course from 15 April to 1 October, using a permanent, buried system of pop-up sprinklers. Greens and aprons are watered twice daily, other areas are watered daily. Fertilization is also currently limited to the golf course. Details concerning timing and types of fertilization recommended may be found in the landscape development plan.

9-6d(4) Urban Tree Maintenance

Tree maintenance on improved and semi-improved grounds is performed both by Roads and Grounds section and MWR personnel (in the case of the golf course). Maintenance is usually limited to removing trees that are dangerous or unsightly, and re-

placing those trees with saplings from the base nursery or wild trees. Currently, most trees planted are native species.

9-7 Environmental Considerations

9-7a Erosion Control

Erosion control is practiced primarily on the golf course, along the banks of Ship Creek. The most common methods include installation of silt matting and rip-rap barriers, followed by backfilling with gravel. Because this maintenance has been required annually in recent years, a proposal was made to conduct a stream bank stabilization study in this area.

9-7b Pollution Prevention

Fertilizer and herbicide use is constantly reviewed to ensure that these practices do not contaminate the waterways in the landscaped areas. Water sampling is conducted periodically and monitored by the Environmental Management Branch. If chemicals are detected during sampling, their necessity and application rates will be immediately reviewed.

9-7c Wetlands/Flood Plain Protection

Wetlands in developed areas receive the same protection that they do elsewhere. As part of the Environmental Impact Statement (EIS) process, all activities that affect wetlands are carefully screened to ensure that impacts are eliminated or kept to a minimum. Appropriate coordination with federal/state agencies is conducted prior to activities occurring, as required by federal and Air Force regulations. When activities take place in these areas, silt curtains must be used to limit the movement of silt generated by construction or repair activities. Compliance with federal regulations is monitored by the Environmental Flight as well federal and state agencies. Further details on wetlands protection procedures may be found in Section 9-3.

9-7d Coordination

Siting of gravel pits, concrete and asphalt debris sites, and clean fill disposal sites must be coordi-

nated with 3 SPTG/CEVR. Other land management activities under this plan must be coordinated with Community Planning, Environmental Management, Pest Management, Civil Engineer (CE) Operations, and MWR, as appropriate, depending on the type of activity.

9-7e Environmental Assessments

Environmental Assessments for all government projects at Elmendorf AFB, including this INRMP, are conducted in-house by the Environmental Flight.



Photo: William A. Gossweiler

10. FISH AND WILDLIFE MANAGEMENT

10-1 Fish and Wildlife Management Objectives

- ▶ Protect, conserve, and manage fish and wildlife and their habitat as vital elements of an integrated natural resources program
- ▶ Ensure species are well distributed throughout suitable habitat
- ▶ Protect and conserve endangered and threatened species
- ▶ Identify and monitor status of key and indicator species and species of concern
- ▶ Maintain or enhance wetlands valuable to waterfowl and other wildlife
- ▶ Provide improved opportunities for wildlife-based recreational activities (consumptive and non-consumptive)
- ▶ Minimize human-wildlife conflicts and their impacts to the mission and base personnel and facilities
- ▶ Establish partnerships with other land and wildlife management agencies to facilitate landscape scale management of wildlife species and ecosystems
- ▶ Establish individual population and habitat objectives which are measurable and monitor them

- ▶ Integrate wildlife/habitat issues into land-use planning and decision-making processes
- ▶ Minimize fragmentation by promoting natural landscapes and connectivity of habitats
- ▶ Improve health and diversity of aquatic ecosystems
- ▶ Restore damaged or degraded fish habitat
- ▶ Minimize impacts to and emphasize wild, self-sustaining fish populations
- ▶ Implement objectives of Executive Order 12962, including:
 - Increase access for recreational fisheries
 - Provide fish passage for anadromous species
 - Restore native fisheries and improve fish habitat

10-2 Management Strategies

- ▶ Establish a long-term management plan for wildlife populations and habitat
- ▶ Manage habitat to reduce the bird-aircraft strike hazard
- ▶ Restore disturbed areas to productive forests and wildlife habitat
- ▶ Improve winter moose habitat through manipulation of plant succession by a combination of the following methods:
 - Site conversion of disturbed site to early seral stages of productive forest
 - Commercial timber sales
 - Patch cuts to create wildlife openings
 - Timber stand improvement
 - Hydro-axing of rights of way, firebreaks, etc
 - Prescribed burning
- ▶ Develop a management program for beaver which includes best practices such as protecting large trees and beaver proof culverts for damage prevention, supplemented by population control as necessary as a means of preventing damage to facilities
- ▶ Identify and protect existing nesting and denning areas. Provide for cavity-nesting species. Improve waterfowl nesting habitat on Green, Hillberg and Spring lakes through the installation of nest platforms
- ▶ As part of the BASH reduction program, work to reduce the number of Canada geese and other birds that rest and feed along the flightline through habitat changes and population reduction
- ▶ Reduce the number of cliff swallows nesting on buildings through a combination of building modifications, nest destruction prior to egg-laying, and establishment of nesting boxes
- ▶ Reduce human-wildlife conflicts with large, potentially dangerous animals such as bears and moose through an aggressive program of public education, garbage management, and enforcement
- ▶ Conduct aversive conditioning of wildlife and monitor results
- ▶ Improve efforts to cooperatively manage wildlife by seeking ecosystem management partners and forming joint management initiatives
- ▶ Establish a joint special management area with Fort Richardson
- ▶ Identify and protect critical habitat including travel corridors, calving areas, and seasonal habitats
- ▶ Monitor significant events such as changes in moose browse availability and berry crops
- ▶ Close roads and trails not needed for mission accomplishment or other purposes to decrease fragmentation
- ▶ Initiate user fees for hunting and fishing and use proceeds for wildlife habitat improvement activities

- ▶ Conduct moose browse study
- ▶ Conduct study of Six-Mile system productivity and map fisheries habitat
- ▶ Conduct study to determine total take of salmon from predation, fishing, and poaching
- ▶ Protect fish habitat on Ship Creek through bank stabilization project
- ▶ Monitor fishery through creel checks and expand to include saltwater fishery
- ▶ Plant fish only in systems without self-sustaining wild populations
- ▶ Use results of lake stocking study and other monitoring efforts to manipulate stocking schedules
- ▶ Conduct habitat improvement projects such as improving trout and salmon fry rearing habitat

10-3 Species of Special Interest

10-3a Key and Indicator Species

Keystone or key species are those which have important effects on their ecosystems. Moose and snowshoe hare are keystone species for terrestrial habitats in this boreal forest ecosystem. Keystone species for aquatic habitats are Pacific salmon (anadromous systems), loons, and sculpin (non-anadromous). Keystone species for wetlands are beaver. Possible plant indicators could include willow, alder, devil's club, and early seral stages of aspen.

Indicator species are those species whose populations and health can be used as indications of overall ecosystem health. Indicator species selection is addressed in detail in Chapter 8.

10-3b Endangered and Threatened Species and Species of Concern

No federally listed endangered or threatened species are known to exist on Elmendorf AFB. One formerly listed species, the peregrine falcon, is known to over-fly the area during migration, and has been verified at Eagle River Flats. No known nesting sites have been found on Elmendorf AFB,

therefore, no management program currently exists. The Cook Inlet sub-population of the beluga whale has been proposed for listing as a threatened species by the National Marine Fisheries Board. This sub-population occurs in the marine waters off Elmendorf AFB and does not actually occur on base. Finally, the bald eagle, formerly listed as threatened, is common on Elmendorf AFB. Although it is not protected under the Endangered Species Act, it is protected under the Bald Eagle Protection Act.

Several species of concern exist on Elmendorf AFB. Although not listed as endangered or threatened, their status will be monitored due to small numbers or declining populations, regionally or nationally. These species include the lynx, bald eagle, common and arctic loon, gray wolf, and brown bear. The lynx and brown bear are listed as species of concern by the state.

10-4 Wildlife Population Management

10-4a Terrestrial Forest Wildlife

10-4a(1) Moose

Population goals for the North Anchorage Herd are 500 animals, as censused during November of each year (post hunting season). The goal for bull/cow ratios is 35:100, and cow/calf ratios of 50:100. (USARAK 1998). These goals are too high for the current level of browse and habitat quality and quantity available, but may be attainable in the long term. The population goal of 500 is a reduction from past years, and is based on striking a balance between moose hunting and viewing opportunities, and concerns about severe over-browsing in areas, increasing numbers of moose-auto collisions, and increased conflicts with people and pets. In general, herd productivity is declining as evidenced by significant declines in cow-calf ratios, from a high of 60:100 in 1987, to 28-38:100 in the 1990s. It is believed that this decline is primarily due to declining habitat.

Moose are currently the only species on Elmendorf AFB subject to a legal hunting season. At the request of the ADF&G, an archery hunt for moose was undertaken on a trial basis in 1990 as a means of helping to reduce moose numbers on military

lands. The normal permit hunts on Fort Richardson alone were not effective enough in reducing moose numbers, due to movement of the moose onto Elmendorf AFB lands during the hunting periods. A total of 15 permits were issued during the annual drawing for state permit hunts, eight for bulls and seven for cows, with the hunt taking place from 5 to 30 September. The hunt was extremely successful, with 14 of the 15 moose being taken. This hunt has since been established as a permanent addition to the state drawing hunts for archers. Between 1990 and 1997, an average of 12 animals have been taken annually. Harvest data for the Elmendorf AFB hunt is kept at the Natural Resources Office.

Population census data, including bull:cow ratios, calf:cow ratios, and sex ratios, is kept by the Natural Resources Branch at Fort Richardson. Hunting is currently permitted north of Ridge Road and the Davis Highway, and includes both bull and cow hunting. Possible future adjustments to management strategies for the North Anchorage Moose Herd include adjusting numbers of hunters, timing and length of hunting seasons, adjusting harvest levels from year to year or between management units, and increased habitat improvement efforts. One adjustment that has been proposed to ADF&G is splitting the 30-day season into two 15-day seasons, and doubling the number of bull tags. This would not likely result in additional harvest, but would increase hunter opportunity and, with the implementing of user fees, help fund badly needed habitat improvement projects. A formal proposal to this effect should be made to ADF&G, as adjustments to hunting seasons must be approved by the Alaska Board of Game.

In addition to hunting mortality, several moose each year are destroyed after being stuck by cars, and one or two are destroyed each winter due to excessive aggressiveness and human conflicts in the main cantonment area. Meat from these animals is donated to needy individuals or organizations through the Alaska State Troopers.

10-4a(2) Bears

Black Bears. Black bears are the most common type of bear on Elmendorf AFB. Black bear populations were estimated at 35-42 bears for the Elmendorf AFB/Fort Richardson area, excluding cubs of the

year. This population appears to be stable or increasing. A black bear study was initiated in 1990 due to increasing problems with nuisance bears and concerns about human-wildlife conflicts and potential for human injuries (Bostick 1997). During this study, numerous bears were translocated. About 50% returned after translocation. Further details may be found in the section on Wildlife Conflict Management. A Joint Management Agreement between Fort Richardson, ADF&G, and Elmendorf AFB, was initiated in 1995. This agreement established joint management responsibility and spelled out control actions to be taken against specific types of nuisance bears. Since its approval, a total of five bears have been destroyed under the authority of this agreement. This action, as well as stepped up levels of garbage control, public education, and non-lethal aversive conditioning of other nuisance bears, resulted in a significant (but possibly temporary) decrease in nuisance activity from 1995 through 1997 (Bostick 1997). Further details, including a detailed bear management data base, may be found in the report.

Brown Bears. Increased brown bear sightings on Elmendorf AFB and the Anchorage Bowl in recent years indicate that brown bears may be becoming more common. This is likely due to the increasing salmon runs on Six-Mile Creek. Population estimates are three to five bears on Elmendorf AFB and Fort Richardson, excluding the upper Ship Creek Drainage, which has additional bears. Increasing conflicts with humans became an issue in 1995, when two young brown bears were captured in Fort Richardson housing areas where they had been hunting moose calves for several weeks. Brown bears are more likely to be aggressive with humans than black bears are, particularly if defending cubs or a food source. In 1995, a brown bear treed two hunters on Elmendorf AFB. The next year, two hikers in nearby Chugach State Park were fatally mauled by a brown bear defending a food cache near a popular trail. With this in mind, trails in some areas of Elmendorf AFB were closed due to brown bear activity and bear-human conflicts in 1995, and again in 1996. Conflicts are expected to increase due to declining habitat, increasing salmon runs, and more people. For further details on conflict management, see Section 10-6c.

General Bear Population Management. In spite of human-caused mortality, bear populations on the two military bases are believed to be stable or increasing. No population control is currently necessary. A preliminary report on the nuisance black bear study completed in 1997 recommended that bear populations for the two bases be held to a total of no more than 40 black bears.

Current management concerns and activities include upgrading base dumpsters and garbage management procedures, monitoring selected family groups to determine productivity and den site selection, and habitat management issues such as protection of core areas and movement corridors. An ongoing bear study being conducted throughout the Anchorage Bowl is focusing on movement corridors and habitat selection. This study is being conducted by a University of Alaska graduate student, and will provide information that will be very useful for future management decisions.

10-4a(3) Wolves

Wolves have been periodically sighted on Elmendorf AFB since the late 70s and early 80s (Rothe et al. 1983). Beginning in 1995, wolf sightings dramatically increased, and wolf-human and wolf-dog conflicts began to become common on the installation. A telemetry study initiated in 1995 revealed that at least two wolf packs, totaling about 15 animals, used the base on a regular basis. Capture and handling of wolves from the Elmendorf or Eagle River Flats pack, which appeared to be responsible for most conflicts, seemed to have the effect of reducing further conflicts, perhaps by serving as a form of aversive conditioning. Most wolves captured during this study died within months of their capture, severely limiting findings. However, it is known that this pack spends late winter off the installation, and that most mortality occurs during this period. The continued decline of moose habitat on the two bases, if not reversed, will eventually result in a reduced prey base for the wolves. The Elmendorf pack has denned on Fort Richardson close to the Elmendorf AFB boundary in the past but no longer does so. Current management practices consist of protection of known denning areas and travel corridors such as the EOD Creek and Cook Inlet shoreline areas, and continued monitoring by telemetry. A wolf ecology study using state-of-the-art Global Positioning sys-

tem radio collars has been proposed to gather further information on this species.

10-4a(4) Beaver

Beaver are common on Elmendorf AFB, with at least eight lodges active in 1996. Beaver control is necessary annually in Ship Creek along the golf course and in the cooling pond area, where at least 3 lodges are active. Culvert clearing and occasional beaver control work is necessary at the culvert between Six-Mile Creek and Lower Six-Mile Lake. A beaver dam in 1996 blocked Six-Mile Creek temporarily, causing the death of an estimated 1000 migrating sockeye salmon.

Some methods of discouraging beaver problems, especially with damming culverts, have shown some promise (see Section 10-6e). Even with these techniques, however, some beaver control will likely be required. Beaver control has been conducted in the past by issuance of depredation permits from the ADF&G to military conservation agents or selected depredation trappers. Since this trapping occurs as problems arise during the summer, the pelts are in poor condition and the meat is not edible for humans. Meat is typically donated to the Alaska Zoo, and pelts are turned in to ADF&G. A total of 16 animals were taken by depredation trappers in the summer of 1997. A change to Fish and Game regulations in 1997 allows beaver trapping in certain portions of Unit 14C, including Elmendorf AFB. Recreational trapping, which occurs during the winter when the pelts are marketable, could be allowed on Ship Creek through a simple change of base regulations. This would likely be a very popular season, and some type of drawing would be necessary to determine the number and identity of trappers. Annual harvest for such a season will be no more than 12 beaver, with any additional problems during the summer handled by depredation permit as they have been in the past.

10-4a(5) Other Furbearers

Other furbearers on Elmendorf AFB include lynx, red fox, coyote, muskrat, martin, and possibly mink and wolverine. No data is available on numbers, and no specific management efforts currently exist. However, moose habitat improvement efforts will likely improve habitat for snowshoe hare, which is

the primary prey species for lynx. Coyotes and foxes that become nuisances in base housing areas are occasionally captured and relocated off base. An effort is underway to conduct track count censuses of furbearers on base, with baseline data being obtained through a contract (See Chapter 13), and monitoring thereafter by utilizing volunteers trained by ADF&G. If successful, this project will allow an annual trend count to be developed, which will be useful for future management efforts.

10-4a(6) Small Game

Small game populations on Elmendorf AFB are believed to be low, although localized populations of spruce grouse and snowshoe hare do exist. Spruce grouse are found sparsely throughout the base, with concentrations in the EOD Creek area and the Knik Bluff Trail area. Snowshoe hare are found primarily in the extreme southeast and southwest portions of the base, where younger vegetation types exist. Snowshoe hare populations are cyclic in nature, and are believed to be near their peak in the Anchorage area (R. Sinnott, pers. comm). Wildlife clearings, site conversion projects, and moose habitat improvement work will likely also benefit snowshoe hare. Other than this, no specific management efforts are currently underway. A former proposal to introduce ruffed grouse to the base has been tabled due to inadequate habitat, but may be re-initiated again at a later date. No small game hunting is currently allowed due to (assumed) low population levels, limited space, and too many potential hunters. Elmendorf AFB will begin some sort of annual census program for snowshoe hare, and possibly other types of small mammals. A snowshoe hare census could be conducted in conjunction with furbearer counts, or by conducting pellet counts on vegetation plots.

10-4b Waterfowl

Waterfowl population management is limited to activities of the Dispersal Team during migratory season, and occasional round-ups and translocations of geese in the vicinity of the golf course and cooling ponds during the molting or flightless period in June. Approximately 100 geese and ducks are killed each year as part of the Bird-Aircraft Strike Hazard reduction program, and geese are occasionally translocated.

10-4c Other Birds and Mammals

Management of other birds and mammals, including raptors, small birds, and small mammals such as porcupines and squirrels, is limited to protection from hunting/poaching and protection of habitat.

10-5 Terrestrial Wildlife Habitat Management

10-5a Forest Wildlife

Moose, as the most numerous, large land mammal on Elmendorf AFB, are a key or featured species. Landscape-level management is particularly critical for moose. The North Anchorage herd range includes Elmendorf AFB, Fort Richardson, and portions of Chugach State Park, as well as most of the Anchorage Bowl in the wintertime. Fort Richardson has an extensive moose browse management program. Chugach State Park and Municipality of Anchorage do not actively manage for moose habitat. It is critical that habitat management efforts on Elmendorf AFB are designed to complement and augment efforts in other jurisdictions within the range of the moose herd.

Some studies have found that habitat management programs for moose favor up to 60% of other boreal forest species (Crichton 1998). Moose generally favor early seral stages, with willow, aspen, birch, and cottonwood, in that order, being preferred browse species. In addition to adequate browse, moose also need adequate aquatic feeding areas, calving areas, and escape and thermal cover. Locations of browse improvement projects should also take into account efforts to draw moose away from potential conflict areas.

10-5a(1) Browse Management

Any manipulation of browse on BLM jurisdiction lands will be coordinated with BLM. Moose browse habitat can be improved using one or more of the following strategies (USARAK 1998, Peek 1997):

Site conversion on disturbed areas. The primary method used on Elmendorf AFB will be converting large stands of alder or blue joint grass to early seral stages of forest or shrubland through use of prescribed fire, hydro-axing, or other mechanical

means, followed by broadcast seeding or planting of desirable browse species.

Enhancing existing habitat areas that are growing out of reach. This is usually done by hydro-axing these areas prior to spring bud-break or after growth has ceased in the fall. Right-of-way and fire break maintenance activities are a good example of this type of management activity.

Converting forested areas to early seral stages. Commercial timber programs and personal-use woodcutting programs can accomplish this option best. Personal-use timber sales are well adapted to creating small (less than 5 acres) forest openings for moose, snowshoe hare, and black bears.

Planting willow root bundles in suitable areas. This option works best in recently cleared areas or openings with adequate moisture and low amounts of perennial grasses such as blue joint grass. This method is, however, very manpower and labor intensive.

Removal of large trees on a particular site followed by hydro-axing. Trees removed for military purposes, rights-of-way, and small scale firewood cutting to remove larger trees (over 4 inch Diameter Base Height (DBH), and can make hydro-axing of remaining trees and vegetation more economically feasible.

10-5a(2) Forest Wildlife Habitat Management Considerations

Design of treatment areas is critical. In general, treatment areas will be circular or square rather than long and narrow. This maximizes response to light and moisture regimes. Areas will usually range in size from 10 to 40 acres. If areas larger than 40 acres are treated, islands of vegetation will be left for resting areas and escape cover. Edges will be left irregular. All aspen will be felled as this will encourage coppice or root suckering. If birch is a desired regeneration species, 7-10 seed trees per acre will be left. A similar number of snag trees will be left for those wildlife species that require them. Residual trees will be left in small patches where possible to minimize wind-throw. Patches of forest should be left adjacent to ponds and wetlands as well as calving areas, and logging or other human disturbance should be minimized during calving season. For

moose calving area locations, see Figure 4-2a. No logging will be done within 1/4 mile of known, occupied bear or wolf den sites or within 300 feet of eagle or goshawk aeries. No logging will be done within 100 feet, and only selective logging will be done within 300 feet, of lakes or anadromous streams.

It is critical to maintain a mix of various seral stages, old growth, and most importantly, travel corridors between these areas. Many forest species, such as lynx and wolves, rely on early seral stages for prey and food, and old-growth areas for denning and security.

10-5a(3) Forest Wildlife Habitat Identification, Evaluation, and Management

Forest wildlife habitat management on Elmendorf AFB will focus on the following strategies:

- ▶ Habitat improvement areas will be selected primarily based on their status so far as impact and disturbance by humans
- ▶ Secondary selection criteria will be the optimal distribution of habitat based on landscape ecology parameters such as patch size and connectivity
- ▶ Identify habitat selection areas based on the above two selection criteria as well as GIS analysis of the following factors:
 - Identify high quality browse areas (those with a high percentage of willow and birch/aspen/cottonwood less than 25 years in age)
 - Identify areas of low browse quality
 - Identify aquatic feeding areas, calving areas, denning areas, travel corridors
 - Identify areas with slope greater than 20%, high densities of blue joint grass, or human-wildlife conflict concerns, and eliminate these areas from consideration
- ▶ Using the above information, select habitat improvement sites and schedule habitat improvement projects

10-5b Waterfowl

Waterfowl habitat management is of two types—that designed to improve habitat, and that designed to remove or make habitat less useful. Habitat for loons is enhanced by placement of artificial nesting platforms on several base lakes. Waterfowl, and in particular, goose habitat, is reduced around the airfield and golf course (LMUs 5 & 6) as part of the BASH program. Grass is allowed to grow along the flightline to discourage geese from roosting, some grass species known to be unpalatable to geese are planted, and grassy fields are broken up by planting trees to discourage use by geese. Where possible, habitat losses associated with these activities will be mitigated off-site in areas where human conflicts are not an issue. More detail concerning this program can be found in the 3rd Wing BASH Operations Plan.

10-5c Other Birds and Mammals

Habitat for other terrestrial species is managed primarily by managing forests and wetlands for biodiversity.

10-6 Wildlife Conflict Issues and Management

10-6a Wildlife Conflict Overview

Wildlife conflict issues are extremely common on Elmendorf AFB. Wildlife is found in close proximity to large numbers of people, facilities, and developments. As development continues and remaining



Bear sightings are common on Elmendorf AFB.

pockets of vegetation close to humans are cleared, wildlife-human conflicts are likely to increase.

Recognizing the unique nature of human-wildlife conflicts in the Anchorage area, the ADF&G initiated a planning program for the Anchorage area in 1996 called “*Living with Wildlife*.” Two of the stated goals of this program were to “*optimize human-wildlife interactions (positive and negative) within the Municipality of Anchorage, and to integrate wildlife issues into land planning and decision-making process within the Municipality.*” Elmendorf AFB is a member of this planning group and has similar goals. Other key members include Fort Richardson, ADF&G, the Municipality of Anchorage, and other land and natural resource management agencies.

10-6b Bird Aircraft Strike Hazard (BASH) Program

The most serious wildlife-human conflict issue on the installation is that of bird-aircraft strikes. In September of 1995 an E-3 Airborne Warning aircraft with 24 persons on board crashed and burned on take-off. There were no survivors. Post crash investigation revealed that ingestion of four geese forced two engines to shut down, causing the crash. Since that time, BASH reduction programs have been substantially expanded.

The BASH program consists of 4 sub-programs:

- ▶ Bird dispersal
- ▶ Habitat change
- ▶ Reduction of goose populations
- ▶ Research related to the first three management programs

Dispersal Teams are formed during the migratory season, and are responsible for keeping the airfield and the surrounding Bird Exclusion Zone (LMU 6) clear of birds. Both non-lethal and lethal methods are used as required. Details of these procedures may be found in OPLAN 127-15. Elmendorf AFB also entered into agreements with USDA Wildlife Services and the Natural Resources Conservation Service (NRCS) to provide technical support and conduct evaluations of habitat around the airfield. Changes were made in the types of grass planted

near the airfield (less palatable species are now planted) as well as adjustments in mowing schedules, which allowed the grass to grow higher to discourage geese.

The USDA's National Wildlife Research Center was contracted to conduct telemetry studies to help determine goose movement patterns in the Anchorage area. A joint-agency task force was formed to conduct goose management in the Anchorage area. In keeping with recommendations made by this task force (Crowley et al. 1997), some geese were translocated and the remaining geese near the airfield are hazed and, as a last resort, shot. These activities were conducted under a depredation permit issued to Elmendorf AFB by the USFWS and ADF&G.

Research and adjustment in management techniques for BASH reduction continues, and will remain a high priority tasking for the Natural Resources Office and the entire 3rd Wing.

Current management of BASH programs focuses on vigorous harassment of birds within the zone, with the hope that habitat changes currently underway will eventually decrease the need for bird dispersal operations. Beginning in 2000, bird dispersal and harassment operations will be turned over to the USDA's Wildlife Services Office, with an Air Force BASH Officer/NCO and a DOD wildlife biologist providing direction and assistance.

10-6c Bear Management Program

Elmendorf AFB has an extensive bear-human conflict management program in place [See also Section 10-4a(2)]. The focus of the bear management program is an aggressive combination of public education, garbage management, and enforcement. All military conservation agents receive bear safety and nuisance bear procedure training. Selected agents, along with the base biologist, ADF&G biologists, and personnel from Fort Richardson, form a Joint-Agency Bear Response Team, which handles nuisance bear problems, responds to reports of bears in developed areas, and conducts aversive conditioning, translocation, and other bear management efforts. Elmendorf AFB's policy has been to place radio collars on all brown bears on base, in order to track locations and head off potentially lethal conflicts. Black bears that are consistent nuisances are

captured, marked, and collared, and are subjected to various non-lethal and lethal control measures based on their history, sex, and reproductive status. All bears found in nuisance situations are captured and marked if possible, and reports of behavior submitted. Nuisance behavior and location is tracked by database. Bears found in housing or developed areas are hazed out of the area, if possible, or tranquilized and moved to the north portion of the base.

A preliminary report on the first seven years of this aggressive management program was completed in 1997 (Bostick 1997). It made the following recommendations concerning bear management on military lands in the Anchorage area, including Elmendorf AFB:

- (1) Increased efforts at public education, garbage management, and enforcement of feeding laws
- (2) Modify dumpsters in critical areas (such as recreation sites or golf course) to make more bear resistant
- (3) Apply risk classifications for known nuisance bears and track behavior
- (4) Identify worst offenders and target for elimination by translocation (black and brown bears) or capture and euthanasia (black bears)
- (5) Consider instituting a limited archery bear hunt if bear populations on the two bases exceed 40. Hunt could be conducted concurrent with the archery moose hunt to take advantage of moose carcasses
- (6) Manage bears jointly with ADF&G and Fort Richardson. Establish a Joint Advisory Board to make recommendations on an annual basis

Bear-human conflicts have also been addressed in a Joint-Agency Bear Management Memorandum of Agreement (MOA), approved in 1995, and procedures are reviewed during the annual meeting of the Joint-Agency Advisory Board. Recent changes in nuisance bear policy by ADF&G have not yet been included in base management efforts. Although it is beyond the scope of this document, it is recommended that a detailed bear management plan be prepared for the base, utilizing the Joint Agency Bear Management MOA, ADF&G policies, and the

results of the various bear studies as a basis for planning.

10-6d Urban Moose Conflict Management

Due to the frequency of moose wandering through the developed portion of the base, they present a threat to life and property of base personnel. Military conservation agents and occasionally Security Forces personnel respond to calls from quarter's occupants and chase moose away when there is a clear threat to personnel or dependents. Critical times of the year are November through late March, with severity increasing during the later portion of this period. Agents attempt to haze moose from housing areas using noisemakers and occasionally rubber bullets. Aversive conditioning of moose is difficult and potentially dangerous, and appears to have limited effect on their behavior. Moose have severely injured dogs on the installation, chased people, and become aggressive with responding agents. Several individuals in the Anchorage area have been severely injured or killed by moose. Due to these factors and concern for public safety, one or two animals have to be destroyed each winter due to excessive aggressiveness.

Property damage also occurs as a result of moose-vehicle accidents. Even at the relatively slow speeds posted on the base, three to six accidents occur each year. These accidents happen primarily during the winter months when darkness and road conditions reduce visibility and make stopping more difficult. Vehicle damage can range anywhere from slight to total. The Alaska Department of Transportation and Public Facilities estimates that each moose/vehicle collision in rural Alaska averages \$15,000 in property damage, medical bills, etc. (Sinnott 1995b). The moose sometimes suffer minor injuries, but more often are killed or suffer serious injuries and have to be destroyed by Natural Resources Office personnel. Road-killed moose are the property of the state. The Alaska Department of Public Safety maintains a list of charitable organizations in the community, which are contacted on a rotating basis to salvage the meat.

Prevention of future moose-human conflicts will focus on habitat improvement designed to draw moose from conflict areas, and stepped up efforts

at public education concerning critical times of the year, problems created by feeding moose, and how to prevent and react to conflict situations. Other possible options include testing of moose repellants, and possibly population reductions. The base landscape plan and/or urban forestry plan should specify approved shrubs and plants for landscaping that are low in moose-palatability. A list of moose-resistant species is currently being developed by the Municipality of Anchorage. Additionally, at least some moose habitat enhancement efforts should be located where they are likely to draw moose from the airfield and residential areas. Moose archery hunting should also help to reduce moose problems during the following winter by eliminating moose that are habituated to people.

So far as education and enforcement, several notices are placed in the base newspaper and the base bulletin each year to make personnel aware of the potential hazard moose represent. Increased enforcement of feeding regulations is also recommended, as most aggressive moose have a history of having been hand fed.

10-6e Beaver

Beaver cause problems at the base golf course by plugging culverts and cutting trees. The plugging of culverts has resulted in the flooding of some greens and roads, causing a substantial increase in maintenance costs. Partially cut trees along cart paths and fairways cause safety concerns due to their susceptibility to wind-throw. There are also occasional problems at recreation areas and lakes on the northern part of the base.

Beaver conflict management will include both preventative measures and population control. Possible preventative measures include painting or fencing large trees near beaver lodges and installation of beaver resistant culverts and dams, particularly along the golf course. Population control will focus primarily along the developed lands bordering Ship Creek. Because of the excessive cost in labor time to live-trap problem beavers, use of killing traps is the preferred method of removal. The ADF&G will issue the base depredation permits for the removal of beaver, as their population in the Anchorage area is very healthy. All trapping is presently performed

by Military Conservation Agents, but consideration will be given to opening a limited recreational trapping program if significant numbers of beaver continue to be taken under depredation permits each year.

10-6f Wild and Feral Canids

Foxes and coyotes are occasionally a problem in housing areas. These problems are often caused by feeding these animals, either deliberately or inadvertently. Numerous pets have been killed by foxes and coyotes, and one child injured by a coyote. Conflict management includes public education concerning feeding wildlife, aversive conditioning, and removal of offending animals. Attempts have been made to live-trap offenders with limited success. Leg-hold traps and snares cannot be used in most of the problem area due to safety considerations. Some problem animals have been captured and relocated, however, relocations of less than 10 miles almost always result in the animal coming back. Problem animals will be moved at least 20 miles the first time they are captured. Individual offenders that are captured a second time in nuisance situations should be euthanized. Translocation or euthanasia of foxes or coyotes requires approval by ADF&G.

Feral dogs are occasionally a problem. When possible, they are captured and turned in to the Anchorage Animal Control facility or Fort Richardson Veterinary Services.

10-6g Birds

The construction of nests by cliff swallows on base quarters creates an annual nuisance and health concern. Their droppings are unsightly and are a growth medium for fungi that cause a respiratory infection known as histoplasmosis. The swallows also are heavily infested with mites that enter the quarters when the birds leave the nest. Although the mites do not attack people, their presence causes considerable distress to quarter's occupants.

Control measures include building modifications, removal of food and nesting habitat, and direct removal in the spring during nest construction, with the pest management personnel knocking down nest concentrations under authority of a permit from the

USFWS. This is the most effective means of reducing the problem, but has met with criticism when eggs or young are destroyed. Over the next five years, attempts will be made to place nesting platforms to draw swallows away from quarters where they have concentrated in past years. Several different designs will be experimented with to find one that is attractive to the birds.

Gulls are also an occasional problem during nesting season, particularly around warehouses and open bay buildings. Pigeons are also a problem in these areas. They are usually dealt with by personnel from the 3rd Civil Engineer Squadron's Pest Management section.

10-6h Pest Management

Personnel from the 3rd CES Pest Management section are responsible for dealing with small vertebrate and invertebrate pests, as well as weed and insect control. The base Integrated Pest Management Plan is approved by Environmental Branch personnel as well as the base wildlife biologist.

10-7 Aquatic Systems and Fisheries Management

10-7a Objectives

- ▶ Improve health and diversity of aquatic ecosystems
- ▶ Restore damaged or degraded fish habitat
- ▶ Minimize impacts to and emphasize wild, self-sustaining fish populations
- ▶ Implement objectives of Executive Order 12962, including:
 - Increase access for recreational fisheries
 - Provide fish passage for anadromous species
 - Restore native fisheries and improve fish habitat

10-7b Management Strategies

- ▶ Conduct study of Six-Mile system productivity and map fisheries habitat

- ▶ Conduct study to determine total take of salmon from predation, fishing, and poaching
- ▶ Protect fish habitat on Ship Creek through bank stabilization project
- ▶ Monitor fishery through creel checks and expand to include saltwater fishery
- ▶ Plant fish only in systems without self-sustaining wild populations
- ▶ Use results of lake stocking study and other monitoring efforts to manipulate stocking schedules
- ▶ Conduct habitat improvement projects such as improving trout and salmon fry rearing habitat

10-7c Aquatic Ecology and Ecosystem Management

10-7c(1) Six-Mile Lake System

Upper and Lower Six-Mile lakes, and the one-mile stretch of Six-Mile Creek that connects them to the Cook Inlet, are and will be managed as one system. This anadromous system is home to annual runs of sockeye salmon, pink salmon, and small numbers of silver salmon each year. It is also home to rainbow trout and three-spine stickleback. Lower Six-Mile Lake is the only one of the base lakes that is not stocked (Upper Six-Mile Lake is stocked occasionally). These lakes are managed as a trophy trout fishery, and rainbows to 27 inches have been taken from this system. Trout populations in both lakes appear to be stable, and adequate spawning takes place. Management efforts will focus on improving data on salmon runs and lake productivity, and improving spawning habitat and passageways for migratory salmon.

10-7c(2) Landlocked Lakes and Ponds

Landlocked lakes include Spring, Hillberg, Fish and Triangle lakes. Green Lake is also included, although it has a small stream connecting it to the ocean. This stream is very shallow and has not supported anadromous fish in recent times. These lakes vary in size between 3 and 124 acres [See Table 4-1d(4)]. Most are relatively shallow. Fish Lake has been known to

completely freeze in the winter. Winter oxygen levels and lack of spawning habitat are problems in all the kettle lakes, and limits trout. For this reason, these lakes are routinely stocked with fish. Other bodies of water, which have only small fish, include the golf course cooling pond and Oval Lake.

10-7c(3) Streams

Ship Creek. This creek is the only one on base that runs through developed lands. Soil erosion is a constant problem (See Section 7-5b). The dam at the Ship Creek hatchery, just below where the stream crosses onto Elmendorf AFB, prevents most (but not all) salmon from moving upstream onto the base. Small numbers of king (chinook) and silver (coho) salmon do pass this dam and spawn successfully in the stretch of stream that runs through the golf course. Upstream of the golf course, fish are limited to small rainbow trout and possible Dolly Varden. Upstream activities on Chugach State Park and Fort Richardson are critical to the health of this ecosystem. Discussions concerning possible removal of the upstream (Fort Richardson) dam are taking place. Should this become a reality, this ecosystem will likely face considerable changes.

Six-Mile Creek. This one-mile stretch of stream connects Lower Six-Mile Lake with the Cook Inlet. Management activities include salmon censuses, conducted annually since 1989, periodic clearing of obstructions, and limited access to protect from erosion. No fishing is allowed in this stream upstream from the high tide marker at the mouth of the creek where it runs into the Cook Inlet.

EOD Creek. EOD Creek is home to a small run of silver or coho salmon, as smolt have been found in this stream. Little further information is available at this time. This tiny creek is closed to fishing.

10-7c(4) Saltwater Shoreline

This eight-mile stretch of shoreline falls under state jurisdiction below the tide line for management purposes. Air Force management activities are limited to enforcement of saltwater fishing regulations and protection of marine mammals and salmon habitat.

10-7d Fisheries Management

10-7d(1) Anadromous Fisheries

Both Ship Creek and the Six-Mile system support anadromous fisheries. In an effort to obtain better information on the size of salmon runs returning to the Six-Mile drainage, annual salmon counts were initiated in 1988. Counts were conducted by establishing a weir in the creek, which blocked salmon migration. The fish behind the weir were netted, counted and passed to the upstream side on a daily basis at the height of the run. Counts were conducted every other day when the number of fish in the trap averaged less than 20 fish per day. Beginning in 1995, a fish trap type of counter was installed. This reduced the necessity of handling fish and resulting fish mortality. A fish ladder is in place where the creek enters Lower Six-Mile Lake. A new and improved culvert between Lower and Upper Six-Mile Lakes was installed in 1996. Salmon numbers in the Six-Mile drainage have increased significantly over the past five years and are expected to continue this trend, subject to species-related annual variations. Increasing numbers of salmon are fully utilizing all existing spawning beds in the lakes. Late arriving salmon have been observed reworking spawning beds used by the early arriving salmon. This results in the destruction of the earlier eggs, reducing the number of salmon fry produced by the run. Over-spawning by returning salmon may cause periodic reductions in the number of fish in future salmon runs. Most spawning takes place in Upper Six-Mile Lake and a small portion of Lower Six-Mile near the culvert.

ADF&G fishery enhancement programs for silver and king salmon have resulted in increased numbers of fish returns to Ship Creek. However, this has only a minor effect on Elmendorf AFB, due to the presence of the fish barrier at the state hatchery, which prevents all but a few salmon from migrating onto the base.

10-7d(2) Native Trout Fisheries

The trout fishery in the Six-Mile system appears to be stable, and apparently has adequate numbers and size of fish and some spawning habitat. However, little data exists, and more study of this system will be considered. Trout fisheries in other lakes depend

on the stocking program, as little spawning habitat exists in those lakes. Occasionally larger fish are caught, but it is believed that the majority of stocked fish are caught each year.

10-7d(3) Stocking Program

The stocking program for rainbow trout has been conducted for the base as part of the state-wide program run by the ADF&G. Stocking numbers are based on state-estimated carrying capacity and estimates of fishing pressure. The stocking program has changed greatly over the years. Current practice is to stock the landlocked lakes with about 6000 six-to-eight inch rainbow trout in late May. Several lakes are then selected for fall stocking of about 4000 landlocked salmon, which bite better under the ice. It should be possible to alleviate pressure on the trout fishery by manipulating stocking schedules. Although it was not possible to change the timing of the stocking program because of ADF&G hatchery scheduling, this objective can be partially completed by changing the distribution of the stocking allotment among the lakes. A current study is being done on the effects of lake stocking. Results of this and other monitoring efforts should be used to determine the best way to manipulate stocking schedules. There has also been some discussion of the feasibility of stocking a small number of rainbow trout in Ship Creek to supplement native populations as a means of improving the fishery.

The stocking program is operated at no cost to the Air Force through a cooperative agreement between the Air Force, the USFWS and the ADF&G. There has been some concern on the part of the state recently that public fishing will no longer be allowed on Elmendorf AFB due to security considerations. A recent agreement was reached with ADF&G to ensure continued stocking of base lakes in exchange for water supply for the Elmendorf AFB fish hatchery.

10-7e Fishing Program

10-7e(1) Freshwater Fishing

Most of Elmendorf AFB's lakes, plus portions of Ship Creek, are open to year-round fishing under state regulations and bag limits. Six-Mile and EOD creeks are closed to fishing. A state license is re-

quired, and base licenses were instituted in 1999. No fee is currently required for the base license, but public access is based on the current security status of the base. Access is only allowed during normal or routine security operations. Military Conservation Agents conduct occasional creel checks. These checks, taken in conjunction with fishing surveys mailed out by ADF&G, should eventually give adequate information on fishing use and harvest levels.

10-7e(2) Saltwater Fishing

The entire stretch of saltwater shoreline is open to fishing under state saltwater fishing regulations. Fishing at the mouth of Six-Mile Creek is legal up to the high water marker jointly installed by the state and the Natural Resources Office. Fishing at this location has grown increasingly popular in recent years due to the increasing salmon run. During the peak of the run it is not uncommon to find 100 or more anglers in this 200-yard stretch of beach. Exact numbers of salmon harvested here are unknown. The Natural Resources Office will investigate a better or more intense method of sampling in order to gather this information.

10-7f Proposed Habitat Evaluation and Improvements

10-7f(1) Trout and Salmon Habitat Mapping

Fish habitat locations and status are relatively unknown. However, the requirement for stocking of

base lakes to maintain fisheries, as well as visual observations of salmon re-using spawning beds, suggests that habitat is inadequate or limiting at this time. A project to map and evaluate fisheries habitat on base is therefore the necessary first step in the habitat improvement process.

10-7f(2) Habitat Improvement

The focus of fish habitat improvements will be on increasing the amount of trout and salmon fry rearing habitat available in base lakes and streams. For salmon with a freshwater rearing phase, juvenile rearing habitat is most often the limiting factor. Winter temperatures and low water can also be factors. Improving salmon habitat in the Six-Mile Creek drainage could allow both trout and salmon numbers to increase to a new carrying capacity level. Prior to conducting habitat improvement, an inventory of fish habitat needs to be completed. This project has been submitted for funding. Once the survey has been completed, then habitat improvement projects can be planned and scheduled. Primary criteria for selection will be those areas degraded due to human impacts. These improvement projects will eventually increase salmon fishing opportunities on base.



Photo: D.D. Wilcox

11. OUTDOOR RECREATION, ENVIRONMENTAL EDUCATION, AND PUBLIC RELATIONS

11-1 Management Objectives

- ▶ Provide quality outdoor recreation opportunities to support the military mission while maintaining ecosystem health and sustainability
- ▶ Provide a diversity of natural resources based outdoor recreation opportunities for the base residents, and allow public access for recreation where compatible with mission requirements and recreational carrying capacity
- ▶ Maintain and improve existing outdoor recreation facilities and opportunities
- ▶ Educate about the natural world as a way to ensure wise resource use
- ▶ Conduct an active public relations and education program

11-2 Management Strategies

11-2a Recreation Activities and Facilities

- ▶ Develop general and special group tent camping areas
- ▶ Develop day use facility at Six-Mile Lake
- ▶ Develop handicapped access facilities

- ▶ Improve facilities at recreation area at mouth of Six Mile Creek
- ▶ Construct boat docks at Hillberg and Upper or Lower Six-Mile lakes
- ▶ Repair recreation facilities such as boat docks and kiosks
- ▶ Implement permit and user fee system
- ▶ Build permanent restroom facilities at key areas
- ▶ Establish areas for those who wish to try gold panning

11-2b Trail Management

- ▶ Develop multi-use trail system
- ▶ De-emphasize motorized recreation in summer
- ▶ Establish a trail management committee made up of managers, representatives from user groups, and agencies
- ▶ Develop gated access management system

11-2c Interpretation and Outdoor Education



Staff biologist discusses the life history of the beaver with a fifth grade class.

- ▶ Develop existing trail into a nature trail suitable for family use
- ▶ Develop a weekly learn-to-fish program that is targeted at minorities and single parent households, including Mountain View community

- ▶ Improve interpretive program through expansion of displays and development of written tour guides for museum and nature trail
- ▶ Develop auto tour guide
- ▶ Develop and expand natural resources volunteer programs as part of an overall effort to promote appreciation of nature and natural resources

11-3 Public Access

Access to base recreational facilities is divided into three categories: A, B, and C.

Category A is open to the general public. At the present time, this includes only hunting and fishing. It should be noted, however, that access to the general public is closed for security reasons at any time the base is in a heightened security posture. (only the moose hunt, other activities must have sponsor)

Category B is open to DOD employees, military personnel, and their guests. This category includes most outdoor recreation activities such as trails, snowmobiling, camping, picnicking, and nature-related and gathering activities (including woodcutting).

Category C is open to military personnel and retirees only. This category includes most facilities run by Morale, Welfare, and Recreation (MWR), such as use of recreation chalets at the various lakes, use of the FAMCAMP facility, and use of the Seward Recreation Camp.

11-4 Outdoor Recreation Facilities, Activities, and Resources

11-4a General Recreation Facilities

General recreation facilities on Elmendorf AFB include two existing campgrounds, one picnic area, and several winter and water sports areas, including Green Lake Recreation Area and Hillberg Recreation and Ski Area (Figure 11-4a). Table 11-4a summarizes information about these sites. Facili-

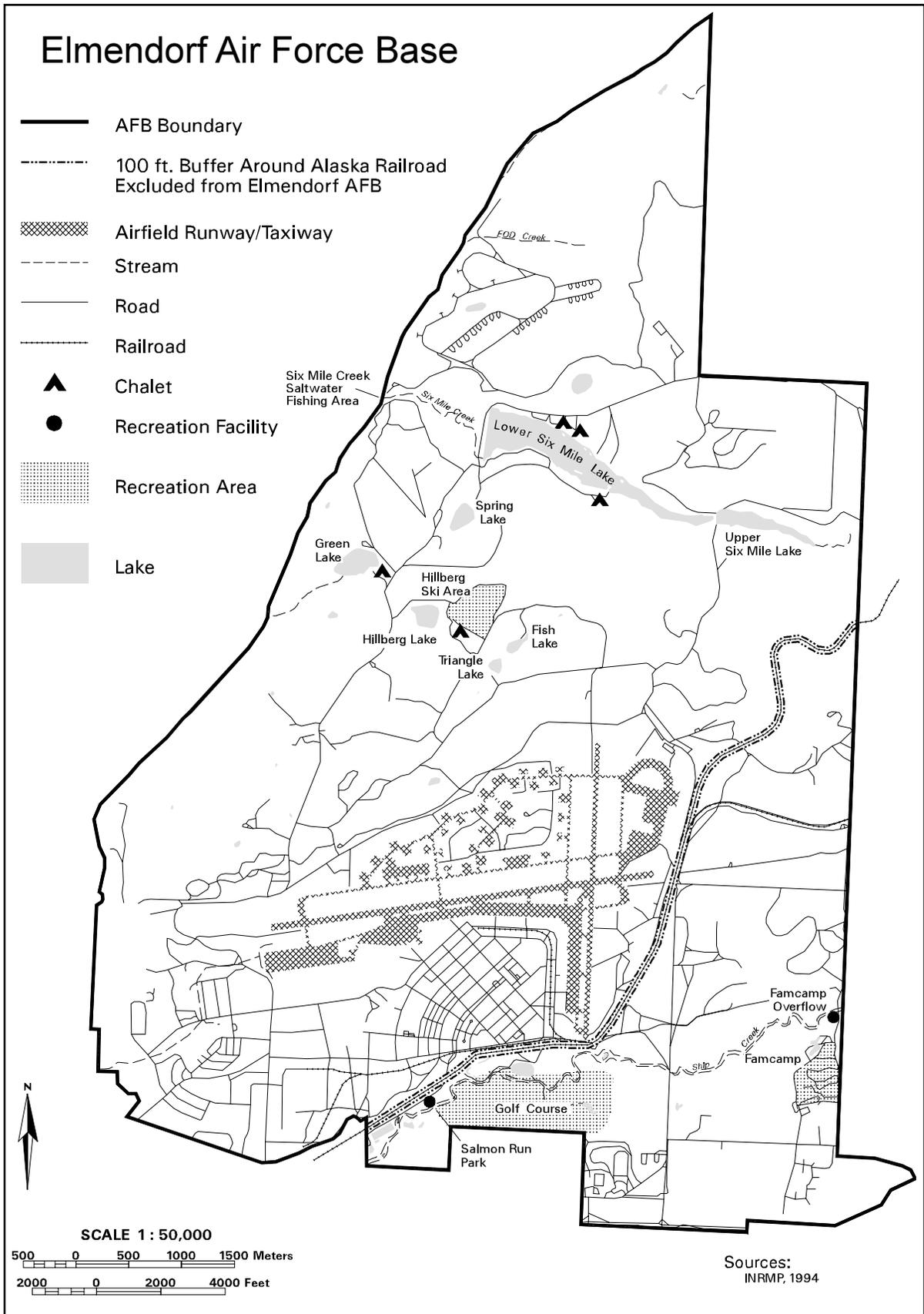


Figure 11-4a. Recreation Facilities Located on Elmendorf Air Force Base, Alaska.

Table 11-4a. General Outdoor Recreation Areas for Elmendorf AFB, Alaska.

Development Type	Acres	Carrying Units	Degree of Capacity	Public Access
Campgrounds				
FAMCAMP	10.0	40	20/Acre	Class C
Picnic Sites				
Family	20.0	7	25/Acre	Class B
Group (Chalets)	3.0	6	100/Acre	Class B
Winter Sports Sites				
Skating	2.0	2	25/Acre	Class B
Sledding	2.0	2	20/Acre	Class B
Skiing				
Downhill	100.0	1	30/Acre	Class B
Cross-Country	100.0	1	20/Acre	Class B
Dog Sledding	150.0	1	1/10 Acres	Class B
Snowmachine Areas		8	1/10 Acres	Class B
Boating				
Motorized	123.9	1	1/10 Acres	Class A
Non-Motorized	209.2	7	1/10 Acres	Class A
Sailing	123.9	1	1/10 Acres	Class A
Other				
Golf Course	30	5	unknown	Class B

ties listed include those run by both MWR and the Natural Resources Office.

11-4b Outdoor Recreation Activities and Resources

11-4b(1) Wildlife-Related Activities

Wildlife-related activities include fishing, hunting, wildlife viewing and photography. Fishing is extremely popular year-round. Base lakes are stocked with rainbow trout in the summer and landlocked salmon in the winter for ice fishing. The saltwater salmon fishing season, which extends from about 15 July to 1 September, draws numerous anglers from both the base community and the general public. However, due to the heightened security of the base, it is not open to the general public without a sponsor.

Hunting is currently limited to an archery-only draw hunt for moose. This hunt is very popular with local archers, as it has the highest success rate in the state for archers. The Natural Resources Office is looking at expanding this hunt in terms of numbers of hunters and length of season, and possibly adding archery-only small game hunting (See Chapter 10).

Elmendorf AFB's hunting and fishing regulations are found in Wing Instruction 32-7001, *Conservation of Natural Resources*. Regulations conform to

state laws, with some additional and more restrictive regulations for base usage.

Wildlife viewing and photography are popular in the summer. Many base residents cruise the back roads in the evening hoping for a glimpse of a moose or bear. A Watchable Wildlife site is located at the entrance to Lower Six-Mile Lake, where visitors can see salmon spawning from July through September. A similar site is planned for Upper Six-Mile Lake. Another possibility for a Watchable Wildlife site is a moose viewing area overlooking a browse improvement project.

11-4b(2) Water Sports Activities

Water resources on Elmendorf AFB include seven natural lakes and ponds, three man-made impoundments, three streams, and eight miles of saltwater shoreline [See Table 4-1d(4)]. Water-related activities include fishing, motorized and non-motorized boating, and swimming. Additionally, most outdoor recreation facilities such as campgrounds, chalets, and picnic areas are found around the lakes and impoundments. Both fishing and boating are very popular during the summer. Canoes and float tubes are allowed on all the base lakes, as well as non-motorized boating, including electric trolling motors. Motorized boating is currently allowed only on Lower Six-Mile Lake, with a 10 HP limit.

11-4b(3) Winter Sports Activities

Winter sports activities include skating, cross-country and downhill skiing, sledding, ice fishing, dog mushing, and snowmobiling. MWR maintains downhill and cross-country facilities at Hillberg Lake Recreation Area, and cross-country facilities at Eagle Glen Golf Course. Areas for ice skating on Hillberg, and occasionally Green lakes are cleared of snow, and several sledding hills are scattered through the housing areas. Ice fishing is allowed on most base lakes from mid-November through late March (see *Wildlife- Related Activities*). Dog mushing is allowed by permit only, primarily on Knik Bluff Trail (for snowmobiling, see *Trail-Related Activities*).

11-4b(4) Nature and Gathering Activities

Common nature activities include birdwatching, nature and wildlife photography, and rock collecting. All are popular with base residents, and no permit is required. Gathering activities include firewood, berry and mushroom picking, sapling digging (for landscaping) and Christmas tree cutting. Permits are required for wood and Christmas tree cutting and sapling digging. Wood and Christmas tree cutting are the most popular activities. In peak years, as many as 800 families participate in the Christmas tree cutting program. Permits are sold beginning the Monday after Thanksgiving, and maps and cutting instructions are given out with the permit. Families are directed to areas with many small spruce trees, which are in need of thinning. Future plans included an established tree plantation to augment or replace this program.

11-4b(5) Trail-Related Activities

Trail-related activities include snowmobiling, off-roading with four-wheelers, hiking, snowshoeing, horseback riding, and cross-country skiing. Elmendorf AFB has an extensive trail system including Knik Bluff Trail, Upper Six-Mile Trail, Spring Lake Trail, the All Terrain Vehicle (ATV) trail, and an extensive winter snowmobile trail system. Summer trails, with the exception of the ATV trail, are non-motorized, multiple-use trails. Most trails are also open during the winter, but, with the exception of the snowmobile trail system, are not maintained.

Snowmobiling is a popular winter trail activity on Elmendorf AFB. The Natural Resources Office marks and maintains over 40 miles of trails, in addition to the base lakes where snowmobiling is allowed. Snowmobile races are occasionally held on Green Lake, which is cleared of snow for that purpose. Snowmobile trails are much more extensive than the summertime ORV trails, since wetlands are frozen and damage by snowmobiles is minimal.

The base snowmobile club conducts initial hands-on training for snowmobilers and safety-inspects their machines. The Natural Resources Office then issues an Outdoor Recreation Permit (Wing Form 35). Trails are maintained jointly by the Natural Resources Office, Civil Engineering's Heavy Equipment section, and the base snowmobile club, which holds several volunteer weekends each year for this purpose.

11-4b(6) Camping/Special Group Activities

Camping on Elmendorf AFB has in the past been restricted to special groups such as Boy and Girl Scouts and church groups. The Boy Scouts have been granted an easement to develop a Boy Scout-only campground near Triangle Lake. The Girl Scouts have used a small (five sites) campground near Green Lake, but have not camped there recently. This campground could easily be renovated and used as a general purpose tent camping area, as it is already equipped with picnic tables and fire pits or grills.

11-5 Management of Outdoor Recreation and Recreationists

11-5a Potential Changes or Additions to Current Outdoor Recreation Programs

- (1) Due to low usage (less than 20 permits issued/year) and limited potential for expansion due to wetlands, the Natural Resources Office is considering closing the ATV trail and converting it to a multi-use trail for hiking, mountain biking, and possibly development of a portion as a nature trail (Figure 11-5a). This trail could be used to connect other multi-use trails, such

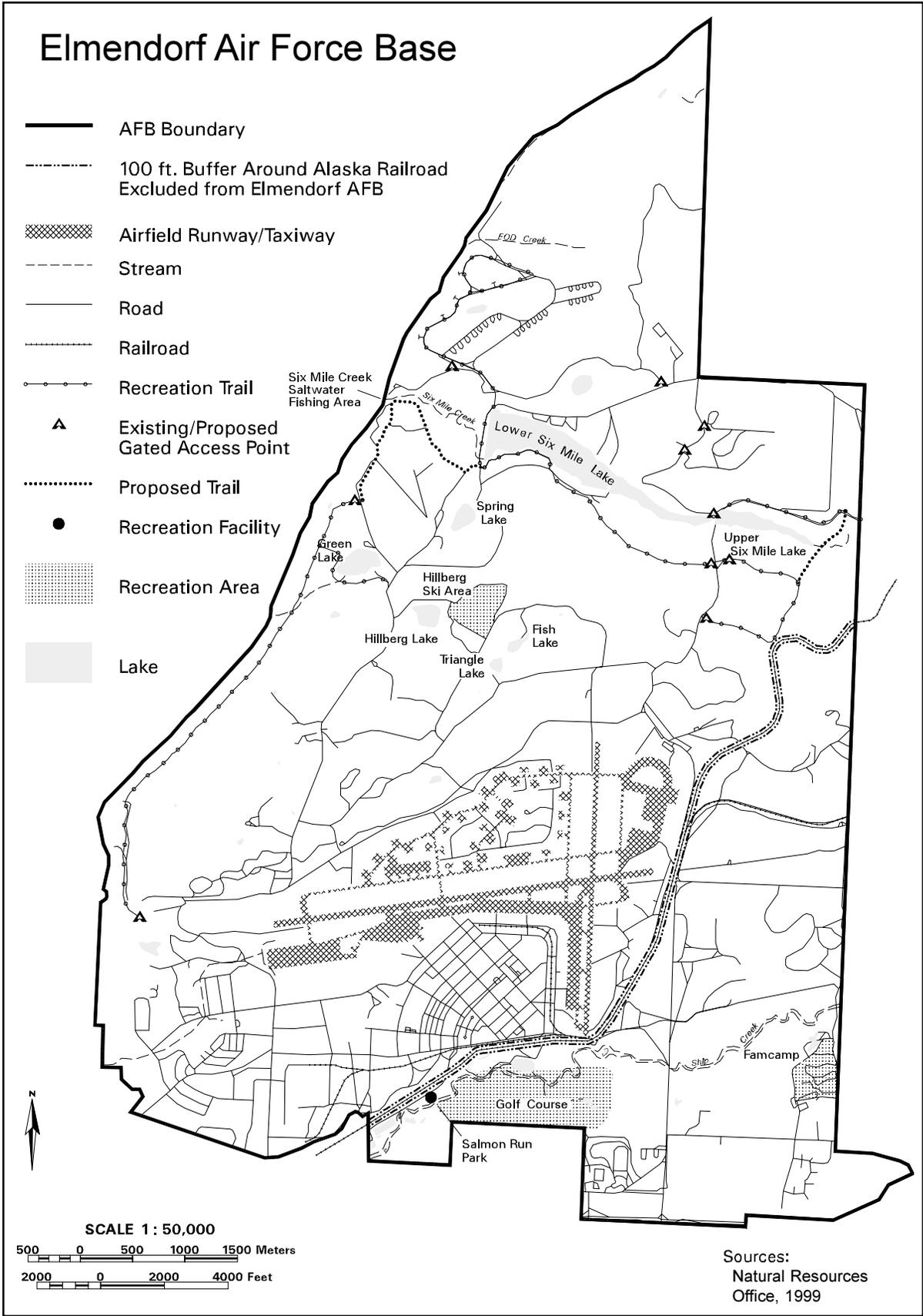


Figure 11-5a. Year-Round Recreational Trails Located on Elmendorf Air Force Base, Alaska.

as Upper Six-Mile and Knik Bluff trails into a coherent trail system. It could still be used as part of the winter snowmobile trail system without serious conflicts with other users. This would also alleviate damage caused by four-wheelers that currently use chains in the winter and operate illegally in the spring, damaging wetlands and rutting trails. The trail could still be used for limited, duty-related four-wheeling by MCAs and trail repair crews.

- (2) The Natural Resources Office will consider a project to connect the portion of the ATV trail on the east side of Talley Avenue to the Upper Six-Mile Lake trail. This would require about a ¼ mile section of trail, which could be easily constructed by following the high ground on the east side of Upper Six-Mile Lake. This trail extension would create a two-mile trail loop on fairly level ground, which would have great potential to be developed into a nature trail suitable for families with children. The presence of Upper Six-Mile Lake, related wildlife resources, old-growth and young forest, and future forest management and browse improvement projects, would all provide outstanding opportunities for interpretation. If this project is not feasible, then the Natural Resources Office will consider upgrading Knik Bluff Trail into a nature/historic interpretive trail.
- (3) Renovate the Girl Scout campground at Green Lake and open it for general tent camping, with the Scouts allowed to reserve usage in advance. Install pit-type toilet, a limited (five vehicle) parking area and walk-in access for tent camping only.
- (4) Develop day-use facilities with parking and pit toilets at Lower Six-Mile Lake and the mouth of Six-Mile Creek. Limit size of facilities consistent with fishing and outdoor recreation resources available at each site.
- (5) Construct docks at Lower and Upper Six-Mile lakes. Consider making handicapped accessible facilities.
- (6) Establish gated access points for the EOD Creek turnoff at Six-Mile Munitions, the Oval Lake access road, ATV trailheads, and hiking

trailheads. These gates will prevent unauthorized access by four-wheelers, while allowing foot and bicycle traffic. Gates should be locked, with key access available for enforcement and work crews who need access for duty purposes. This system is similar to that used on Fort Richardson, and should alleviate much of the illegal four-wheeling and damage currently taking place. Gates could be opened during the winter snowmobiling season when damage is unlikely.

- (7) Close Six-Mile Lake to motorized fishing, and establish wake control limits for floatplanes. Also eliminate the practice of issuing “engine-test permits,” which are routinely abused and create problems for non-motorized boating and waterfowl nesting.

11-5b Allowable Use Guidelines

Allowable use guidelines define maximum recreational usage rates for facilities and management areas. Usage rates vary by activity type. Table 11-5b describes the allowable use of the recreational facilities maintained by Elmendorf AFB.

11-6 Permits, User Fees, and Funding Issues

Currently, permits are required for off-road vehicle use (both four-wheeler and snowmobile), special group camping, fishing, hunting, firewood cutting, and some specialized activities such as dog mushing, Christmas tree cutting, and boat engine testing. Wing Forms 30 and 35 are used for issuing permits for these activities. Permits are issued at the Wildlife Museum during open hours. Fishing permits are also issued at the MWR Rental Office.

The only permits currently charged for are woodcutting and Christmas tree cutting. Elmendorf AFB is somewhat unique among Air Force bases in that it does not charge for hunting, fishing, or off-road vehicle permits. Most military bases do charge for such permits. With the exception of woodcutting, user fees are normally kept in a local fund, which is maintained by the base, and proceeds are put back into base natural resources programs such as trail

Table 11-5b. Allowable Use Guidelines for Elmendorf AFB, Alaska (From Richmond 1993).

Recreation Opportunity	Level of Use
Class I – Outdoor Recreation Areas	
Camping	Medium
Picnicking	High
Water Sports	Low
Winter Sports	Medium
Class II – Natural Environmental Areas	
Fishing	High
Nature Study	Medium
Hiking	Medium
Horseback Riding	Low
Snowmachining/ATV use	Medium
Cross-Country Skiing	Medium
Class III – Special Interest Area	
Botanical-Nature Study	Low
Geological Viewing	Medium
Scenic Viewing	Medium
Zoological Studies	Low
Historical	Medium

Allowable density based on level of use.

Low = less than 1 person per acre

Medium = 1 to 20 people per acre

High = Over 20 people per acre

maintenance, wildlife habitat and management programs, and fish stocking programs.

Given the increasing difficulty of funding these programs from other sources, Elmendorf AFB will investigate instituting a user fee program to help fund base natural resources management activities. Proposed fee structures and uses are detailed in Table 11-6. Once this system is instituted, it may be possible to have both the Natural Resources Office and MWR issue permits on some type of a cost-sharing basis.

11-7 Volunteer Programs

The Natural Resources Office has an extremely active Natural Resources Volunteer (NRV) program. Volunteers receive training, are issued equipment, and are covered for liability and workman's compensation. In return, they volunteer a minimum of 48 hours per year to assist in various natural resources projects and programs. In addition to the NRV program, where volunteers sign up individu-

ally, numerous groups such as Boy and Girl Scouts, school groups, clubs, and military organizations, are enlisted for various special projects. Volunteers work on projects in the following areas:

- ▶ Forest inventory
- ▶ Tree planting
- ▶ Wildlife habitat surveys and improvement projects
- ▶ Construction, upgrade, and repair of recreational facilities
- ▶ Trail maintenance and construction
- ▶ Museum display construction/repair
- ▶ Museum tour guide
- ▶ Adopt-a-lake program
- ▶ Adopt-a-road program

Table 11-6. Proposed Outdoor Recreation User Fee Schedule

Activity	Permit Required	Annual Fee	Proceeds Used For
Woodcutting	Yes	\$15 per cord 3 cord limit	Forest Management Costs, Seedlings
General Christmas Tree	Yes	\$5	Seedlings
Pruned Christmas Tree	Yes	\$10-\$20	Seedlings
Fishing	Yes	\$5	Fish Stocking, Habitat Improvement, Enforcement
Moose Hunting	Yes	\$100	Habitat Improvement, Enforcement
Snowmobile	Yes	\$10	Trail Maintenance, Enforcement
Dog Mushing	Yes	No Charge	
All other activities	No	No Charge	

11-8 Environmental Education and Interpretive Programs



The wildlife museum is the center of operations for the interpretive program.

The Wildlife Museum/Natural Resources Office has been the centerpiece of interpretative efforts for many years. Located in one of the base's oldest historic buildings, the museum offers wildlife and natural resources displays that include over 100 life-like mounted specimens, including all of the common species of birds, fish, and mammals found in Alaska. Displays of outdoor recreation opportunities, wildlife safety, and other natural and cultural resources topics are also located here. Tours are conducted by appointment, and over 20,000 people per year (1989-1997 average) participate. The museum is a key resource not only for the base community, but also for the Anchorage public schools, whose K-6th grade classes take tours on a regular basis. The museum is open daily, Monday through Saturday, for a total of 15 hours per week.

Because the museum is co-located with the Natural Resources Office, some of the personnel from the

Natural Resources Office are on hand to answer questions, issue natural resources permits, and provide informational literature. Additionally, volunteer tour guides are on hand to conduct the scheduled tours.

Other environmental education efforts include monthly articles on natural resources topics in the base newspaper, occasional interviews with local media, and special events such as Arbor Day tree planting, guided nature hikes for schools, Scouts, and church groups, and other activities. Military Conservation Agents also conduct monthly newcomer's briefings, as well as wildlife safety briefings.

One area in need of improvement is written tour guides. A written tour guide of the museum will enhance its value for the many that cannot participate in group tours. Another worthwhile project will be to develop written tour guides for the nature trail (when developed), and an auto tour guide, which could be picked up at the museum before taking an auto tour of the undeveloped portions of the base.

A second area is professional staffing. A part or full-time museum attendant would allow the museum to be open longer hours. An attendant could double as interpreter and customer service technician, issuing permits and collecting fees. A volunteer or seasonal technician could fill this position.

Finally, some mechanism of funding for the museum will be investigated. Although the museum is not a high cost item, mount cleanings and repairs, and building maintenance incur expenses. Some type of

donation system or a very nominal charge could be instituted to cover these costs.

11-9 Public Relations

Public relations is a very important, but much neglected, aspect of natural resources management. Increasingly, public agencies are finding that they must educate and persuade the public in order to conduct effective management of natural resources.

Elmendorf AFB's active environmental education program provides much of the positive public relations for natural resources programs. Additionally,

groups such as the Natural Resources Volunteers and Military Conservation Agents, through field contacts and visits, provide positive images of the natural resources program at Elmendorf AFB.

Elmendorf AFB's Natural Resources Office coordinates closely with the 3rd Wing's Public Affairs Office, particularly when dealing with the media or the general public. Special programs or interviews are set up through that office. In the past, this has included coverage on Elmendorf AFB's on-going Bird Aircraft Strike Hazard program, the bear study, Arbor Day activities, and others.



Photo: Staff

12. ENFORCEMENT

12-1 Introduction

Effective enforcement of natural resources regulations and laws is critical to the success of any natural resources management program. Biologists and managers conduct research, make management decisions, and write management plans and regulations, but without the presence of professional natural resources enforcement personnel in the field, these management activities are ineffective.

12-2 Objectives

- ▶ Enforce laws and regulations concerning land management and use of natural resources in an effective, impartial, and cost-efficient manner
- ▶ Conduct public education as a key element in preventative law enforcement
- ▶ Complement other natural resources management activities and programs

12-3 Legal Background

12-3a Authority

Elmendorf AFB, like most military bases, operates under a concurrent jurisdiction system. State or federally commissioned officers, including both the Alaska Department of Public Safety and the USFWS Special Agents, can conduct natural resources law enforcement.

Additionally, enforcement can be conducted by personnel from the Natural Resources Office, who have been trained by the state and commissioned as Fish and Wildlife Protection Officers or Military Conservation Agents, and by law enforcement personnel from the Security Forces Squadron. Authority for military enforcement of these laws stems from paragraph 8 of Air Force Instruction 31-203, as well as Wing Regulation 32-7001. Military Conservation Agents have authority over fish and wildlife laws, off-road vehicles, land and natural resources use regulations, cultural resources, and some types of traffic violations. Agents have the authority to bear arms, request identification, issue citations, and detain personnel to be turned over to law enforcement or Security Forces personnel. The commander of the Security Forces Squadron, in accordance with Wing Instruction 32-7001, delegates this authority to them in writing.

12-3b Jurisdiction

Military Conservation Agents, once trained and certified as Level 2 Enforcement Agents by the State of Alaska and the Natural Resources Office, have authority to enforce natural (and cultural) resources laws and regulations on Elmendorf AFB. Although only authorized to enforce state fish and game laws, federal environmental laws, and DOD and Air Force regulations on military lands, the MCA's scope of authority within that jurisdiction is similar to that of other federal land management agencies. Federal citations, which are handled through the Federal Magistrate's Office, may be written to both military and civilian personnel. In addition, military personnel may be charged under the Uniform Code of Military Justice.

There has been some discussion of expanding Elmendorf AFB's role in natural resources enforcement on Fort Richardson. Currently, MCAs are occasionally called upon to assist with nuisance bear problems on Fort Richardson, but have no role in enforcement. The Wildlife Military Police (MP) section on Fort Richardson is in the process of being down-sized or eliminated. Should this occur, MCAs may play some part in natural resources enforcement on Fort Richardson as a joint effort with the Army.

12-4 Enforcement Problem Areas

12-4a Trespassing

Trespassing is a common problem on Elmendorf AFB. Only the southern border of the base is fenced, and trespassing, frequently for the purposes of poaching or illegal off-road vehicle activity, is commonplace. The areas between the Eagleleglen Golf Course and the Main Gate, and the bluffs areas facing Anchorage on the south and west boundary, are the most common locations for trespass activity. Trespassers encountered by Military Conservation Agents are usually detained and turned over to Security Forces.

12-4b Off-Road Vehicle Activity

Illegal off-road vehicle activity is a chronic problem on Elmendorf AFB. This activity includes illegal off-roading by trucks and jeeps, four-wheelers, dirt bikes, and snowmobiles. Off-road vehicle activity is particularly critical during the summer, due to the potential for damage to wetlands, and oil and fuel contamination of base streams and lakes, and anadromous streams in particular. Although permits from the Natural Resources Office are required, the typical offender does not have a permit. Illegal off-roading, depending on the area, can result in loss of driving privileges on base, fines, or action under the Uniform Code of Military Justice (UCMJ).

12-4c Wildlife Violations

Two major problems are poaching and feeding of wildlife. It is believed that considerable poaching occurs during the salmon season (approximately 1 July through 15 September). This is based on anonymous tips and actual field contacts and citations issued. Most poaching occurs at night or at low tide at the mouth of Six-Mile Creek, where it empties into the Cook Inlet. Individuals have been reported illegally taking as many as 50 salmon at this location. Some poaching also occurs at the salmon census weir, on the spawning grounds in Upper Six-Mile Lake, and in the portion of Ship Creek adjacent to the Eagleleglen Golf Course. Patrols by Military Conservation Agents are stepped up during this period.

Poaching of moose and other large wildlife is not believed to be a serious problem. In the past, several moose carcasses have been found under suspicious circumstances, but poachers have not been apprehended. The recent closure of the roads to Fort Richardson will likely make it more difficult for moose poachers to operate on Elmendorf AFB.

Feeding of wildlife is a major problem, especially in the housing areas. Feeding contributes to wildlife conflict problems by habituating animals to humans. This is a difficult area to enforce, but efforts have been stepped up in this area.

12-4d Cultural Resources Enforcement

Cultural resources enforcement is not a major problem at Elmendorf AFB. However, several incidents have occurred at remote sites, and it is possible that Elmendorf AFB MCAs will be called on in the future to investigate such incidents. Some MCAs have received some Archeological Resources Protection Act (ARPA) training.

12-4e Other Enforcement Areas

Military Conservation Agents also enforce various natural resources and outdoor recreation activities, including wood and Christmas tree cutting (permit required), water sports, snowmobiling, and safety issues. Problem areas include firewood cut without a permit and then sold off-base, and extensive problems with illegal and unsafe snowmobile operations.

12-5 Military Conservation Agent Program

12-5a Agencies Involved

Agencies involved in natural and cultural resources enforcement on Elmendorf AFB include:

- ▶ U.S. Fish and Wildlife Service
- ▶ Alaska Department of Public Safety/Fish and Wildlife Protection Division
- ▶ 3rd Wing Judge Advocates Office
- ▶ 3rd Security Forces Squadron
- ▶ 3rd Civil Engineer Squadron/Natural Resources Office

12-5b Military Conservation Agent (MCA) Program

12-5b(1) Full-Time Military Conservation Agent Duties

The Natural Resources Office currently has one military person (E6) assigned to full-time natural/cultural resources enforcement. Enforcement duties include preventative enforcement, public education, patrol, issue of citations, wildlife incident response, and natural/cultural resource investigations. This individual also serves as the NCOIC (Non-commissioned officer-in-charge) of the MCA augmentee program. In addition to enforcement and wildlife response duties, the full-time agent conducts newcomers briefings, wildlife safety briefings, and assists the natural resources technician with permit issue. This position is tentatively scheduled to be turned into a civilian position.

12-5b(2) MCA Augmentee Program

MCA augmentees are volunteers who are selected from 3rd Wing and tenant units. They volunteer their own time to serve as part-time military conservation agents. The MCA augmentee program was initiated in 1992 as a means of providing the Natural Resources Office with additional manpower to enforce laws and regulations, respond to wildlife problems and incidents, educate the public, and patrol the base. Prior to 1992, a Conservation Agent program did exist, however, agents received little or no training and were not authorized to enforce regulations, write citations, or carry firearms. The first class of enforcement-qualified MCAs was trained and certified by Alaska's Fish and Wildlife Protection Division in May of 1992, and annual training classes have been conducted since.

There are three levels of MCA. Level 1 is similar to a police cadet. He is allowed to ride along and assist fully qualified agents but has no enforcement authority. Level 2 agents are those who have been trained and certified by the state and designated in writing by the Security Forces commander. They are authorized to enforce laws and regulations, write citations, and carry firearms. They could be likened to reserve game wardens or police officers. Finally, Level 3 agents are supervisory agents. In addition to their patrol and supervisory duties, they also act

as members of the base's Bear Response Team, and function as investigators under the direction of a full-time agent, who acts as the NCOIC of the program.

This program has had a significant effect on Elmendorf AFB's ability to enforce natural and cultural resources laws and regulations. Prior to the initiation of this program, enforcement was sporadic at best, due to manpower and funding constraints among the various agencies responsible.

Since 1995, MCAs, who volunteer their own time, much like reserve police officers, have volunteered over 20,000 man-hours, averaging 2.5 man-years annually. In 1997-1998, they issued 132 citations or incident reports and responded to 248 wildlife incidents such as bears or moose in housing areas and removal of nuisance wildlife. This program has become so successful that it is now being implemented at other military bases.

12-5c Training

12-5c(1) Full-Time MCA

The full-time enforcement-qualified MCA has attended the Federal Law Enforcement Training Center (FLETC) at Glenco, Georgia, as well as the FLETC ARPA Investigator's course. When and if replaced by a DOD civilian agent, this individual will also be sent to FLETC for qualification, unless previously certified.

12-5c(2) MCA Augmentees

Level 1 MCAs receive eight hours of orientation and training, and are then assigned to a Level 2 or 3 trainer for field training. After a six-month probationary period, most Level 1 MCAs are scheduled to attend Level 2 MCA training. As mentioned previously, Level 2 MCAs are trained and certified by the state of Alaska's Fish and Wildlife Protection Division. Initial training for Level 2 agents totals some 100 hours, with required annual refresher training of 40 hours. At this point, agents are state commissioned Fish and Wildlife Protection Officers with jurisdiction on military lands only. Training is conducted by Alaska Wildlife Troopers, NPS rangers, USFWS Special Agents, Military Police, full time MCAs, and representatives from the Staff

Judge Advocate's Office. Training topics include legal authority and jurisdiction, search and seizure, state and federal fish and wildlife laws, cultural resources, officer safety, use of force, and weapons qualification. Level 3 agents receive additional training in wildlife investigations and bear response procedures.

12-5d Manpower, Funding and Equipment

As mentioned previously, the existing full-time military conservation agent position may be phased out, and will most likely be replaced by a DOD civilian position. This will make the MCA Augmentee program even more important in day-to-day operations at the Natural Resources Office. Assuming that the MCA program continues to function as it does now, averaging 2.5 man-years annually, and assuming comparable pay to entry-level state Fish and Wildlife Protection Officers, the MCA program is estimated to provide about \$98,000 per year of free labor to the Elmendorf AFB Natural Resources Office.

In spite of the success of the MCA program, it has been hampered by limited funds and equipment throughout its seven-year existence. No dedicated funding source currently exists for this program. Two four-wheel-drive vehicles, along with several four-wheelers and snowmobiles, are shared with the Natural Resources Office. Safety equipment such as firearms, ammunition, and pepper spray is also provided. MCAs are expected to purchase their own duty belt and attachments, hat, badge, and vest. Recently, bulletproof vests and a patrol boat were obtained from other agencies by the NCOIC. Given the increasing prominence of this program, and the degree to which the Natural Resources Office and the Security Forces Squadron have come to rely upon this unit, other, more reliable options for funding will need to be explored. Several possibilities exist. One would be dedicating a certain portion of Operations and Maintenance funds specifically for this program. A second option would be to dedicate a portion of the fish and wildlife user fees and snowmobile permit user fees (when instituted) specifically to this program.



Photo: Staff

13. IMPLEMENTATION

13-1 Organization and Manpower

13-1a Staffing

The Natural Resources Office currently has the following positions authorized:

<u>Title</u>	<u>Type</u>	<u>Series/Grade</u>
Chief of Conservation	DOD Civilian	Series 401 GS-12
Natural/Cultural Resources Manager	DOD Civilian	Series 401 GS-11
Wildlife Biologist	DOD Civilian	Series 486 GS-11
Natural Resources Technician	DOD Civilian	Series 404 GS5
BASH Biologist/Manager (Vacant)	DOD Civilian	Series 401/486 GS-9
Natural/Cultural Resources Enforcement Agent	Military	E6/E7

No DOD seasonal personnel or summer hires are currently utilized, nor is there a position for museum attendant. These types of duties are currently split up between the natural resources technician and volunteers. This is a less than desirable situation, as it takes them away from other duties that require their skills. Some of these types of duties (museum work, some types of field work) could be accomplished by volunteers, however, for continuity purposes, it would be best to use volunteers to augment a part or full-time attendant or seasonal work crew rather than to replace them.

A contract has been funded to provide expertise and manpower for bird dispersal during the spring and fall migration seasons. This program is in the process of being outsourced to the local office of the USDA's Wildlife Services.

13-1b Training

All professional natural resources managers (GS-11 and up) are authorized and usually funded for at least two training courses each year. The Natural Resources Office usually sends at least one representative to the North American Wildlife Conference and joint meetings of the National Military Fish and Wildlife Association. Individuals also occasionally attend the Society of American Foresters Convention, the annual Wildlife Society meeting, and various specialized training sessions related to ecosystem management and biodiversity. The wildlife biologist attends the national BASH conference annually. Maximum use of locally available training is also made. All professional managers are also required to attend the initial training course for Natural and Cultural Resources sponsored by the DOD every three years.

MCAs initially receive 100 hours of training (see Chapter 12) and usually attend refresher training on an annual basis.

Natural Resources Volunteers receive initial orientation and safety training and are then trained on their specific tasks on the job.

13-1c Volunteer Program

Volunteer programs provide significant manpower for the Natural Resources Office. Individuals and groups typically donate labor, and occasionally materials, for specific projects.

13-1d Military Conservation Agent Program

The MCA augmentee program has provided about 2.5 man-years of volunteered time annually over the last five years. Since only one full-time enforcement position exists, this program effectively quadruples available coverage for enforcement, patrol, public contact, and wildlife response activities. It is not an exaggeration to say that the Natural Resources Office could not effectively do its job without this program.

13-2 Technical Support and Outside Assistance

The Natural Resources Office receives outside assistance from a variety of sources. Major projects

such as natural and cultural plans and inventories are often contracted out to various public and private agencies such as the Fish and Wildlife Service, ADF&G, the Center for Environmental Excellence, and the Center for Ecological Management of Military Lands at Colorado State University. Some research is conducted locally by graduate students, primarily from the University of Alaska.

Technical support is sometimes available from agencies such as the ADF&G and Fort Richardson's Natural Resources Branch. The latter has been particularly helpful in terms of GIS support and funding for joint projects such as the bear study. The ADF&G has provided technical advice and training on a host of issues. As previously mentioned USDA's Wildlife Services branch has provided technical assistance in the past, and will be taking over the bird dispersal program in 2000 as part of a contract.

13-3 Program Priorities and Funding

13-3a Program Priorities

13-3a(1) Special Project Funding

Special projects are usually funded through the A106 process. Projects are identified, prioritized, and costs are estimated. They are then submitted through the A106 environmental budget process to the parent command and, ultimately, HQ Air Force. Projects have three categories of priority. Priority 1 projects are usually driven by compliance issues, that is; they are required to comply with federal laws or regulations. An example might be funding for an endangered species related project. Category 2 funding includes projects that are important, but not required in order to comply with federal law and regulations. Category 3 projects are of lesser importance. In recent years, most funded projects were Category 1. Funding is conducted annually, although certain types of projects can be funded for multiple years. About \$630,000 of projects have been submitted for funding during this planning period [See Table 13-3a(1)].

Table 13-3a(1). Programs Funded or Submitted for Funding.

Fiscal Year	Project Name/Description	Project Cost
2000-2007	Biodiversity Monitoring	\$10,000/yr
2000	Fish Habitat Repair-Ship Creek	\$30,000
2000	Winter Lynx/Furbearer Baseline Data Survey	\$7,000
2000-2007	Urban Forestry Plantings	\$5,000/yr
2002	Determine Take of Salmon	\$27,500
2002	Identify/Determine Wildlife Corridor Use	\$80,000
2003-2005	Grizzly Bear Use of Elmendorf AFB Study	\$75,000
2003	Fish Rearing Habitat Survey	\$16,000
2003	Install Outdoor Toilets at Six Recreation Facilities	\$100,000
2004	Day Use Site Development	\$50,000
2004	Winter Moose Browse Survey	\$30,000
2004	Vegetation Management/Ecosystem Health	\$20,000
2004-2007	Disturbed Site Restoration	\$20,000/yr
2006	Raptor Habitat/Population Survey	\$30,000

13-3a(2) Projects or Programs to be Conducted In-House

- ▶ Establish Land Management Units
- ▶ Maintain permanent plot system for long-term monitoring
- ▶ Analyze BASH data
- ▶ Identify habitat improvement areas for lynx, moose, and snowshoe hare
- ▶ Maintain firebreak system
- ▶ Renovate campground at Green Lake
- ▶ Institute permit user fee schedule
- ▶ Establish procedures for GIS program and conduct data development
- ▶ Establish funding programs for museum and MCA program
- ▶ Hire BASH Manager/Enforcement Agent
- ▶ Install bear-resistant dumpsters
- ▶ Conduct unit needs survey
- ▶ Monitor Management Indicator Species
- ▶ Conduct wildlife safety education program
- ▶ Establish Elmendorf AFB as part of a state Special Management Area

- ▶ Consider expanding moose season
- ▶ Use preventative measures to reduce damage by beaver
- ▶ Institute a limited beaver trapping season for Ship Creek
- ▶ Establish Christmas tree farm
- ▶ Repair boat docks and kiosks
- ▶ Construct parking area and toilet facilities at Six-Mile Creek Recreation Area
- ▶ Install gated access points to trails and roads in sensitive areas
- ▶ Convert ATV trail to multi-use trail
- ▶ Develop nature trail suitable for families

13-3a(3) Possible Future Projects

- ▶ Conduct wolf ecology study
- ▶ Conduct bear aversive conditioning study
- ▶ Conduct moose deterrent study
- ▶ Conduct breeding bird survey
- ▶ Conduct berry production survey
- ▶ Increase detail of maps to .25 hectare
- ▶ Conduct GPS mapping of trail system

- ▶ Develop urban forestry plan
- ▶ Develop written tour guide for museum
- ▶ Develop written tour guide for nature trail and/or auto tour
- ▶ Construct boat docks at Upper/Lower Six-Mile Lake
- ▶ Construct Watchable Wildlife sites at Upper-Six-Mile Lake and moose browse improvement area

13-3b Other Funding

13-3b(1) Other Funding Sources

Operations and Maintenance Funding. Natural resources programs are funded through a variety of means. The Natural Resources Office has an annual operations and maintenance budget of \$48,000. This money is allocated through the Civil Engineering Squadron and covers day-to-day operational costs such as vehicles, gas, office supplies, and basic operating requirements. In addition to this general funding source, funding is also received for special projects, and some natural resources programs generate funds which are, by regulation, used to support the programs that generated them.

Natural Resources Program Funding Sources. Timber receipts from commercial and non-commercial timber sales vary from year to year, but have generally averaged about \$10,000 per year over the last 10 years. By regulation, these funds are deposited in the DOD forestry account, and may then be requested back by the base that generated them. These funds may only be used to support forest management programs on the base from which they came. Timber management receipts are expected to decrease during this planning period. Exact amounts generated will depend on changes in user fees and timber harvest levels.

User fees may include hunting and fishing licenses, and various outdoor recreation permits. These funds are usually kept in a local account, and may only be used to support fish and wildlife management and recreation programs on their parent base. If user fees are instituted on Elmendorf AFB, this source of funds is expected to add \$12-\$15,000 annually.

Environmental Funding. A second source of funding for special projects is environmental funding. Such projects are always compliance driven and prioritized as Category 1.

In the past, many special projects have also been funded through the DOD's Legacy program. The status of this program varies from year to year, and it is unlikely that many future projects will be funded from this source.

Finally, year-end funds are sometimes made available, and can be used for special projects.

BASH Funding. Since the fatal air crash in 1995, numerous projects have been funded under this program. Past and future projects to change vegetation around the flightline, as well as the cost of bird dispersal operations, are funded from this source. In many cases the funds are base-level funds that are diverted from other programs. Estimated cost for this program over the next 10 years is 1.1 million dollars.

13-3b(2) Funding Issues

Most projects identified by this INRMP will be rated as Category 1, improving their chances for funding. However, a recent change in funding will involve issue of budgeted funds to the Wing or Base Commander, who will then disperse the funds among the units and operational areas of the wing. This may result in somewhat less funding for natural resources programs.

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APPENDIX B: ACRONYMS

ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
AF	Air Force
AFB	Air Force Base
AFI	Air Force Instruction
AFMAN	Air Force Manuals
AFS	Alaska Fire Service
AK	Alaska
AOG	Air Operations Group
ARPA	Archaeological Resources Protection Act
ASG	Air Support Group
ATV	All Terrain Vehicles
BASH	Bird Aircraft Strike Hazard
BHWG	Bird Hazard Working Group
BLM	Bureau of Land Management
CE	Civil Engineer
CEMML	Center for Ecological Management of Military Lands
CES/CEV	Civil Engineer Squadron/Environmental Flight
CFL	Commercial Forest Land
COE	Corps of Engineers
CONUS	Continental United States
CFR	Code of Federal Regulations
CRREL	Cold Regions Research and Engineering Laboratory
DBH	Diameter Base Height
DEEV	Engineering Design Section
DOD	Department of Defense
DODI	Department of Defense Instruction
DOF	Department of Forestry
EIS	Environmental Impact Statement
EO	Executive Order
EOD	Explosive Ordinance Disposal
EPA	Environmental Protection Agency
FAMCAMP	Family Camp
FFMC	Fine Fuel Moisture Content
FLETC	Federal Law Enforcement Training Center
FWS/OBS	Fish and Wildlife Service Observation
GIS	Geographic Information System
GPS	Global Positioning System
HEP	Habitat Evaluation Procedures
HQ USAF	Headquarters United States Air Force
INRMP	Integrated Natural Resources Management Plan
LMU	Land Management Unit
LRAM	Land Rehabilitation and Maintenance
MCA	Military Conservation Agent
MIS	Management Indicator Species
MOA	Memorandum of Agreement
MP	Military Police
MWR	Moral, Welfare, and Recreation

NAGPRA	Native American Graves Protection and Repatriation Act
NCO	Non-commissioned officer
NCOIC	Non-commissioned officer-in-charge
NEPA	National Environmental Protection Act
N-P-K	Nitrogen-Phosphorous-Potassium
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRV	Natural Resources Volunteer
NWI	National Wetlands Inventory
OG/OGV	Operations Group/BASH Section
OPLAN	Operations Plan
ORV	Off-Road Vehicle
PACAF	Pacific Air Command Air Force
PLO	Public Land Orders
POL	Petroleum, Oil, and Lubricants
RV	Recreational Vehicle
SHPO	State Historic Preservation Officer
SPTG/CEVR	Support Group/Civil Engineer Natural Resources Office
UAA	University of Alaska, Anchorage
UCMJ	Uniform Code of Military Justice
USARAK	United States Army, Alaska
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
WES	Waterways Experiment Station
WI	Wing Instruction

APPENDIX C: JURISDICTIONAL HISTORY

Document	Year	Mo/Day	Purpose	Stipulations/Notes
EO 8102	1939	1-May	Withdrawn from appropriation for military use.	
EO 8343	1940	10-Feb	Withdrawn from appropriation for military use.	
EO 9526	1945	28-Feb	EO 8102 and EO 8343 amended.	Jurisdiction will revert to Dept. of Int. 6 mo. After termination of national emergency.
PLO 2676	1945	12-Jun	Amended EO 8102 and 8343.	Retains to the Secretary of Interior jurisdiction of mineral and vegetative resources and reserves the authority to grant land use rights to others with military concurrence
PLO 582	1949	11-Apr	Withdrawal of lands for Alaska Railroad.	
GO 33 EFF	1950	27-Oct	Jurisdiction of lands is given to the Air Force	
Ltr. Sec. Of the Interior	1952	27-Oct	Lands remain in military use after the national emergency is over	EO 8102 and 8343 are affected, and will be returned to Dept. of the Interior when no longer needed for the military mission.

APPENDIX D: PLANT SPECIES

Plants reported for the Anchorage area. Species listed were found on Elmendorf AFB during the 1982-1983 Resources Inventory. Where no common name shows, none is recognized.

VASCULAR PLANTS

SCIENTIFIC NAME	COMMON NAME
<i>Achillea boreali</i>	Yarrow
<i>Actaea rubra</i> subsp. <i>arguta</i>	Baneberry
<i>Agropyron macrourum</i>	Crested wheatgrass
<i>A. repens</i>	Quackgrass
<i>A. smithii</i>	Western wheatgrass
<i>Agrostis scabra</i>	Ticklegrass
<i>Alnus crispa</i>	Sitka alder
<i>A. tenuifolia</i>	Thinleaf alder
<i>Andromeda poliforia</i>	Bog rosemary
<i>Anemone richardsonii</i>	Yellow anemone
<i>A. parviflora</i>	Northern anemone
<i>Aquilegia formosa</i>	Western columbine
<i>Arabis divaricarpa</i>	
<i>Arctostaphylos rubra</i>	Bearberry
<i>A. uva-rusi</i>	Kinnikinnick
<i>Aster junciformis</i>	Bog aster
<i>Athyrium felix-femia</i>	Lady fern
<i>Betula glandulosa</i>	Resin birch
<i>B. nana</i>	Dwarf arctic birch
<i>B. papyrifera</i> , subsp. <i>humilis</i>	Paper birch
<i>Calamagrostis canadensis</i>	Blue joint grass
<i>Calla palustris</i>	Water arum
<i>Capsella bursa-pastoris</i>	Shepherd's purse
<i>Carex aquatilis</i>	Water sedge
<i>C. atherodes</i>	Awned sedge
<i>C. gigelowii</i>	Buxbaum sedge
<i>C. buxbamii</i>	Silvery sedge
<i>C. capitata</i>	Capitate sedge
<i>C. chordorrhiza</i>	Creeping sedge
<i>C. disperma</i>	Soft-leafed sedge
<i>C. kelloggii</i>	Kellogg sedge
<i>C. lasiocarpa</i>	Hairy-fruited sedge
<i>C. limosa</i>	Shore sedge
<i>C. livida</i>	Livid sedge
<i>C. lyngbyaei</i>	Lyngbye sedge
<i>C. magellanica</i> , subsp. <i>irrigua</i>	Bog sedge
<i>C. membranacea</i>	Bragile sedge
<i>C. microglochin</i>	Mertens sedge
<i>C. oederi</i> , subsp. <i>viridula</i>	Oeder sedge
<i>C. pauciflora</i>	Few-flowered sedge
<i>C. phyllomanica</i>	Stellate sedge

VASCULAR PLANTS CONTINUED

SCIENTIFIC NAME	COMMON NAME
<i>C. pluriflora</i>	Many-flower sedge
<i>C. rariflora</i>	Rare sedge
<i>C. rhynchophysa</i>	
<i>C. ostrata</i>	Beaked sedge
<i>C. rotundata</i>	Rotund sedge
<i>C. sitchensis</i>	Sitka sedge
<i>C. tenuiflora</i>	Sparse-flowered sedge
<i>Chamaedaphne calyculata</i>	Leatherleaf
<i>Chenopodium album</i>	Lamb's quarter
<i>Circuta douglasii</i>	Water hemlock
<i>C. mackenzieana</i>	Mackenzie water hemlock
<i>Corallorrhiza trifida</i>	Early coral-root
<i>Cornus canadensis</i>	Bunchberry
<i>Corydalis sempervirens</i>	Pale corydalis
<i>Cypripedium guttatum</i> , subsp. <i>guttatum</i>	Spotted lady's slipper
<i>Dracocephalum parriflorum</i>	Dragonhead
<i>Droser rotundifolia</i>	Round-leaf sundew
<i>Dryopteris dilatata</i>	Spinulose shield fern
<i>D. dilatata</i> , subsp. <i>americana</i>	Spinulose shield fern
<i>Echinopanax horridum</i>	Devil's club
<i>Eleocharis palustre</i>	Creeping spikerush
<i>Empetrum nigrum</i> , subsp. <i>hermaphroditum</i>	Crowberry
<i>Epilobium adenocaulon</i>	Northern willow herb
<i>E. angustifolium</i> , subsp. <i>angustifolium</i>	Fireweed
<i>E. hornemannii</i>	Alpine willow herb
<i>E. lactiflorum</i>	Alpine willow herb
<i>E. latifolium</i>	Dwarf fireweed
<i>E. palustre</i>	Swamp willow herb
<i>Equisetum arvense</i>	Meadow horsetail
<i>E. fluviatile</i>	Swamp horsetail
<i>E. pratense</i>	Meadow horsetail
<i>E. silvaticum</i>	Woodland horsetail
<i>Eriophorum angustifolium</i> , subsp. <i>scabriusculum</i>	Tall cottongrass
<i>E. angustifolium</i>	
<i>E. gracile</i>	Slender cottongrass
<i>E. russeolum-albidum</i>	Chamiss cottongrass
<i>E. russeolum</i> , subsp. <i>rufescens</i>	
<i>E. scheuchzeri-scheuchzeri</i>	White cottongrass
<i>E. scheuchzeri-tenuifolium</i>	White cottongrass
<i>E. Viridi-carinatum</i>	Thinleaved cottongrass
<i>Festuca rubra</i>	Red fescue
<i>Galium boreale</i>	Northern bedstraw
<i>G. triflorum</i>	Sweet-scented bedstraw
<i>Geocaulon lividum</i>	Bastard toadflax
<i>Geranium erianthum</i>	Cranesbill

VASCULAR PLANTS CONTINUED

SCIENTIFIC NAME	COMMON NAME
<i>Germ macrophyllum</i>	Large-leaf avens
<i>Goodyera repens-ophioides</i>	Lesser rattlesnake
<i>Gymnocarpium dryopteris</i>	Oak fern
<i>Hammarbya paludosa</i>	Bog adder's tongue
<i>Heracleum lanatum</i>	Cow parsnip
<i>Hippuris peploides</i>	
<i>Honckenya peploidis</i>	Sea-bench sandwort
<i>H. jubatum</i>	Squirrel grass plantain
<i>Iris setosa</i> , subsp. <i>setosa</i>	Blueflag
<i>Juncus alpinus</i>	Alpine rush
<i>J. bufonius</i>	Toad rush
<i>J. castaneus</i> , subsp. <i>castaneus</i>	Chestnut rush
<i>J. oreganus</i>	Oregon rush
<i>Juniperus horizontalis</i>	Creeping juniper
<i>Lathyrus palustris</i>	Wild pea
<i>Ledum palustre</i> , subsp. <i>decumbens</i>	Northern labrador tea
<i>L. palustre</i> , subsp. <i>groenlandicum</i>	Labrador tea
<i>Lemna minor</i>	Pondweed
<i>Linaria vulgaris</i>	Butter-and-eggs
<i>Linnaea boreali</i>	Twinflower
<i>Listera cordata</i>	Heart-leafed twayblade
<i>Luminus nootkatensis</i>	Nootka lupine
<i>L. polyphyllus</i>	Large-leafed lupine
<i>Lycopodium annotinum</i> , subsp. <i>annotinum</i>	Stiff clubmoss
<i>Matricaria matricaroides</i>	Pineapple weed
<i>Menyanthes trifoliata</i>	Buckbean
<i>Menziesia ferruginea</i>	Rusty menziesia
<i>Mertinsia paniculata</i>	Tall bluebell
<i>Mimulus guttatus</i>	Yellow monkey-flower
<i>Moehringia lateriflora</i>	Blunt-leafed sandwort
<i>Moneses uniflora</i>	One-flowered wintergreen
<i>Myrica gale-tomentosa</i>	Sweet gale
<i>Nuphar polysepalum</i>	Yellow pond lily
<i>Nymphaea tegrasona</i>	White pond lily
<i>Osmorhiza depauperata</i>	Chile sweet cicely
<i>Oxycoccus microcarpus</i>	Bog cranberry
<i>Papaver nudicaule</i>	Iceland poppy
<i>Parnassia palustris</i> , subsp. <i>neogaea</i>	Northern grass-of-parnassus
<i>Pedicularis capitata</i>	Capitate lousewort
<i>P. labradorica</i>	Labrador lousewort
<i>Picea glauca</i>	White spruce
<i>P. mariana</i>	Black spruce
<i>Plantago major-major</i>	Common plantain
<i>Plantanthera dilathta</i>	White bog orchid
<i>P. Hyperborea</i>	Northern bog orchid
<i>Poa glauca</i>	Glaucous bluegrass

VASCULAR PLANTS CONTINUED

SCIENTIFIC NAME	COMMON NAME
<i>P. plaustris</i>	Wood bluegrass
<i>P. pratensis</i>	Kentucky bluegrass
<i>Polemonium acutiflorum</i>	Jacob's ladder
<i>Polygonum viviparum</i>	Alpine bistort
<i>Populus balsamifera</i>	Balsam poplar
<i>P. tremuloides</i>	Trembling aspen
<i>P. trichocarpa</i>	Black cottonwood
<i>Potamogeton alpinus</i> , subsp. <i>tenuifolius</i>	Northern pondweed
<i>P. epihydrus-ramosus</i>	Nuttal pondweed
<i>P. filiformis-borealis</i>	Filiform pondweed
<i>P. gramineus</i>	Fries pondweed
<i>P. natans</i>	Floating pondweed
<i>P. pectinatus</i>	Fennel-leaf pondweed
<i>P. perfoliatus-richardsonii</i>	Clasping-leaf pondweed
<i>Potentilla fruticosa</i>	Shrubby cinquefoil
<i>Pyrola asarifolia-purpurea</i>	Liverleaf wintergreen
<i>P. chlorantha</i>	
<i>P. grandiflora</i>	Large-flower wintergreen
<i>P. minor</i>	Lesser wintergreen
<i>P. secunda</i> , subsp. <i>obtusata</i>	One-sided wintergreen
<i>Ranaunculus gmelini</i> , subsp. <i>gmelini</i>	Yellow water crowfoot
<i>R. lapponicus</i>	Lapland buttercup
<i>Rhinanthus minor</i> , subsp. <i>borealis</i>	Rattlebox
<i>Ribes glandulosum</i>	Skunk currant
<i>R. laxiflorum</i>	Trailing black currant
<i>R. triste</i>	American red currant
<i>Rorippa hispida</i>	
<i>Rosa acicularis</i>	Prickly rose
<i>R. arcticus</i>	Nagoonberry
<i>R. chamaemorus</i>	Cloudberry
<i>R. idaeus</i> , subsp. <i>melanolasius</i>	Raspberry
<i>R. pedatus</i>	Five-leaf bramble
<i>Salix alexensis</i> , subsp. <i>alexensis</i>	Alaskan willow
<i>S. alexensis</i> , subsp. <i>longistyulis</i>	
<i>S. barclayi</i>	Barclay willow
<i>S. bebbiana</i>	Bebb willow
<i>S. brachycarpa</i> , subsp. <i>niphoclada</i>	Barren-ground willow
<i>S. fuscescens</i>	Alaska bog willow
<i>S. glauca</i>	Grayleaf willow
<i>S. lasiandra</i>	Pacific willow
<i>S. myrtilifolia</i>	Low blurberry willow
<i>S. planifolia</i> , subsp. <i>pulchre</i>	Diamond-leaf willow
<i>S. pulchra</i>	Richardson willow
<i>S. scouleriana</i>	Scouler willow
<i>S. sitchensis</i>	Sitka willow
<i>Sambucus racemosa</i>	Red elderberry

VASCULAR PLANTS CONTINUED

SCIENTIFIC NAME	COMMON NAME
<i>Sanguisorba menziesii</i>	Menzies burnet
<i>S. stipulata</i>	Sitka burnet
<i>Scirpus validus</i>	Great bullrush
<i>Shepherdia canadensis</i>	Soapberry
<i>Sorbus scopulina</i>	Western mountain ash
<i>Sparganium angustifolium</i>	Narrow-leaved burreed
<i>S. hyperboreum</i>	Northern burreed
<i>S. minimum</i>	Small burreed
<i>Speianthes beauverdiana</i>	Ladies tresses
<i>Stellaria media</i>	Common chickweed
<i>Striptopus amplexifolius</i>	Twisted stalk
<i>Swertia perennis</i>	
<i>Taraxacum officinale</i>	Common dandelion
<i>Thalictrum alpinum</i>	Arctic meadowrue
<i>Thelypteris phegopteris</i>	Northern beach-fern
<i>Tolfieldia coccinea</i>	Northern asphodel
<i>T. glutinosa</i>	
<i>T. pusilla</i>	False asphodel
<i>Trichophorum alpinum</i>	
<i>T. caespitosum</i>	Tufted clubrush
<i>Trientalis europaea</i> , subsp. <i>arcticus</i>	Arctic starflower
<i>Trifolium hybridum</i>	Alsike clover
<i>T. repens</i>	White clover
<i>Triglochin maritimum</i>	Maritime arrowgrass
<i>T. palustris</i>	Marsh arrowgrass
<i>Typha latifolia</i>	Common cattail
<i>Utricularia intermedia</i>	Flat-leaf bladderwort
<i>U. vulgaris</i> , subsp. <i>macrorhiza</i>	Common bladderwort
<i>Vaccinium ovalifolium</i>	
<i>V. uliginosum</i>	Bog blueberry
<i>V. vitis-idaea</i> , subsp. <i>minus</i>	Lowbush cranberry
<i>Valeriana captiata</i>	Capitate valerian
<i>Viburnum edule</i>	Highbush cranberry
<i>Viola episila</i> , subsp. <i>repens</i>	Marsh violet
<i>V. renifolia-Brainerdii</i>	White violet

MOSSES

SCIENTIFIC NAME	COMMON NAME
<i>Aulucomium</i> spp.	Brown fen moss
<i>Dicranum</i> spp.	Cranesbill moss
<i>Hylocomium spledens</i>	Feathermoss
<i>Mnium</i> spp.	Big-leaf moss
<i>Pleurozeum schreberi</i>	Schrebers feathermoss
<i>Polytricum</i> spp.	Haircapped moss

MOSSES CONTINUED

SCIENTIFIC NAME

COMMON NAME

Rhytidiadelphus triquetrus

Feathermoss

Scorpidium spp.

Brown fen moss

Sphagnum fuscum

Brown sphagnum peat moss

S. green spp.

Green sphagnum peat moss

S. squarrosum

Squarrose sphagnum peat moss

S. warnstorffianum

Red sphagnum peat moss

Thomenthypnum spp.

Brown fen moss

LICHENS

SCIENTIFIC NAME

Caldina spp.

Cladonia spp.

APPENDIX E: VERTEBRATE SPECIES

Common and scientific names of mammals, birds and fish found on Elmendorf AFB, Alaska,
during the 1982-1983 Natural Resources Inventory

MAMMALS

COMMON NAME	SCIENTIFIC NAME
Bat, Little Brown	<i>Myotis lucifugus</i>
Bear, Black	<i>Ursus americanus</i>
Bear, Brown	<i>Ursus arctos</i>
Beaver	<i>Castor canadensis</i>
Coyote	<i>Canis latrans</i>
Fox, Red	<i>Vulpes vulpes</i>
Hare, Snowshoe	<i>Lepus americanus</i>
Lynx	<i>Lynx canadensis</i>
Marten	<i>Martes americana</i>
Mink ?	<i>Mustela vison</i>
Moose	<i>Alces alces</i>
Muskrat	<i>Ondatra zibethica</i>
Otter, River	<i>Lutra canadensis</i>
Porcupine	<i>Erethizon dorsatum</i>
Shrew, Dusky ?	<i>Sorex monticola</i>
Shrew, Masked	<i>Sorex cinereus</i>
Shrew, Northern Water ?	<i>Sorex palustris</i>
Shrew, Pigmy ?	<i>Microorex hoyi</i>
Shrew, Tundra	<i>Sorex arcticus</i>
Shrew, Vagrant	<i>Sorex vagrans</i>
Squirrel, Arctic Ground	<i>Spermophilus parryi</i>
Squirrel, Northern Flying ?	<i>Glaucomys brinus</i>
Squirrel, Red	<i>Tamiasciurus hudsonicus</i>
Vole, Meadow	<i>Microtus pennsylvanicus</i>
Vole, Northern Redback	<i>Clethrionomys rutilus</i>
Weasel, Least	<i>Mustela nivalis</i>
Weasel, Shorttail	<i>Mustela erminea</i>
Wolf, Gray	<i>Canis lupus</i>
Wolverine,	<i>Gulo luscus</i>

? no verified observation, but habitat present.

BIRDS

COMMON NAME	SCIENTIFIC NAME
Blackbird, Rusty *	<i>Euphagus carolinus</i>
Chickadee, Black-capped *	<i>Parus atricapillus</i>
Chickadee, Boreal *	<i>Parus hudsonicus</i>
Crane, Sandhill #	<i>Grus canadensis</i>
Creeper, Brown @	<i>Certhia americana</i>

BIRDS CONTINUED

COMMON NAME	SCIENTIFIC NAME
Crossbill, White-winged +	<i>Loxia leucoptera</i>
Crow, Northwestern	<i>Corvus caurinus</i>
Dipper, American *	<i>Cinclus mexicanus</i>
Dove, Rock +	<i>Columba livia</i>
Dowitcher + @	<i>Limnodromus griseus</i>
Duck, Harlequin +	<i>Histrionicus histrionicus</i>
Duck, Mallard *	<i>Anas platyrhynchos</i>
Duck, Ring-necked	<i>Aythya collaris</i>
Eagle, Bald *	<i>Haliaeetus leucocephalus</i>
Eagle, Golden @	<i>Aquila chrysaetus</i>
Falcon, Peregrine #	<i>Falco peregrinus</i>
Flicker, Northern	<i>Colaptes auratus</i>
Flycatcher, Alder +	<i>Empidonax alnorum</i>
Flycatcher, Olive-sided +	<i>Contopus borealis</i>
Goldeneye, Barrow @	<i>Bucephala islandica</i>
Goldeneye, Common @	<i>Bucephala clangula</i>
Golden-plover, Lesser	<i>Pluvialis dominii</i>
Goose, Canada #	<i>Branta canadensis</i>
Goshawk	<i>Accipiter gentilis</i>
Grebe, Horned @ *	<i>Podiceps auritus</i>
Grebe, Red-necked	<i>Podiceps grisegena</i>
Grosbeak, Pine *	<i>Pinicola enucleator</i>
Grouse, Spruce	<i>Dendragapus obscurus</i>
Gull, Bonaparte's +	<i>Larus philadelphia</i>
Gull, Glaucous-winged	<i>Larus glaucescens</i>
Gull, Mew *	<i>Larus canus</i>
Gull, Herring	<i>Larus argentatus</i>
Harrier, Northern *	<i>Circus cyaneus</i>
Hawk, Red-tailed	<i>Buteo jamaicensis</i>
Hawk, Sharp-shinned	<i>Accipiter striatus</i>
Jay, Gray	<i>Perisoreus canadensis</i>
Jay, Stellar *	<i>Cyanocitta stelleri</i>
Junco, Dark-eyed	<i>Junco hyemalis</i>
Kingfisher, Belted +	<i>Ceryle alcyon</i>
Kinglet, Golden-crowned +	<i>Regulus satropa</i>
Kinglet, Ruby-crowned *	<i>Regulus calendula</i>
Longspur, Lapland #	<i>Calcarius lapponicus</i>
Loon, Arctic *	<i>Gavia arctica</i>
Loon, Common *	<i>Gavia immer</i>
Loon, Red-throated @	<i>Gavia stellata</i>
Magpie, Black-billed *	<i>Pica pica</i>
Merlin	<i>Falco columbarius</i>
Nuthatch, Red-breasted @	<i>Sitta canadensis</i>
Owl, Boreal?	<i>Aegolius funereus</i>
Owl, Great Gray *	<i>Strix nebulosa</i>
Owl, Great horned *	<i>Bubo virginianus</i>

BIRDS CONTINUED

COMMON NAME	SCIENTIFIC NAME
Owl, Hawk @	<i>Surnia ulula</i>
Owl, Short-eared	<i>Asio flammeus</i>
Pewee, Western +	<i>Contopus sordidulus</i>
Phalarope, Red-necked +	<i>Phalaropus lobatus</i>
Pintail, Northern *	<i>Anas acuta</i>
Plover, Semipalmated *	<i>Charadrius semipalmatus</i>
Ptarmigan, Willow @	<i>Lagopus laopus</i>
Raven, Northern *	<i>Corvus corax</i>
Redpoll, Common *	<i>Carduelis flammea</i>
Redpoll, Hoary *	<i>Carduelis hornemanni</i>
Robin, American	<i>Turdus migratorius</i>
Sandpiper, Least +	<i>Calidris minutilla</i>
Sandpiper, Pectoral @	<i>Calidris melanotos</i>
Sandpiper, Semipalmated @	<i>Calidris pusilla</i>
Sandpiper, Solitary +	<i>Tringa solitaria</i>
Sandpiper, Spotted +	<i>Actitis macularia</i>
Sandpiper, Western @	<i>Calidris mauri</i>
Scaup, Greater	<i>Aythya marila</i>
Scaup, Lesser	<i>Aythya affinis</i>
Scoter, White-winged #	<i>Melanitta fusca</i>
Shoveler, Northern @	<i>Anas clypeata</i>
Shrike, Northern	<i>Lanius excubitor</i>
Siskin, Pine *	<i>Carduelis pinus</i>
Snipe, Common	<i>Gallinago gallinago</i>
Sparrow, American tree @	<i>Spizella arborea</i>
Sparrow, Fox	<i>Passerella iliaca</i>
Sparrow, Golden-crowned @	<i>Zonotrichia atricapilla</i>
Sparrow, Lincoln's	<i>Melospiza lincolnii</i>
Sparrow, Savannah +	<i>Passerculus sandwichensis</i>
Sparrow, Song *	<i>Melospiza milidia</i>
Sparrow, White-crowned	<i>Zonotrichia leucophrys</i>
Swallow, Bank *	<i>Riparia riparia</i>
Swallow, Cliff *	<i>Hirundo pyrrhonota</i>
Swallow, Tree *	<i>Tachycineta bicolor</i>
Swallow, Violet-green *	<i>Tachycineta thalassina</i>
Swan, Trumpeter @ #	<i>Cygnus buccinator</i>
Swan, Tundra @	<i>Cygnus columbianus</i>
Teal, Blue-winged @ *	<i>Anas discors</i>
Teal, Green-winged	<i>Anas crecca</i>
Tern, Aleutian @ #	<i>Sterna aleutica</i>
Tern, Arctic @ #	<i>Sterna paradisaea</i>
Thrush, Gray-cheeked #	<i>Cathorus minima</i>
Thrush, Hermit *	<i>Cathorus guttata</i>
Thrush, Swainson's	<i>Cathorus ustulata</i>
Thrush, Varied	<i>Ixoreus naevius</i>
Warbler, Arctic ?	<i>Phylloscopus borealis</i>

BIRDS CONTINUED

COMMON NAME	SCIENTIFIC NAME
Warbler, Blackpoll + *	<i>Dendroica striata</i>
Warbler, Orange-crowned	<i>Vermivora celata</i>
Warbler, Townsend's ?	<i>Dendroica townsendi</i>
Warbler, Wilson's ?	<i>Wilsonia pusilla</i>
Warbler, Yellow + *	<i>Dendroica petechia</i>
Warbler, Yellow-rumped	<i>Dendroica coronata</i>
Waterthrush, Northern	<i>Seiurus novaboracensis</i>
Waxwing, Bohemian +	<i>Bombycilla garrulus</i>
Wigeon, American	<i>Anas americana</i>
Woodpecker, Black-backed +	<i>Picoides arcticus</i>
Woodpecker, Downy *	<i>Picoides pubescens</i>
Woodpecker, Hairy *	<i>Picoides villosus</i>
Woodpecker, Three-toed	<i>Picoides tridactylus</i>
Yellowlegs, Greater	<i>Tringa melanoleuca</i>
Yellowlegs, Lesser	<i>Tringa flavipes</i>

- * confirmed nester
- @ rare
- ? no verified observation
- + suspected nester
- # migrant

FISH

COMMON NAME	SCIENTIFIC NAME
Salmon, Chum (dog)	<i>Oncorhynchus keta</i>
Salmon, King (chinook)	<i>Oncorhynchus tshawytscha</i>
Salmon, Pink (humpback)	<i>Oncorhynchus gorbuscha</i>
Salmon, Red (sockeye)	<i>Oncorhynchus nerka</i>
Salmon, Silver (coho)	<i>Oncorhynchus kisutch</i>
Sculpin, Slimy	<i>Cottus cognatus</i>
Stickleback, Threespine	<i>Gasterosteus aculeatus</i>
Stickleback, Ninespine	<i>Pungitius pungitius</i>
Trout, Dolly Varden	<i>Salvelinus malma</i>
Trout, Rainbow	<i>Salmo gairdneri</i>

APPENDIX F: PERSONS CONTACTED

ALASKA DEPARTMENT OF FISH AND GAME

Sinnott, Rick-Area Biologist, Area 14C, Division of Wildlife Conservation
McDonald, Michael-Regional Coordinator/Wildlife Biologist, Division of Wildlife Conservation
Whitaker, Doug-Consultant/Urban Wildlife Planner

ALASKA DEPARTMENT OF NATURAL RESOURCES

Ketchum, Daniel-Urban and Community Forestry Program Coordinator, Division of Forestry

ALASKA HERITAGE LAND TRUST

Tande, Jerry-Inventory Specialist/Biologist

BUREAU OF LAND MANAGEMENT, U. S. DEPARTMENT OF THE INTERIOR

Denton, Jeff-Subsistence Specialist/Wildlife Biologist, Anchorage District Office
Denton, Lorri-Realty Specialist, Anchorage District Office

ELMENDORF AIR FORCE BASE

3rd Civil Engineer Squadron

Bennett, Dave-Environmental Specialist (Water Quality)
Gillory, Gil-Environmental Planner, Environmental Flight
Hanson, Bill-Chief, Environmental Flight
Liebscher, Tom-Natural/Cultural Resources Manager
Morris, Robert Biological Technician
Richmond, Allen-Chief, Natural Resources, Environmental Flight
Sledge, Mark-Natural/Cultural Resources Enforcement Agent
Thomason, Marv-Community Planner
Wedemeyer, Kate-Wildlife Biologist

3rd Wing Legal Office

Capt Larry Lynch

3rd Wing Safety

USARAK/FORT RICHARDSON

Andrews, Jeff-GIS Coordinator
Gossweiler, William-Chief, Natural Resources Office
Johnson, Doug-Chief, Environmental Branch
Larson, Gary-Integrated Training Area Manager
Quirk, Bill-Environmental Scientist, Natural Resources Office
Smith, Bill-Environmental Protection Specialist, Natural Resources Office