US AIR FORCE INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Eielson Air Force Base

(See INRMP signature pages for plan approval date)

ABOUT THIS PLAN

This installation-specific Environmental Management Plan (EMP) is based on the United States Air Force's (USAF) standardized Integrated Natural Resources Management Plan (INRMP) template. This INRMP has been developed in cooperation with applicable stakeholders, which may include Sikes Act cooperating agencies and/or local equivalents, to document how natural resources will be managed. Non-US territories will comply with applicable Final Governing Standards (FGS). Where applicable, external resources, including Air Force Instructions (AFIs); USAF Playbooks; federal, state, local, FGS, biological opinion and permit requirements, are referenced.

Certain sections of this INRMP begin with standardized, USAF wide "common text" language that address USAF and Department of Defense (DoD) policy and federal requirements. This common text language is restricted from editing to ensure that it remains standard throughout all plans. Immediately following the AF-wide common text sections are installation sections. The installation sections contain installation-specific content to address local and/or installation-specific requirements. Installation sections are unrestricted and are maintained and updated by USAF environmental Installation Support Teams (ISTs) and/or installation personnel.

NOTE: The terms 'Natural Resources Manager', 'NRM' and 'NRM/POC' are used throughout this document to refer to the installation person responsible for the natural resources program, regardless of whether this person meets the qualifications within the definition of a natural resources management professional in DODI 4715.03.

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DOCUMENT CONTROL

Record of Review – The INRMP is updated no less than annually, or as changes to natural resource management and conservation practices occur, including those driven by changes in applicable regulations. In accordance with (IAW) the Sikes Act and AFI 32-7064, *Integrated Natural Resources Management*, the INRMP is required to be reviewed for operation and effect not less than every five years. Annual reviews and updates are accomplished by the base Natural Resources Manager (NRM), and/or an Installation Support Team Natural Resources Media Manager. The installation shall establish and maintain regular communications with the appropriate federal and state agencies. At a minimum, the installation NRM (with assistance as appropriate from the NR Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of the United States Fish and Wildlife Service (USFWS), state fish and wildlife agency, and National Oceanic and Atmospheric Administration (NOAA) Fisheries, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INRMP Review Summary. By signature to the Annual INRMP Review Summary, the collaborating agency representative asserts concurrence with the findings. Any agreed updates are then made to the document, at a minimum updating the work plans.

INRMP APPROVAL/SIGNATURE PAGES

DAVID A. MINEAU, Colonel, USAF
Commander

30 Jun 2017
Date

U.S. Fish and Wildlife Service

8/16/16
Date

Alaska Department of Fish and Game

1/11/17
Date

EXECUTIVE SUMMARY

Purpose

The purpose of this INRMP is to develop an ecosystem management approach on Eielson Air Force Base (AFB) to support USAF and Base mission requirements, to sustain natural resources while promoting biodiversity and providing resource commodities at a sustainable level, and support the implementation of the Eielson AFB Installation Development Plan (IDP).

Scope

As a component of the Eielson AFB IDP, this plan is for the management of natural resources on Eielson AFB and to address and integrate all management activities in a way that sustains and restores the health and integrity of ecosystems on Eielson AFB lands. This plan will provide guidance for management activities and long range planning on Eielson AFB managed lands with goals, objectives, and management plans.

Mission

The plan addresses integrated natural resource management while supporting the mission on Eielson AFB, C Battery, Chena River Research Site, Blair Lake Air Force Range (AFR), and Birch Lake Recreation Area by addressing potential conflicts with aircraft, personnel, and facilities on Eielson AFB and its lands. The INRMP will also address the military's impact on natural resources and give guidelines to conduct mitigations keeping in mind that the mission comes first.

Benefits

Implementation of the INRMP will keep Eielson AFB in compliance with the Sikes Act (Title 16, United States Code [USC] §670 t. seq.), AFI 32-7064, *Integrated Natural Resources Management*, Air Force Policy Directive (AFPD) 32-70, *Environmental Quality,* DoD Instruction (DODI) 4715.03, *Natural Resources Conservation Program,* and 354th Fighter Wing Instruction (354FWI) 32-7001, *Conservation and Management of Natural Resources*.

Goals

- Support USAF mission by providing natural environments for training and by minimizing conflicts between mission requirements and land natural resources use.
- Comply with Federal and State laws and regulations in the management of natural resources on Eielson AFB.
- Manage under the guidelines and principles of sound ecosystem management.
- Maintain functional ecosystems, including viable populations, native species, and commodities.
- Maintain, protect, and improve air, soil, and water quality in support of all federal and state laws and regulations.
- Develop and maintain habitat within the cantonment area to facilitate Bird Aircraft Strike Hazard (BASH) issues while supporting airfield/airspace obstruction and airfield safety programs.
- Manage human use of resources for long term sustainability, producing products and services compatible with ecosystem diversity, health, and productivity.
- Contribute to scientific knowledge.

Implementation

The Eielson AFB INRMP provides guidance from September 2016 through 2021 for management activities and long-range planning on Eielson AFB. The emphasis of the INRMP is to develop an ecosystem management approach at Eielson AFB whereby planning decisions incorporate consideration of the interrelationships among the natural resources on and around Eielson AFB lands, and between these resources and the military mission.

The overarching goal of the INRMP is to bring together and integrate all management activities in a way that sustains and restores the health and integrity of ecosystems on Eielson AFB lands. The plan addresses natural resource management on Eielson AFB, Chena River Research Site, and Birch Lake Recreation Area.

This plan is also to include management responsibilities on the leased lands of C Battery, Blair Lake AFR and several other sites (see Appendix I, Eielson Air Force Base, Alaska List of Site Installations) for USAF use in accordance with: AFI 32-7064, *Integrated Natural Resources Management;* Executive Order (EO) 11990, *Protection of Wetlands;* and user lease agreements. C Battery and Blair Lake AFR are comprised of land use areas frequently used by USAF personnel and will be addressed in this document. The remainder of leased sites are small in size comprised of small facilities with little or no impact on the lands they are placed on and most are attached to Detachment (DET) 460 seismic arrays. Some of these sites are currently in the process of being decommissioned.

Natural Resources

Most of the land managed by Eielson AFB is relatively undisturbed and comprised of a variety of natural resources that are typical to the broad river valleys of interior Alaska. The soils are generally formed from glacial material that was moved from nearby mountain ranges and deposited in the lowlands by river and wind action. Surface soils consist of unconsolidated silty sands and gravels, organic silts, and clays. Discontinuous permafrost occurs commonly in the upper soil layers and results in perched water lenses where wetlands are likely to form. Surface water, in the form of wetlands, ponds, lakes, and streams, occurs throughout Eielson AFB lands and dominates the landscape in the lowland areas. Much of the developed area at Eielson AFB is located within the 100-year floodplain of the Tanana River and its tributaries. Due to a generally shallow groundwater table, a number of artificial lakes and ponds were created on Eielson AFB in association with gravel extraction activities. The vast flat area that comprises Blair Lake AFR is crossed with extensively braided streams and is almost entirely occupied by wetlands. The streams and lakes on Eielson AFB lands provide habitat for a number of fish species.

The vegetation on Eielson AFB managed lands is comprised of boreal forest that is dominated by evergreen stands of white spruce and black spruce. Common deciduous species include paper birch, quaking aspen, balsam poplar, and a variety of willows. The composition of the plant communities varies considerably depending on the aspect of the slope, soil drainage, and forest age. Fire is a major determining event in upland areas, whereas flooding is the primary influence on vegetation patterns in lowland areas. Plant communities provide habitat for a wide variety of wildlife including large and small mammals, a number of migratory waterfowl, and songbirds.

Moose, snowshoe hare, red squirrel, Canada goose, and other species commonly occur on Eielson AFB lands. No threatened or endangered plant or animal species are known to occur on base.

Outdoor Recreation

Eielson AFB actively promotes the use of natural resources on Eielson AFB managed lands to provide the maximum outdoor recreational benefits within the constraints of the military mission and the capability of the available resources, and to preserve these resources for future generations.

Some of the most common activities are fishing, hunting, trapping, camping, picnicking, skiing, and off road vehicle use. Eielson AFB provides and maintains a downhill skiing facility, cross-country ski trails, a parcours exercise trail, nature trail, campgrounds, and other facilities.

Issues and Goals

The primary issues and concerns facing natural resources management at Eielson AFB were identified during the development of this plan. For each issue and concern, specific goals and objectives were developed to guide the direction of management over the next five years. All goals are intended to contribute to promoting ecosystem health, while still meeting the military mission of the base. Issues, concerns, goals, and objectives form the foundation of the INRMP. Issues and concerns were divided into nine major categories for management purposes and along with their goals are summarized below. The specific objectives developed to implement and achieve each goal can be found in Section 8.

8.1 Natural Resource Constraints to Installation Planning and Missions
8.2 Wetlands and Floodplains
8.3 Lake and Watershed Protection
8.4 Fish and Wildlife Management
8.5 Threatened and Endangered Species (T&E) and Critical Habitats
8.6 Forest Management
8.7 Grounds Maintenance
8.8 Outdoor Recreation and Public Access
8.9 Geographic Information System (GIS)

1.0 OVERVIEW AND SCOPE

This INRMP was developed to provide for effective management and protection of natural resources. It summarizes the natural resources present on the installation and outlines strategies to adequately manage those resources. Natural resources are valuable assets of the United States Air Force. They provide the natural infrastructure needed for testing weapons and technology, as well as for training military personnel for deployment. Sound management of natural resources increases the effectiveness of USAF adaptability in all environments. The USAF has stewardship responsibility over the physical lands on which installations are located to ensure all natural resources are properly conserved, protected, and used in sustainable ways. The primary objective of the USAF natural resources program is to sustain, restore and modernize natural infrastructure to ensure operational capability and no net loss in the capability of USAF lands to support the military mission of the installation. The plan outlines and assigns responsibilities for the management of natural resources, discusses related concerns, and provides program management elements that will help to maintain or improve the natural resources within the context of the installation's mission. The INRMP is intended for use by all installation personnel. The Sikes Act is the legal driver for the INRMP.

1.1 Purpose and Scope

The Eielson AFB INRMP provides a road map for natural resources management based on an interdisciplinary approach to ecosystem management. The plan provides base personnel a management tool to use when making decisions about base natural resource management, activities, and development. This document addresses current and future natural resources management on Eielson AFB managed lands, which include Eielson AFB, C Battery, Chena River Research Site, Blair Lake AFR, and Birch Lake Recreation Area.

1.2 Management Philosophy

This INRMP was developed for use by base personnel in managing the natural resources on Eielson AFB lands. The plan is intended for use as a tool to guide both short-term resource management activities and long-range planning for mission needs. The plan should be used for all planning at Eielson AFB and is intended to provide guidance for natural resource management for the period September 2016–2021. The plan is based on an interdisciplinary approach that attempts to integrate all aspects of natural resources management with the base mission. The goals and objectives of this plan will be considered when planning projects and mission changes are proposed.

In accordance with USAF and DoD policy, this INRMP has been developed with consideration of the interrelationships among natural resources on base and between the resources and the military mission. The plan is based on a philosophy that emphasizes ecosystem management over one of managing individual species or arbitrary geographic areas. This approach 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. Ecosystem management is a goal driven approach to environmental management that is at a scale compatible with natural processes. This approach encourages consideration of social and economic viability as parts of functioning ecosystems and is best accomplished through effective partnerships among private, local, state, tribal, and federal interests. The overall goal of this plan is to bring together and integrate all management activities in a way that sustains and restores the health and integrity of ecosystems on Eielson AFB lands. More specific goals to guide practical management activities are included in subsequent sections of the plan.

Using the ecosystem management approach, the mission of the installation must be clearly identified when developing priorities for natural resource management. This will help managers to reduce

incompatibilities with necessary military activities. Development of new projects should be coordinated between the Environmental Element, engineering planners, and community planners. Cooperation in the base planning process will aid in preventing natural resources damage from USAF activities. Prior to initiation of any new construction activity, the installation proponent for natural resources will coordinate on all Certificates of Compliance for Critical Planning Actions prepared in accordance with AFI 32-1021, *Planning and Programming of Military Construction (MILCON) Projects*. Environmental Restoration Program (ERP) operations conducted in accordance with AFI 32-7020, *The Environmental Restoration Program* must include plans to mitigate potential damage to natural resources from restoration activities. This INRMP is an active functioning document that is reviewed and updated as needed. The regular monitoring and adjustment of management strategies is an integral part of this plan that should help to achieve the flexibility needed to meet the overarching and specific plan goals.

1.3 Authority

AFI 32-7064, *Integrated Natural Resources Management*, explains how to manage natural resources on USAF property in compliance with federal, state, and local standards. AFI 32-7064 implements the following:

- Sikes Act, 16 USC 670 *et. seq.*
- AFPD 32-70, *Environmental Quality* (20 July 1994)
- DoDI 4715.03, *Natural Resources Conservation Program* (18 March 2011)
- Department of Defense Directive (DoDD) 4700.4, *Natural Resources Management Program* (24 January 1989)
- DoDI 7000.14-R, (Volume 11A, Chapter 16) DoD, *Accounting for Production and Sale of Forest Products* (August 2002)

This plan follows the outline found in Attachment 2 of AFI 32-7064, *Integrated Natural Resources Management* (18 November 2014).

Environmental Documentation

The environmental assessment for the INRMP can be found in Appendix J; Environmental Assessment. The standard National Environmental Protection Act (NEPA) process was followed to include a public notice, public comment period, and the issuance of a decision document (Finding of No Significant Impact) by the Wing Commander.

Installation-Specific Policies (including State and/or Local Laws and Regulations)	
354FWI 32-7001	*Conservation and Management of Natural Resources*

1.4 Integration with Other Plans

It is intended to supplement the Eielson AFB IDP and is itself supplemented by annual, agency coordinated updates and other related Eielson AFB plans (e.g., Integrated Cultural Resources Management Plan, Installation Restoration Management Plan, Storm Water Pollution Prevention Plan, Landscape Development Plan, Integrated Pest Management Plan, Bird and Wildlife Aircraft Strike Hazard Management Plan). This INRMP was prepared with cognition of these plans and coordination with appropriate Eielson AFB offices are imperative to the success of this INRMP.

Function

This INRMP will guide Eielson AFB Natural Resources Management Program. The INRMP has been developed primarily by Eielson AFB natural resources personnel, but other related functions (e.g., Pest Management, Public Affairs, Integrated Training Area Management, Air Quality, Environmental Restoration, Flight Safety and Community Planning) have also contributed to ensure the plan is fully integrated. The INRMP has been reviewed by operations and mission functions to ensure it fully supports military missions on Eielson AFB, including National Guard missions. Coordination with federal and state agencies involved with the management of natural resources in the region ensures this INRMP complies with and supports federal and state natural resources-related laws and mandates. The integration and coordination aspect of this INRMP are explained further in other INRMP sections.

2.0 INSTALLATION PROFILE

Office of Primary Responsibility	354 Civil Engineer Squadron (CES) has overall responsibility for implementing the Natural Resources Management program and is the lead organization for monitoring compliance with applicable federal, state and local regulations
Natural Resources Manager/POC	Ronald Gunderson 907-377-5182 ronald.gunderson@us.af.mil
State and/or local regulatory POCs (For US-bases, include agency name for Sikes Act cooperating agencies)	US Fish and Wildlife Service (USFWS) Alaska Department of Fish and Game (ADF&G)
Total acreage managed by installation	57,507
Total acreage of wetlands	44,627
Total acreage of forested land	46,533
Does installation have any Biological Opinions? (If yes, list title and date, and identify where they are maintained)	N/A
Natural Resources (NR) Program Applicability (Place a checkmark next to each program that must be implemented at the installation. Document applicability and current management practices in Section 7.0)	☐ Threatened and endangered species ☐ Invasive species ☒ Wetlands Protection Program ☒ Grounds Maintenance Contract/SOW ☒ Forest Management Program ☒ Wildland Fire Management Program ☐ Agricultural Outleasing Program ☒ Integrated Pest Management Program ☒ Bird/Wildlife Aircraft Strike Hazard (BASH) Program ☐ Coastal Zones/Marine Resources Management Program ☒ Cultural Resources Management Program

2.1 Installation Overview

2.1.1 Location and Area

Eielson AFB is located in the interior of Alaska within the Fairbanks North Star Borough. The base lies approximately 120 miles south of the Arctic Circle, 23 miles southeast of Fairbanks, and 9 miles

southeast of the city of North Pole. The base is located in the Tanana River Valley along the northern bank of the river on a low, relatively flat, floodplain terrace approximately two miles from the active river channel. The Richardson Highway (Highway 2) passes through the western portion of the base. The Alaska Railroad terminates within the base. The Trans-Alaska Pipeline connecting Prudhoe Bay and Valdez passes through the base entering in the northwestern portion and exiting to the southeast. Other communities near Eielson AFB include Moose Creek, which abuts the northern boundary, and the Salcha area which lies a few miles south of base.

The main base encompasses approximately 19,789 acres. The base manages an additional 37,718 acres at four other locations. The Blair Lake AFR (33,964 acres) is located approximately 17 miles southwest of Eielson AFB in the Fort Wainwright Tanana Flats Training Area. The Chena River Research Site is comprised of the Chena River Annex (690 acres), the Air Force Technical Applications Center (AFTAC) Remote Operating Facility (2,995 acres), and the access road to these sites (106 acres). This site is located approximately 10 miles northeast of the main base within the Fort Wainwright Yukon Training Area. The Birch Lake Recreation Area (51 acres) is located on the western shore of Birch Lake approximately 35 miles southeast of the main base along Highway 2. C Battery (18 acres) is located on a ridge line within the Fort Wainwright Yukon Training Area approximately 12 air miles east-southeast of the base.

Table 2.1. Installation/GSU Location and Area Descriptions

Base/GSU Name	Main Use/Mission	Acreage	Addressed in INRMP?	Describe NR Implications
Eielson AFB		19,789	X	
Blair Lake AFR		33,964	X	
Chena River Annex		690	X	
AFTAC Remote Operating Facility		2,995	X	
Birch Lake Recreation Area		51	X	
C Battery		18	X	

2.1.2 Installation History

Military History of Eielson AFB Managed Lands

Mile 26 (now Eielson AFB) was originally constructed in 1943 as a satellite field for Ladd Field (now Fort Wainwright). Mile 26 served as an alternate landing strip for aircraft being ferried from the lower 48 states to Alaska during the Forgotten 1,000 Mile War in the Aleutians and the lend-lease program with Russia. During the next few years, nearly 8,000 aircraft passed through Alaska.

At war's end, the lend-lease route was shut down and Mile 26 was put in caretaker status. In 1946, with the onset of the Cold War looming, military planners decided a strategic bomber base was needed in the interior of Alaska. The first choice for the new base was a site 29 miles south of Nenana. As preliminary work began, a series of about 30 earthquakes in the vicinity of the Nenana site occurred, one quite severe. Military planners decided Mile 26 would be reopened and expanded to accommodate bombers. The two runways at Mile 26 were increased to 14,500 feet, and buildings constructed to house the planes. On 4 February 1948, the USAF changed the name of Mile 26 to Eielson AFB in honor of famed Arctic aviation pioneer Carl Ben Eielson.

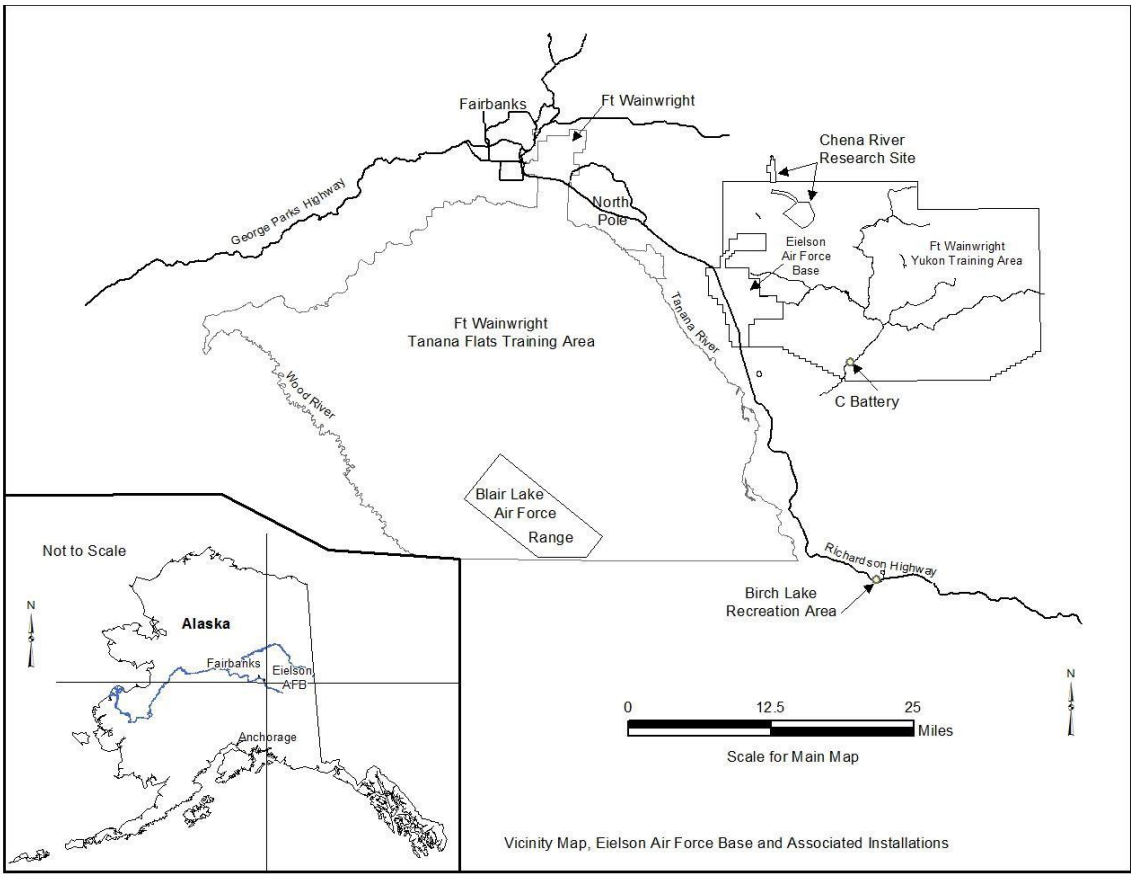
Since the rebirth of the base in 1946 with the Strategic Air Command's 97th Bomber Group, Eielson AFB has been host to B-29s, B-36s, and B-47s. The largest hangar on Eielson AFB today is now used for the USAF's RED FLAG-Alaska exercises. The hangar was originally built to house two B-36 Peacekeeper bombers, the largest bomber in the USAF inventory at the time. The COPE THUNDER exercise was renamed RED FLAG-Alaska on 31 March 2006 by the Chief Secretary of the USAF General Mosely.

The USAF has seen many changes at Eielson AFB in which many missions and aircraft have come and gone. Since the early days, Eielson AFB has also been home to the weather reconnaissance aircraft, tactical units from Alaskan Air Command, aerial tankers, A/OA-10s, and F-16s as part of the 354th Fighter Wing. Eielson AFB has currently been selected to host two squadrons of the new F-35A fighters with the first aircraft arrival scheduled for 2020.

The Birch Lake Recreation Area was originally constructed by Ladd Air Force Base (now Fort Wainwright) in 1955. Eielson AFB assumed operating responsibility in 1962. Eielson AFB began operating the Chena River Research Site in 1952. The Blair Lake AFR was constructed and activated in 1972.

History of Natural Resources Management on Eielson AFB Managed Lands

Eielson AFB began as Mile 26, a storage area for Ladd AFB which was located in Fairbanks. Construction at Mile 26 began in June 1943. What now comprises much of the cantonment area was stripped of all vegetation and silt and backfilled with gravel. This gravel came from extensive pits that were dug nearby. During excavation, the location and depth of gravel pits, which would become future lakes and ponds, was given little consideration. Subsequent base expansions used similar land practices. In the late 1950's the base had a wildlife conservation program consisting of a Base Conservation Committee and a Wildlife Conservation Agent. No formal natural resources management plans were developed. In 1974, the CES became responsible for natural resources management. In 1975, initial plans were implemented for fish and wildlife, outdoor recreation, and land management. In 1983, a forest management plan was implemented. The Fish and Wildlife Management Plan was revised five times, Land Management Plan four times, Outdoor Recreation Management Plan three times, and Forest Management Plan twice. The plans were coordinated with one another. The resulting land practices better complemented the use and development of natural resources than the practices of the past. In June 1998, an initial INRMP was implemented consolidating the four previously discussed plans into a single natural resources planning document.



2.1.3 Military Missions

The current mission of Eielson AFB and the 354th Fighter Wing is to "Prepare US and partner nation joint forces for 21st century combat, Deploy combat ready Airmen in support of worldwide operations and Enable contingency operations via a strategic power projection platform." The primary mission of Eielson AFB has evolved from one of support of both rotating and assigned strategic air assets, to one of supporting permanently-assigned fighter aircraft for the training of close air support, air interdiction, and support to ground forces; as well as hosting one of the AF's premier tactical training exercises, RED FLAG-Alaska. The importance of Eielson AFB's mission can be explained by an excerpt from a speech Brigadier General Billy Mitchell gave during an appearance before the House Committee on Military Affairs in early 1935. Brigadier General Mitchell said, "Alaska is the most central place in the world for aircraft, and that is true of Europe, Asia, or North America. I believe in the future, he who holds Alaska will hold the world, and I think it is the most strategic place in the world."

Mission of Main Units Stationed at Eielson AFB

354th Fighter Wing—The 354th Fighter Wing has been at Eielson AFB since August 1993. In 2020, the Wing will realize the arrival of the F-35A advanced fighter aircraft. Their mission will be to maintain efficient and effective combat capability and mission readiness in the Pacific Air Forces (PACAF) Area of Responsibility, while also providing for homeland defense. The 18th Aggressor Squadron flies Block 30 F-16 C's. The 353d Combat Training Squadron controls and maintains Eielson's vast aerial ranges, which are used to provide air-to-ground training for Eielson AFB pilots and visiting aircrews during the RED FLAG-Alaska exercises.

***354th Operations Group*—**The 354th Operations Group (354 OG) provides air-bridge support and realistic combat flying training in support of 354th Fighter Wing, USAF and national objectives. The squadrons assigned to the 354 OG include the 354th Operations Support Squadron, 18th Aggressor Squadron, and 353d Combat Training Squadron.

***354th Maintenance Group*—**The 354th Maintenance Group (354 MXG) provides aircraft and munitions maintenance support to the 354th Fighter Wing's F-16 aggressor aircraft as well as RED FLAG-Alaska, tanker task force, transient and special mission aircraft operating at Eielson AFB. The squadrons assigned to the group include the 354th Maintenance Squadron, 354th Aircraft Maintenance Squadron, and 18th Aircraft Maintenance Unit.

***354th Mission Support Group*—**The 354th Mission Support Group (354 MSG) supports the 354th Fighter Wing by providing combat ready forces, equipment, and essential services while sustaining base infrastructure and providing programs to improve quality of life for the Eielson AFB community. The squadrons assigned to the 354th MSG include the 354 CES, 354th Communications Squadron, 354th Contracting Squadron, 354th Force Support Squadron (354 FSS), 354th Logistics Readiness Squadron, and 354th Security Forces Squadron.

***354th Medical Group*—**The 354th Medical Group (354 MDG) provides outpatient medical and dental care for active duty military personnel and their family members, retired military, and other eligible beneficiaries living in the interior of Alaska. The clinic operates a family practice service staffed by board-certified family practice physicians, general medical officers, physician assistants, and nurse practitioners.

***168th Wing, Alaska Air National Guard*—**The 168th Wing (168 WG) is the premier workhorse tanker unit of the Pacific Rim. The 168 WG aircrews annually transfer more than 17 million pounds of fuel in flight primarily to active duty aircraft on operational missions.

***Detachment (DET) 460, AFTAC*—**DET 460 maintains several unmanned seismic arrays and air sampling systems throughout the state of Alaska. Collected information is provided to an organization within the US Atomic Energy Detection System responsible for monitoring provisions of nuclear treaties.

***Detachment 1, 66th Training Squadron*—**More commonly referred to as the "Cool School," DET 1, 66th Training Squadron trains personnel from all branches of the DoD, Civil Air Patrol, and USFWS how to survive in arctic conditions. There are 20 weekly classes held each year from October through March.

***Detachment 1, 210th Rescue Squadron, Alaska Air National Guard*—**Equipped with up to two HH-60G Pave Hawk rescue helicopters, DET 1, 210th Rescue Squadron provides alert coverage for aircraft assigned to the 354th Fighter Wing, and logistic support for base ranges. The Detachment is also tasked by the 11th AF to provide search-and-rescue for both military and civilian aviators north of the Alaska Range.

Mission of Other Lands Managed by Eielson AFB

While the units listed above are primarily associated with the main base, some of their activities are conducted on other lands managed by Eielson AFB. These lands are associated with the military mission of Eielson AFB in the following ways:

***C Battery*—**The current military mission for C Battery is bombing range operations support. Electronic target monitoring equipment stored in bunkers is used to determine bomb scoring during practice bombing missions on the nearby Yukon Range. Prior to its current use, C Battery was a Nike missile facility.

***Chena River Research Site*—**The Chena River Research Site consists of two distinct areas, the Chena River Annex and AFTAC Remote Operating Facility. The Chena River Annex is open for public use and contains the Chena River Campground located at the northern-most end of the site adjacent to the Chena River. The campground was built in the early 1970s and is maintained as a recreation facility for military personnel. The AFTAC Remote Operating Facility is closed to public use and contains the unmanned DET 460 seismic arrays used in monitoring provisions of nuclear treaties.

***Blair Lake AFR*—**The range is an active bombing/gunnery range for pilot training.

***Birch Lake Recreation Area*—**The Birch Lake Recreation Area provides recreational activities such as camping, fishing, boating, and picnicking for military personnel and their dependents, retired military, DoD civilians, and bonafide guests.

Table 2.2. Listing of Tenants and NR Responsibility

Tenant Organization	NR Responsibility
168th Wing, Alaska Air National Guard	Eielson AFB
Detachment (DET) 460, AFTAC	Eielson AFB
Detachment 1, 66th Training Squadron	Eielson AFB
Detachment 1, 210th Rescue Squadron, Alaska Air National Guard	Eielson AFB

2.1.4 Surrounding Communities

Eielson AFB is located within the Fairbanks North Star Borough and is located in a relatively undeveloped area. The base is bordered on the north, east, and west by undeveloped military reservation lands. A mixture of commercial, light industrial, and residential areas, as well as recreational sites have been developed in a narrow corridor along the Richardson Highway between the base and Fairbanks. New commercial and residential development is occurring in the region primarily to the northwest of the base between Eielson AFB and the city of Fairbanks. The communities within the borough are Fairbanks, College, North Pole, Moose Creek, Salcha, Ester, Fox, Fort Wainwright, and Eielson AFB. Fairbanks with a current population of about 32,000 residents is the second largest city in Alaska. Fairbanks is the center for employment, trade, and transportation for the borough. The surrounding communities provide housing and a variety of services. Eielson AFB is a major employer in the Fairbanks area employing approximately 1,895 military personnel and 783 civilians. The average residential population of Eielson AFB is around 5,239.

The borough government provides the framework for the community to make decisions related to land use, future development, and preservation of natural resources. The Borough Assembly and Planning Department prepared a comprehensive plan adopted in 1984 and amended it in 1990. The plan is to provide a general direction for future growth of Fairbanks and the borough. In July 2001, the Borough began restructuring the comprehensive plan and adopted the plan on 13 September 2005. The plan provides the framework for citizens and officials to make decisions related to land use and to form the basis for ordinances and programs to guide land use and development in response to future growth and change. It is also a guide for responding to change in the community and develop regional goals, objectives, and policies (Fairbanks North Star Borough 2005). The Borough anticipates that once the

entire land use planning effort has been completed, the land use portion of the plan will be updated on an area-by-area basis yearly. Although planning within the base boundaries is not under the Borough's jurisdiction, coordination between the base and the Borough often occurs. This coordination has prevented problems that are usually connected with land use and noise conflicts between air bases and the surrounding community.

The table, North Star Borough Population Growth From 1980-2015, shows the population for the Fairbanks North Star Borough from 1980-2015. The population is predicted to show continued slow to steady growth. The Fairbanks Gold Mining Company operates Fort Knox and True North mines, which are about 20 miles north of Fairbanks and would like to expand operations to three ore deposits to the north of the True North site. In 1998, the Pogo Mine which is located about 65 miles south of Eielson AFB, began exploratory drilling. The Pogo Mine began commercial production in April 2007 and has a 10-year life based on its current reserves. The natural gas at Prudhoe Bay is awaiting favorable market conditions. There is potential for a natural gas pipeline to be built along the existing Trans Alaska Pipeline that is partially located within the Fairbanks North Star Borough. The Alaska Railroad is presently being extended from Eielson AFB to Fort Greely to support the National Missile Defense System. The tracks may also be extended to Canada in the future.

Table 2.3. North Star Borough Population Growth From 1980-2015

Year	City of Fairbanks	City of North Pole	Fairbanks North Star Borough
1980	22,645	724	56,247
1985	27,099	1,640	72,416
1990	30,843	1,456	77,720
1997	31,850	1,631	82,278
1998	31,601	1,619	83,928
1999	31,697	1,616	83,773
2000	30,224	1,570	82,840
2001	29,558	1,500	83,530
2002	29,670	1,683	84,791
2003	29,486	1,646	82,214
2004	30,083	1,532	84,979
2005	31,071	1,599	87,608
2006	30,552	1,710	96,888
2008	30,367	2,099	97,970
2014	32,000	2,178	97,600

Source: Fairbanks North Star Borough, 2002, 2009, 2014

Regional Land Use

Eielson AFB is located in Sub-region 1 of the Fairbanks North Star Borough. This is the most populated sub-region in the Basin which receives the most use and has the most potential for land use conflicts. The area surrounding Fairbanks has the most accessible land areas with many other roads and navigable rivers located throughout this sub-region. Principle land uses include mining, forestry, open space natural areas, reserve areas, and military lands

2.1.5 Local and Regional Natural Areas

Interior Alaska, in which Eielson AFB is located, is bounded on the south by the Alaska Range and on the north by the Brooks Range. The principal river systems draining the interior are the Yukon and Tanana Rivers. The Yukon River located approximately 120 miles northeast of Eielson AFB, dominates

the landscape of interior Alaska, flowing some 2,000 miles from the Canadian Yukon to the Bering Sea. The Yukon River and its tributaries, one of which is the Tanana River, form the largest river system in Alaska and support large diverse populations of fish and waterfowl. Nearby federally-owned lands include national parks, preserves, and wildlife refuges. Denali National Park and Preserve, one of the best known and most visited areas in Alaska, is located approximately 80 miles southwest of the base.

The Alaska Range, located approximately 90 miles south of the base, is glacially sculptured and trends in a 625-mile arc from the Canadian border to the Aleutian Range. The Alaska Range is comprised of numerous glaciated mountain peaks over 10,000 feet in elevation, the highest of which is Denali at 20,320 feet. The area abounds with wildlife including caribou, moose, Dall sheep, and grizzly bear.

Several state recreation areas and a state historical park are located within 40 miles of Eielson AFB. The 254,000-acre Chena River State Recreation Area is less than an hour's drive from Fairbanks on Chena Hot Springs Road. This recreation area offers a full range of recreational activities including fishing, boating, and camping. Canoeing on the Chena River and hiking to prominent granite formations in the alpine country are popular summer activities. Winter recreation includes snow machining, cross-country skiing, and dog sledding. Beaver, moose, and bear are numerous and often spotted in the area. Additionally, there are several developed hot springs (Circle, Chena, and Manley) located within driving distance from Eielson AFB.

The Fort Wainwright Yukon Training Area abuts Eielson AFB's eastern boundary, and the Fort Wainwright Tanana Flats Training Area is located 6 miles west of the base across the Tanana River. These provide 248,000 and 643,000 acres, respectively, of valuable natural habitat for fish and wildlife.

Eielson AFB has three campgrounds. The Chena River Campground, 12 miles north of the main base at the end of Transmitter Road on the Chena River, offers good stream fishing. The Birch Lake recreation area, located 35 miles south of the main base, offers cabins, campsites, boat rentals, and fishing opportunities for rainbow trout, arctic grayling, and arctic char. The Family Campground (FAMCAMP) is located conveniently on the main base and offers developed campsites.

The region surrounding Eielson AFB has extensive forested lands, mountain ranges, and numerous lakes, rivers, and streams. Within 5 miles to the west of the base lies the Tanana River, one of the largest tributaries of the Yukon River. The Tanana River supports virtually all fish species found in interior Alaska and provides excellent summer habitat to many species of migratory waterfowl. The hills located to the east of the base provide topographic contrast to the flat, somewhat featureless terrain of the Tanana Valley. Of the 19,789 acres on Eielson AFB, about 15,553 acres are forested. The base has 13 lakes totaling 413 acres, 91 ponds totaling 189 acres, and 29.1 miles of fresh-water stream.

Mullins Pit Wildlife Management Area

Mullins Pit is an active borrow pit. This lake is 84.7 acres in size and is expanded annually from gravel extraction. The pit is being developed in accordance with the guidelines found in Section 7.1.

In 1996, Mullins Pit was designated as a Wildlife Management Area. In 2002, mowing policies were developed to promote biodiversity and user access. The mowing policies encourage an alternating mixture of strips of trees/brush and openings of short length on the shorelines of the peninsulas. The strips of trees/brush provide shade, food sources, and other riparian benefits. Openings facilitate user access. The strips of trees/brush will be encouraged by not mowing areas approximately 15 feet wide and 200 feet long on the long hooked peninsula (northernmost) and approximately 25 feet wide and 200 feet long on all other peninsulas. The trees and brush will be allowed to establish naturally. The openings will have the same length. The length of the strips and openings may be adjusted to take advantage of

establishing trees and brush or for safety reasons. The goal is to have a minimum of one-half of all the peninsula shoreline covered with strips of trees and brush. The mowing will occur once annually after nesting season is over. Off-road vehicle use is prohibited when snow cover is absent to prevent damage to the ground cover.

Bear Lake Wildlife Management Area

In 1994, about 1,300 feet of littoral zone (shoreline with water depth of 3 feet or less) and a 2.8-acre hydro-axed area were created along the northeast side of Bear Lake as part of a Gravel Pit Dissolved Oxygen and Wetlands Enhancement Demonstration Project. In 1996, about 267 feet of littoral zone was created and a 2.9-acre disturbed area was revegetated on the south end of Bear Lake. In 1996, these two areas of Bear Lake were designated a Wildlife Management Area and management policies were developed. In 2001-2002, about 1,217 feet of littoral zone and 3.1 acres of shoreline along the southwest side of Bear Lake were contoured, revegetated, and added to the Wildlife Management Area. This increased the revegetated area on the southern end of the lake to a total of 6 acres. The 2.8-acre hydro-axed area and 6-acre revegetated area will be mowed once annually after nesting season to promote biodiversity and user access. To prevent damage to the vegetation, the area is barricaded with a fence and gate to prohibit off-road vehicle use when there is no snow cover on the ground.

Scout Lake Wildlife Management Area

In 1996, a 2.3-acre irregular shaped shallow bay, 1,711 feet of littoral zone, and a 1.9-acre hydro-axed area was created on the east side of the lake as part of a Wetlands Restoration Project. This section of Scout Lake was designated a Wildlife Management Area in 1996, and management policies were developed.

Manchu Ponds Wildlife/Wetlands Management Area

The wetlands permit for Construct Replacement Housing Section 801 Build/Lease required a 100-foot buffer zone of native vegetation be maintained around Manchu Ponds and off-road vehicle use be prohibited in the buffer zone to protect these quality wetlands as mitigation for the project. To comply with the mitigation, the area was designated the Manchu Ponds Wildlife/Wetlands Management Area. Off-road vehicle barricades and maintenance vehicle access gates were installed in 1995. Vegetation removal is prohibited except for safety and sanitation reasons. The area will be perpetually managed for the wetlands resource and wildlife habitat.

2.2 Physical Environment

2.2.1 Climate

The interior of Alaska has a subarctic climate. Weather monitoring instruments are located near each end of the Eielson AFB runway. The climatic conditions are characterized by low annual precipitation and large differences between summer and winter temperatures. The extremes in temperature have ranged from -64°F in the winter to 93°F in the summer. The mean annual temperature is 26°F. The average annual precipitation at Eielson AFB is 13.0 inches, and approximately 60 percent of the annual precipitation occurs during the warmer months of June through September (Table, Mean Climatic Conditions at Eielson AFB). The average annual snowfall is 73.5 inches. The average growing season lasts about 89 days. The annual average first and last killing frost occurs on 25 August and 28 May, respectively. In June and July, there are almost 24 hours of daylight. In December there is less than four hours of daylight. The Table below shows the average monthly temperature, precipitation, humidity, and wind data recorded by the weather station at Eielson AFB.

Table 2.4. Mean Climatic Conditions at Eielson AFB[1]

Month	Temperature			Precipitation		Relative Humidity	Wind	
	Mean Daily Min (°F)	Mean Daily Temp (°F)	Mean Daily Max (°F)	Mean Precip (inches)	Mean Snowfall (inches)	Mean (%)	Mean Speed (kph)	Prevailing Direction
January	-14	-10	01	0.6	10.3	85.5	2	S
February	-07	01	14	0.5	8.0	81.5	2	N
March	-02	10	24	0.4	6.9	65	4	N
April	21	33	44	0.4	4.1	58.5	4	W
May	38	49	61	0.8	0.9	53	5	W
June	50	60	71	1.8	0.0	59	4	W
July	52	61	72	2.5	0.0	65.5	4	W
August	46	56	67	2.3	0.0	69.5	3	W
September	35	44	56	1.3	1.9	70	3	S
October	19	26	35	0.9	10.7	79	3	S
November	-03	03	11	0.7	12.6	85	2	S
December	-11	-05	04	0.6	11.3	86	2	S
Annual	**19**	**28**	**38**	**12.9**	**67.9**	**71.5**	**3**	**S**

1 Period of Record: Mean 2000/01/01 – 2014/12/31 Source: Eielson AFB Weather Flight.

2.2.2 Landforms

Interior Alaska is comprised of a vast plateau that stretches from the Brooks Range in the north to the Alaska Range in the south. This plateau has two major river valleys, the Yukon and Tanana. The lands managed by Eielson AFB lie in the Tanana River Valley. The Tanana Valley is roughly 50 miles wide in the vicinity of the base. Countless tributaries to the Tanana River dissect the valley walls and floor. The Tanana River Valley is broad with relatively flat or gently sloped terrain. In a 50-mile radius to the west and south of Eielson AFB, the valley floor ranges in elevation from 400–1,000 feet above sea level. Hills rise sharply to the east to form the valley edge. Here the slopes become quite steep and elevations rise to peaks and ridgetops over 3,000 feet. These hills are dissected by the Chena and Salcha Rivers which flow in an east-west direction, and their numerous tributaries. The Eielson AFB managed lands are situated primarily in the valley floor, with some portions extending into the adjacent foothills.

Eielson AFB Land Forms

Eielson AFB (19,789 acres) is located along the eastern edge of the Tanana River Valley. The eastern portions of the base extend into the foothills along the eastern edge of the valley. About 89 percent of the base is flat alluvial floodplain with elevations ranging from 520–550 feet. The remaining 11 percent of the base occurs in the hills. At the northeast extent of the base is Engineer Hill, which reaches 1,000 feet in elevation. The highest point, at 1,125 feet, occurs on Quarry Hill in the southeast corner.

C Battery Land Forms

C Battery is a small, 18-acre site located on a ridgetop to the east of the main base at an elevation of about 2,100 feet. The site is relatively flat with the ground to the north and south dropping sharply down

the slopes of the ridge. The soils at the site have not been inventoried, but general information is known for the area. Ridgetop soils are typically shallow gravelly silt (US Army 1994). The geology of the general vicinity of C Battery is described in Section 2.2.3.

Chena River Research Site Land Forms

The Chena River Research Site consists of two distinct parcels, the Chena River Annex (690 acres) and the AFTAC Remote Operating Facility (2,995 acres). The Chena River Annex is essentially flat, occurring within the floodplain and on old terraces of the Chena River at an elevation of roughly 600 feet. The AFTAC Remote Operating Facility lies to the south of the Chena River Annex in the foothills along the east edge of the Tanana Valley, and has the most variable topography of all lands managed by Eielson AFB. The AFTAC Remote Operating Facility is situated on two ridges oriented northwest to southeast that join to form one high ridge near the southeast corner of the site. This single ridge has very steep slopes and ranges in elevation up to 1,900 feet at the extreme southeast tip of the site. Heading northwest, the ridge descends to about 1,500 feet before splitting. The terrain in the northwest portion of the site is hilly, but less steep. The valley between the ridges is more narrowly confined at its southeast end, opening out broadly to the northwest with more moderate slopes. The lowest elevation on the site occurs in the valley bottom along the northwest boundary of the property at 750 feet. The geology of the general vicinity of the Chena River Research Site is described in Section 2.2.3.

Blair Lake AFR Land Forms

The Blair Lake AFR lies on the floor of the Tanana River Valley in a very flat, low-lying area called the Tanana Flats. The site totals approximately 33,964 acres in size. The land has a very gradual slope to the northwest with little apparent variation in topography. Elevations range from 900 feet above sea level in the south to approximately 600 feet in the north end of the site, a drop of 300 feet spread over 9 miles. Two knolls just outside of the southeast boundary, one of which reaches 1,400 feet in height, separate the range from Blair Lake. The remainder of the surrounding area is relatively flat.

The geology of the area consists of very thick layers of river sediments and fluvioglacial drift deposits of unconsolidated silts, sands, and gravels. These resulted from alluvial fans and outwash plains that built up along the southern margin of the Tanana River Valley during the glaciations of the Quaternary period. These thick deposits overlay bedrock that is situated below sea level. The primary sources of the sediments in the Blair Lake region are the Totatlanika Schist and the Birch Creek Schist of the Alaska Range. This parent material is more mafic (composed chiefly of magnesium and iron) than the alluvial outwash at Eielson AFB, resulting in higher background metal concentrations.

The soils of the Blair Lake AFR have not been inventoried, but exploratory borings show profiles consist of unconsolidated silty sands and gravels, organic silts, sandy silts, and clays (EA 1995). The upper 8 feet is dominated by fine-grained deposits, occurring as 2- to 8-foot thick lenses. One to 3-foot thick gravel layers may also be present, especially at the land surface. These gravels are comprised of granite, granodiorite, conglomerate, sandstone, schist, gneiss, quartz, and gabbro (EA 1995). Mucky organic deposits of peat mixed with silt can be found on the surface over much of the area.

Discontinuous permafrost occurs throughout the site. The permafrost occurs at depths varying from 6 and 30 feet. Permafrost appears to vary significantly, across the site and is closest to the surface on the east side of the building complex. This variable depth to permafrost may be the result of a combination of variable groundcover (including vegetation in summer and snow in winter), sediment grain size distribution, and artificial heat sources associated with the developed areas on the site. The permafrost extends to a depth of approximately 160 feet.

Birch Lake Land Forms

The Birch Lake Recreation Area (51 acres) lies on the east side of Birch Lake on an east-west peninsula. The middle third of the peninsula is relatively flat. The north third drops to the lake at about a 10 to 12 percent slope. Some isolated areas have a 20 to 25 percent slope. The south third drops to the lake at about 25 to 27 percent slope. The elevation of most of the Birch Lake Recreation Area is approximately 850 feet. The geology of the general vicinity of the Birch Lake Recreation Area is described in Section 2.2.3.

The soil in the Birch Lake Recreation Area is Steese silt loam, moderately sloping. Permeability is moderate. For this soil type, there is no erosion hazard from wind or water if the vegetative cover is not removed from the soil surface. If this cover is removed, the erosion hazard from water is moderate to severe, and from wind is severe. In a representative profile, a dark reddish-brown mat of decomposing organic matter and roots, about two inches thick, overlies a surface layer of dark-brown and brown silt loam about four inches thick. The subsoil is dark yellowish brown and olive-brown silt loam about 15 inches thick. The underlying material, at a depth between 19 and 22 inches, is olive silt loam. Shattered schist bedrock extends to a depth of about 28 inches, where it grades to solid rock.

2.2.3 Geology and Soils

Most of the subsurface geologic formations of the central plateau of Alaska date primarily from the Permian and Devonian periods of the Paleozoic era, roughly 230-410 million years ago (Hulten 1968). However, a particularly old formation known as the Yukon-Tanana Terrane comprises most of the Tanana Valley area from just west of Fairbanks east to the Yukon Territory of Canada (Connor and O'Haire 1988). This is the oldest rock known to occur in interior Alaska. The formation dates back to the Precambrian Period of the Paleozoic era, between 600-800 million years ago, and consists of metamorphic rocks including muscovite-quartz schist, micaceous quartzite, and graphitic schist (Connor and O'Haire 1988). These rocks are believed to have formed through metamorphism of shale, mudstone, and sandstone originally deposited along the western margin of North America.

Overlying this bedrock formation are many feet of fluvial and glaciofluvial sediments originating primarily from the Alaska Range. Though most of northern North America was covered by glaciers during the last ice age, only one part of interior Alaska, laying to the west of Fairbanks near the Yukon River, was under ice (Connor and O'Haire 1988). The area in the vicinity of Eielson AFB was apparently never glaciated. The central portion of the Alaska Range was sculpted by at least four Quaternary glaciations. Wind and rivers carried glacial sediments, primarily from the Alaska Range into the valley bottom and left deposits as thick as 750 feet in an area south of Fairbanks (Pewe and Reger 1983). These deposits have pushed the Tanana River northward, toward the Yukon-Tanana upland. In this area, the bedrock floor of the valley is well below sea level.

Soils in the Tanana River Valley consist of unconsolidated silty sands and gravels, organic silts, sandy silts, and clays. Floodplain soils nearest the active channel are sandy with a thin silt loam layer on the surface. On higher terraces the soils are predominately silt belonging to the Salchaket series (Van Cleve *et al*. 1993). On older river terraces, silt loam soils of the Goldstream series dominate and often have a significant organic component (Van Cleve *et al.* 1993). These soils tend to be cold and wet and are generally underlain by permafrost. The Salchaket and Goldstream series are described further in Section 2.2.3, which addresses the soils found on Eielson AFB. Clays, sandy silts, and sandy gravelly loams may be found in upland areas of the Tanana River Valley.

In interior Alaska, the distribution of permafrost and the active layer thickness are closely related to the slope, aspect, and drainage of a site; the thermal properties of the parent material of the soil or substrate

and vegetation (Van Cleve *et al*. 1993). Permafrost is defined as a thickness of soil or other surficial deposit that has been colder than 32°F (0°C) for at least two years. The active layer is the portion of the soil profile above the permafrost that thaws and refreezes annually. The areas that are generally underlain by permafrost in the Yukon-Tanana uplands include north aspects, valley floors, and poorly drained lower slopes (Van Cleve *et al*. 1993). Well-drained south aspects and sediments adjacent to and beneath active river channels are typically permafrost free.

Eielson AFB Geology

Bedrock units that crop out in the hills northeast of the base consist of Precambrian and Paleozoic-age schists, micaceous quartzites, and subordinate phyllite and marble. These units have been locally intruded by a series of Cretaceous to lower Tertiary intrusions of granodiorite and quartz monzanite. The intrusions are also related to precious metal deposits near Eielson AFB and elsewhere in the Fairbanks region. The headwaters of both French Creek and Moose Creek are underlain by Tertiary granodiorite of the Eielson AFB pluton (EA 1995).

During the Quaternary period, alluvial fans were built up along the southern margin of the Tanana River Valley by rapid uplift of the Alaska Range and glacial advances and retreats. Aggradation of the river plain built up a thick, layered sequence of unconsolidated silts, sands, and gravels. Unconsolidated sediments are approximately 200-300 feet-thick beneath Eielson AFB. Glacial outwash plains at the base of the Alaska Range provided wind-blown silts that have been transported northward and deposited as loess mantles along the crystalline uplands. Silt has also accumulated at lower elevations in organic muck deposits in combination with plant debris.

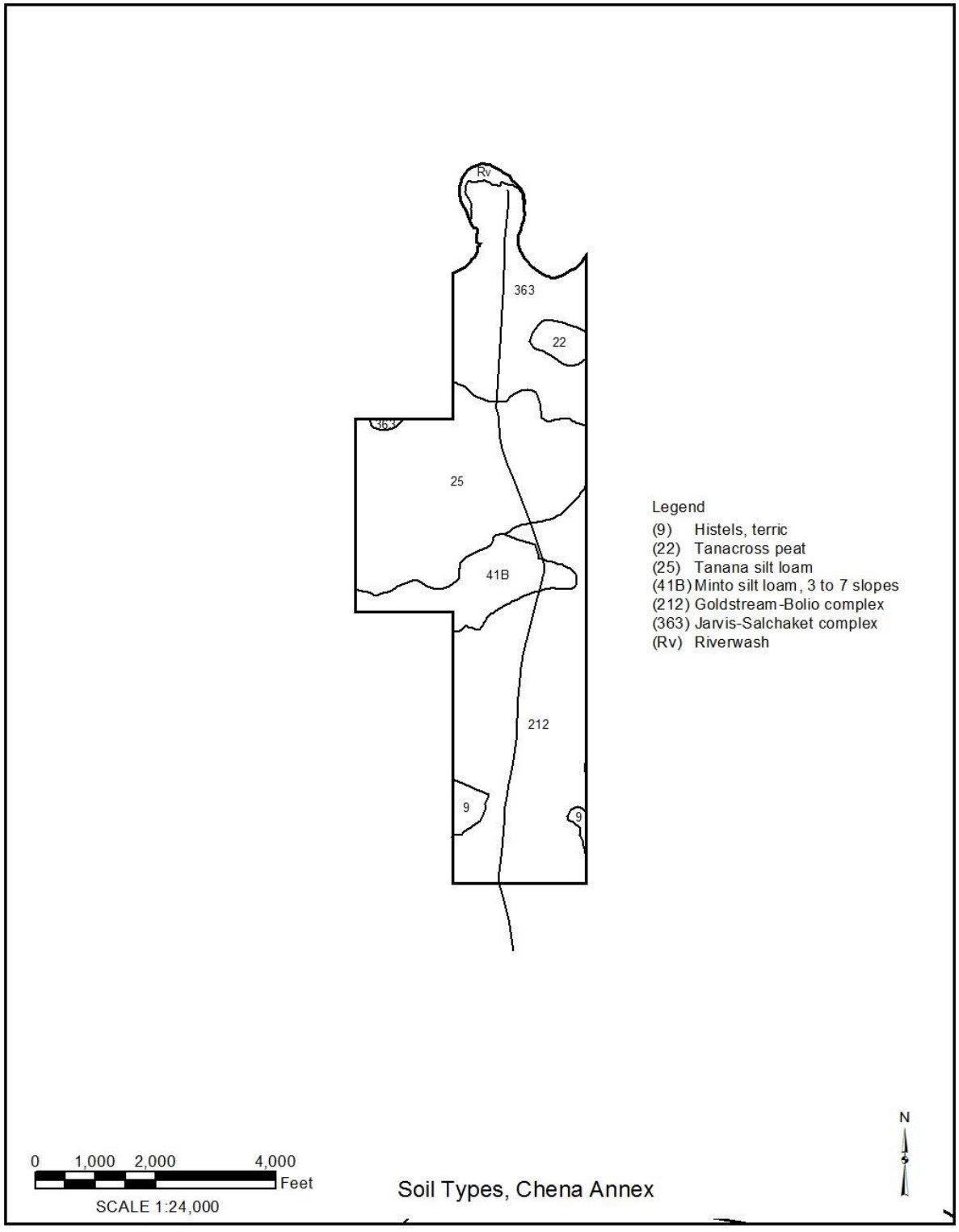
Numerous small faults are mapped in the pre-Tertiary metamorphic units. Larger regional faults border the major petrologic units within the bedrock and probably extend under the Tanana floodplain deposits (EA 1995). In 1937, a magnitude 7.3 earthquake occurred with the epicenter at Salcha Bluff, about 13 miles southeast of Eielson AFB (EA 1995).

Eielson AFB/Chena Annex Soils

In 1998, the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) completed a soils survey of Eielson AFB and the Chena Annex. Soils and miscellaneous land types were mapped using interpretation of high altitude, black-and-white aerial photography. Detailed soils mapping was accomplished by traversing the landscape and determining representative soil profiles. Soils were assigned to taxonomic classes and described by general characteristics found in the 1975 USDA Soil Taxonomy Handbook. For a description of the soils found on Eielson AFB and the Chena Annex, see Appendix H Taxonomic Classes and General Characteristics of Soils Found at Eielson AFB. Map Soil Types, Chena River Annex are the soils classification maps for the base.

AFTAC Remote Operating Facility Soils

Soils in the AFTAC Remote Operating Facility have not been surveyed. A generalized soil survey for nearby Army lands provides information that can be applied to this site. Soils on the south-facing slopes are generally well drained and free of permafrost. The soils on the north slopes are usually underlain by permafrost and are poorly drained (US Army 1994). The soils are generally silt loams. South slopes vary from shallow, gravelly silt near ridgetops to deep, moist silt loams on the lower slopes. North slopes have shallow, gravelly silt loams with thick vegetative cover. Drainage bottoms and depressions have shallow, gravelly silt loam overlain with a thick layer of peat and underlain with permafrost. The potential for erosion of exposed soil by flowing water and wind is high for these upland silt loams.


Rv
363
22
363
25
41B
212
9
9
Legend
(9) Histels, terric
(22) Tanacross peat
(25) Tanana silt loam
(41B) Minto silt loam, 3 to 7 slopes
(212) Goldstream-Bolio complex
(363) Jarvis-Salchaket complex
(Rv) Riverwash
N
0 1,000 2,000 4,000
Feet
SCALE 1:24,000
Soil Types, Chena Annex

2.2.4 Hydrology

Wetlands and low gradient alluvial streams comprise most of the surface water resources within the area. Wetland areas dominate the flat, low-lying areas within and surrounding Eielson AFB. Most wetland areas are created as a result of surface waters becoming trapped in the thawed layer over the perennially frozen subsurface. The largest river system to the base is the Tanana River drainage. The major tributaries are the Salcha, Chena, and Wood Rivers. Surface drainage is generally north-northwest. The broad, unconfined nature of these rivers makes them very susceptible to flooding. Flood periods tend to occur during spring snowmelt and during middle to late summer when heavy rain or warm air quickly brings mountain streams to flood capacity (Van Cleve *et al.* 1993). There are three large natural lakes (Harding, Birch, and Blair) located within 35 miles of the base. The general area has numerous natural and constructed lakes and ponds.

Eielson AFB Hydrology

Eielson AFB was constructed within the floodplain of the Tanana River. Surface water resources include creeks, sloughs, lakes, and ponds (see Map, Surface Water, Eielson Air Force Base, Appendix H). There are 13 lakes and 91 ponds totaling 602 acres and 29.1 miles of freshwater streams. Floodplains on the main base total 6,444 acres (see Map, Wetlands and Floodplains, Eielson Air Force Base in Section 2.3.5 [Wetlands and Floodplains] for floodplain locations).

Surface drainage at Eielson AFB is generally north-northwest parallel to the Tanana River. Five streams flow through the base and discharge into the Tanana River via Moose Creek. Piledriver Slough, located along the western edge of Eielson AFB, receives no runoff from the urban developed area of base and has good water quality. About 12.6 miles of Piledriver Slough occurs on Eielson AFB and discharges into Moose Creek. Moose Creek, located in the northern part of Eielson AFB, has good water quality. The portion of Moose Creek that flows through base receives no direct runoff from the urban developed area. Garrison Slough, which receives direct runoff from urban developed portions of the base, flows into Moose Creek downstream from the base boundary. About 1.3 miles of Moose Creek occurs on Eielson AFB and discharges into the Tanana River. French Creek, located along the eastern edge of the base, and Knokanpeover Creek, a main tributary of French Creek, have good water quality and receive some runoff from the urban developed area of the base. About 8.1 miles of French Creek and 2.4 miles of Knokanpeover Creek occur on Eielson AFB. French Creek discharges into Moose Creek.

Garrison Slough receives direct runoff from the urban and industrial areas of the base. About 4.5 miles of Garrison Slough is on base. Garrison Slough discharges into Moose Creek. The water in Garrison Slough is discolored; contains algae; has a high concentration of minerals; and exceeds present United States Environmental Protection Agency (USEPA) Maximum Contaminant Limits (MCLs). During a remedial investigation, Polychlorinated biphenyl (PCB) contamination was discovered in the tissue of the fish using Garrison Slough and the sediments in the slough between the railroad crossing near Bear Lake and Building 2258. A risk calculation indicated that a 50-pound child would have to consume in excess of 22 pounds of fish annually for 6 years to pose a significant risk of contracting cancer from the contaminated fish (USAF 1996). In 1997-98, the Eielson AFB Installation Restoration Program removed PCB contaminates to levels that comply with an industrial use scenario. The USEPA and the Alaska Department of Environmental Conservation (ADEC) concurred with the removal through a signed record of decision. Since 1998, engineering controls have been maintained to limit fish access to the section of the slough between the railroad crossing near Bear Lake and Building 2258. Fish access has been restricted by screens and the fish present at that time were removed by shocking the area above the screens. Institutional control signs were placed in the area to advise that consumption of fish from recreational fishing should be limited due to the PCB levels in the fish tissue. The Installation Restoration Section continues to sample fish and monitor the PCB levels in the slough. A new remedial investigation,

including human health and ecological risk assessments, are scheduled to be conducted beginning in fiscal year (FY) 2018 (FY18).

Eielson AFB has one naturally occurring lake, Lily Lake, 12 manmade lakes, 14 naturally occurring ponds, and 77 manmade ponds. The manmade lakes and ponds were developed during the excavation of gravel deposits for use as fill material for construction projects on base. The northern end of Lily Lake is under investigation as a potential munitions disposal area part of the Military Munitions Response Program (MMRP). Lake development, through gravel extraction, is still occurring at Mullins Pit, and Cathers Lake.

The low-lying developed portions of Eielson AFB are underlain by a shallow, unconfined aquifer comprised of 200-300 feet of loose alluvial sands and gravel overlying bedrock of relatively low permeability (Battelle PNL 1994). The aquifer has high transmissivity, defined as the rate at which water is transmitted through the aquifer, and relatively flat groundwater gradients. The groundwater table is typically less than 10 feet below the ground surface, but it can rise with seasonal variations to as shallow as 1.5 feet below grade (Battelle PNL 1994). The highest elevations occur during the snowpack melting period in April or May. The lowest occur during the winter months. The usual direction of groundwater flow is north-northwest, although the direction is locally influenced by surface water bodies such as Garrison Slough and by groundwater extraction from the base supply wells.

Approximately two-thirds of the base is covered with soils containing discontinuous permafrost. A shallow perched water table occurs in the permafrost soils. Groundwater in the higher upland portions of the base occurs at depths of approximately 50-300 feet in a fractured bedrock aquifer.

A preliminary assessment conducted in 2014 identified perfluorinated compounds (PFC) contamination in groundwater on multiple locations at Eielson that exceeded the USEPA provisional health advisory (PHA) for drinking water. A site investigation conducted in 2016 has confirmed that PFC contamination is ubiquitous in the groundwater underlying the industrial part of the installation and extending northward through the community of Moose Creek.

Groundwater pumped from a shallow unconfined aquifer is the source for all potable water used at Eielson AFB and in the nearby communities. In response to PFC contamination, the Air Force has provided alternative water supplies to protect human health, and is in the process of installing permanent treatment and/or alternate clean water supplies to residents of Eielson AFB and Moose Creek.

On Eielson AFB, water is presently drawn from three production wells, with two more wells available as backup wells. The wells are located near the base central heat and power plant (CH&PP), and pumped to a water treatment plant. The water is treated by a green sand filtration process, primarily to remove iron and manganese and a granular activated carbon (GAC) system is being added to address the PFC contamination, expected completion date is December 2017. Drinking water supplies are routinely tested for contaminants and drinking water quality by Eielson AFB Bio-environmental Engineering. Contaminant levels in Eielson AFB drinking water supply have been found to be below Maximum Contaminant Levels (MCL's) established by the USEPA.

In 1998-99 the storage capacity of the water treatment plant was increased to 1,000,000 gallons. At the same time production was increased to 3,200,000 gallons-per-day to maintain adequate fire-fighting capabilities and support future base expansion. In addition to potable water, groundwater is the principal source for industrial and fire-fighting purposes, for which there are 12 dedicated fire wells around the base.

C Battery Hydrology

C Battery is located on a ridgeline; therefore, surface water from the site drains into two distinct drainage systems, the French Creek drainage to the north and the Little Salcha River drainage to the south. Because there has been minimal ground disturbance within the area, the natural surface water flow pattern or infiltration rates of these drainages are relatively unaltered. There are no wetlands, streams, or ponds on the site. Currently there is no information available on groundwater resources at C Battery to include if there is contamination from PFCs.

Chena River Research Site Hydrology

Map Surface Water, Chena River Research Site shows surface water features for the Chena River Research Site and Map Wetlands and Floodplains, Chena River Research Site (Section 2.3.5 [Wetlands and Floodplains]) shows floodplain locations. The Chena River Annex lies within the floodplain of the Chena River, which is the northern boundary of the site. The natural surface water flow patterns and infiltration rates of the Chena River Annex are relatively unaltered because there has been minimal ground disturbance within the area. There are no lakes, ponds, or perennial streams within the Annex. The area within the 100-year floodplain of the Chena River totals 304 acres. Currently, there is no information available on groundwater resources within the site.

The AFTAC Remote Operating Facility lies to the south of the Chena River Annex in the foothills along the east edge of the Tanana Valley. This hilly area is bisected by a well-defined, branched drainage pattern containing approximately five miles of perennial watercourses and numerous wetlands. Surface water drainage is split into two distinct drainage systems, both of which are tributaries to the Chena River. The eastern corner of the site drains into an unnamed tributary of Horner Creek. The remaining area drains into two branches of an unnamed watercourse. The natural surface water flow patterns and infiltration rates of these drainages are relatively unaltered because there has been minimal ground disturbance within the area. Approximately 2.7 miles of stream occur on this site. No lakes, ponds, and floodplains occur on the Remote Operating Facility. Currently, there is no information available on groundwater resources at the site to include if there is contamination from PFCs.

Blair Lake Land Hydrology

Surface water within the Blair Lake AFR is comprised of small creeks and two man-made ponds (Map Surface Water, Blair Lake Air Force Range Appendix H). Surface drainage is generally north-northwest and is dominated by three general drainage systems, each comprised of numerous perennial watercourses. Clear Creek, a tributary of Salchaket Slough, drains the eastern one third of the range. A series of unnamed, poorly defined tributaries to the Tanana River drain the central portion of the range. Willow Creek, also a tributary to the Tanana River, drains the western-most corner of the range. The vast majority of the range is relatively undisturbed and there have been few apparent impacts to surface water flow patterns or infiltration rates. There are approximately 111 miles of streams and 6.7 acres of ponds on the site. Approximately 1,486 acres of the site lie within floodplains of the small alluvial creeks. Floodplain locations are shown in Map Wetlands, Ponds, and Floodplains, Blair Lake Air Force Range in Section 2.3.5 (Wetlands and Floodplains).

Groundwater at the Blair Lake AFR is encountered above the permafrost in a shallow, unconfined aquifer of alluvial deposits, and again below the permafrost in highly transmissive, alluvial sand and gravel deposits. The depth to the shallow groundwater generally ranges between 6 and 10 feet below the surface and varies with the depth to permafrost. Locally perched water lenses occur in areas where the permafrost extends to near the ground surface. The permafrost also acts as a confining layer to the deeper aquifer below it. Groundwater movement is generally north to northwest, and groundwater levels are recharged

primarily during the spring snowmelt, peaking in May. Groundwater in the area of the old observation tower facility is heavily contaminated with fuels and fuel-related compounds. However, there is no current indication of PFC contamination.

Water is supplied to the facilities at the range from a well drilled into the deeper aquifer. The well operates on a demand basis, and is estimated to pump at approximately 24 gallons-per-minute, for a total of between 500 and 1,350 gallons-per-day (EA 1995).

Birch Lake Land Hydrology

The Birch Lake Recreation Area is located on a peninsula in Birch Lake (see Map, Surface Water, Birch Lake Recreation Area, Appendix H). The site has no permanent bodies of water or streams. Surface water flow is toward the lake. Groundwater at the Birch Lake Recreation Area is encountered around lake level. A well at the crest of the peninsula is 600 feet deep. The well was drilled through alternate layers of schist and hard rock. The static water table was encountered at 74 feet. The well pumps 9.2 gallons per minute to a 10,000-gallon storage tank used to provide the water distribution system. In July 2016, perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) were detected in the new well at concentrations exceeding EPA's Health Advisory level of 0.070 parts per trillion for drinking water.

2.3 Ecosystems and the Biotic Environment

2.3.1 Ecosystem Classification

To develop ecosystem management policies for Eielson AFB managed lands, the relationship of Eielson AFB's biotic environment with the regional biotic environment must be considered. The first step is describing the regional biotic environmental components. The second is to describe the biotic environmental components for each parcel of Eielson AFB managed lands.

Eielson AFB Biotic Environment

The Eielson AFB Natural/Cultural Resources Office has recorded, mapped, inventoried, and compiled information on the biotic environment of Eielson AFB. In a few instances documentation has been done by contracts monitored by the base natural/cultural resources staff.

Wildlife Habitat—Forest Cover Type, Wildlife Species, Acres (See, Map Vegetation Cover Types, Eielson Air Force Base, Appendix H)

Black Spruce—Black Bear, Red Squirrel, Marten, Spruce Grouse, Moose—8,668 acres

The black spruce trees are small to medium sized and of varying densities. Some areas are interspersed with small amounts of paper birch and tamarack. This forest type is interspersed with brush fields containing dwarf arctic birch, resin birch, or bog rosemary, and quite often the ground cover contains lowbush cranberry. Because discontinuous permafrost is very common to this forest type, it has a very low annual growth rate and change is slow. Black bear forage on the freshly sprouted green vegetation in the spring and lowbush cranberries in the late summer and fall. Red squirrels use the spruce cones for food, and the moss for nests. Marten use the spruce for cover.

Spruce grouse use the cranberries in the fall and the spruce needles in the winter for food. Because black spruce forests contain little browse, moose use the area when moving from one food or shelter source to

another. This forest type will continue to meet the needs of the black bear, red squirrel, marten, spruce grouse, and moose in the foreseeable future.

White Spruce—Spruce Grouse, Red Squirrel, Marten, Black Bear—1,465 acres

About 1,374 acres have 5-inch or larger diameter white spruce, 40-70 feet tall. The white spruce on the remaining 91 acres are 1-5 inches in diameter and 10-25 feet tall. In some areas the ground cover contains lowbush cranberry. Spruce grouse use the cranberries in the fall and spruce needles in the winter for food. Red squirrel use spruce cones for food, and tree cavities, twigs, leaves, and moss for nests. Marten use the spruce for cover. Black bear visit this forest type in search of food and cover. This forest type will continue to meet the needs of the spruce grouse, red squirrel, marten, and black bear in the foreseeable future.

Birch (diameter 2 inches and greater, 15–65 feet tall)—Raptors, Black Bear, Ruffed Grouse, Red Squirrel—2,969 acres

About 55 percent of this forest type has large, mature paper birch with scattered pockets of large white spruce or balsam poplar. There is a fair amount of 1-5-inch white spruce reproduction. Highbush cranberry and wild rose are quite common. The remainder of this forest type has 2-5-inch diameter, and 15-40-foot tall paper birch that contains some white spruce reproduction. The growth is often quite dense. For the most part, berry producing shrubs are absent. The large, mature trees provide good nesting habitat for raptors. Some of the large mature paper birch are beginning to deteriorate because of heart rot. As the large, mature paper birch deteriorate and fall, raptor nesting sites will be lost. As the smaller 2-5-inch diameter, 15-40-foot tall paper birch mature, they will become better raptor nesting sites. Eventually, white spruce will become more prevalent. Black bear will visit this forest type in search of food, particularly highbush cranberry and grasses. Ruffed grouse use this forest type primarily in the summer and then retreat to the aspen groves in the hills north and east of base for the winter. Ruffed grouse have been observed nesting in this forest type, and the bases of the many large trees provide many possible nesting sites. The highbush cranberry and rose hips supply food for ruffed grouse. Red squirrel use the scattered pockets of large white spruce for food, shelter, and cover. This forest type will continue to meet the requirements of raptors, black bear, ruffed grouse, and red squirrel.

Birch (1-inch diameter, 8 to 15 feet tall)—Moose, Snowshoe Hare—97 acres

These areas have been cleared in the past; and contain small sized paper birch, willows, alder, and some small balsam poplar and tamarack. The willows and birch provide moose browse, although the willows show only slight evidence of moose use. The snowshoe hare forages on the bark, buds, and twigs of the small birch, willow, and balsam poplar. As the birch mature, they will grow beyond the reach of the moose and snowshoe hare. As the birch grow older, the bark will no longer be tender and succulent and appeal to the snowshoe hare. As this forest type matures, it will become increasingly poorer quality moose and snowshoe hare habitat. Eventually, this forest cover type will fail to meet their needs.

Balsam Poplar—Beaver, Raptors, Moose, Snowshoe Hare—1,286 acres

About 52 percent of this forest type is over mature, decadent balsam poplar located along Piledriver Slough. White spruce reproduction is common, and eventually white spruce should replace the balsam poplar. Alder is the most common shrub. Old beaver cuttings can be found. About 35 percent of this forest type is medium sized balsam poplar that quite often contains 1-2-inch white spruce reproduction. A few areas also have willow or alder. About 13 percent of this forest type is small to medium sized balsam poplar with willow and alder growing on areas that have been cleared in the past. If located near water, beaver use the balsam poplar extensively for food and lodge and dam building material. As the

beaver use the balsam poplar, they reduce their food and building material supply and release the white spruce reproduction.

When the balsam poplar supply is exhausted, the beaver will have to find their needs elsewhere. The large, mature balsam poplar provides raptor nesting habitat; however, as the beaver use the mature trees, possible raptor nesting sites are removed. The medium and small sized balsam poplar will become better raptor nesting sites as they mature, assuming they are not fallen by beavers. Moose and snowshoe hare forage in the small sized balsam poplar stands, which contain willow. As the small sized balsam poplar mature, they will grow beyond the reach of the moose and snowshoe hare and become poorer quality moose and snowshoe hare habitat. Eventually, this forest cover type may fail to meet their needs.

Willow—Moose, Snowshoe Hare—477 acres

This cover type consists of brush fields that contain willow. Alder and very small amounts of paper birch, balsam poplar, dwarf arctic birch, resin birch, or spruce may also be found. Of the various willow species common to the Eielson AFB area, moose prefer *Salix alexensis*, *Salix planifolia,* and *Salix* arbusculoides. *Salix bebbiana*, although common, is little used by moose. Thus, the value of the willows depends on the abundance and distribution of the three preferred species. Willow identification is very difficult, even for a willow expert, because hybridization is quite common. Moose activity is evident in the willow forest cover type on base. Snowshoe hare forage on all types of willows using the twigs, buds, leaves, and bark. Because willow is an early successional species, the future of the willow forest cover type is uncertain. The other tree species found in this forest type could eventually replace willow. Most of the willow forest cover type is found on poorly drained, marginal land that is not conducive to growing other tree species. If not killed by overuse, the willow could be present for years.

Old Burn—Moose, Snowshoe Hare—229 acres

A fire burned through this forest type in the past. The fire burned in an uneven pattern resulting in occasional small clumps of medium or large sized paper birch and white spruce. Presently, willows and small sized white spruce cover the burn area and moose browsing of the willows is evident. Snowshoe hare feed on the willows year-round and the spruce in the winter. As the climax species (white spruce) matures, the fire species (willow) will become less prevalent. As this occurs, the value of this forest type as moose and snowshoe hare habitat will decrease.

Marsh—Waterfowl, Moose—146 acres

Ponded water is common in marshes either in the spring or year-round. The amount of water is dependent upon the winter snowfall and annual precipitation. Waterfowl use these areas extensively for loafing and feeding in the spring when the water level is usually the highest. Nesting occurs near the lakes and ponds on base where water levels are more stable. Moose forage on the grasses and pondweeds associated with these bodies of water. The stability of the marsh cover type appears to be good, as invading tree or brush species are absent.

Lakes and Ponds—Waterfowl, Moose, Muskrat, Beaver—584.2 acres

The diversity of the lakes and ponds, i.e., large, small, deep, shallow, etc., and shoreline shrubs and grasses make them attractive to waterfowl. The lakes and ponds are used by spring and fall migrating waterfowl and by waterfowl resident to the Eielson AFB area. Nesting studies have shown that waterfowl nest primarily near the shallow ponds, lakes with shallow portions, and those with brushy or vegetated shoreline. The annual water conditions are stable due to a high groundwater table, which is about 5 feet below the ground surface. Waterfowl habitat in the lakes and ponds should not change in the foreseeable

future. Although muskrats are found in most of the ponds, they are more abundant in the ones containing vegetation. Occasionally, beaver inhabit a lake or pond, particularly those with a nearby supply of balsam poplar, willow, or birch. The lakes and ponds supply the beaver with a stable water level. Beaver are only limited by the amount of available food and lodge building material. Black bears commonly use lake and pond shores for feeding on succulent vegetation (e.g., equisetum).

Streams—Beaver, Mink, Muskrat—29.1 miles

Beaver colonies are usually established where a supply of balsam poplar, birch, and willow is near a stream. Water is not a limiting factor as Eielson's streams have a stable supply. If they overuse their food and building material supply, the beaver will have to find their needs elsewhere. Mink and muskrat can be found along the base streams.

Mineral Licks—Moose—Three Areas

Sixteen mineral licks located in three areas occur on base. Area locations are kept by natural resource staff to protect these sensitive areas. Mineral licks are an important supplement to wildlife nutrition in the uptake of needed minerals for good health. They are primarily used by moose. Most use occurs during spring and early summer.

C Battery Biotic Environment

The biotic environment of C Battery has been documented by the Eielson AFB Natural/Cultural Resources Office. The entire area was bulldozed in the 1960s when the C Battery Nike Site was built. Over the years the vegetation has been periodically disturbed or controlled for military mission purposes. The site is no longer used by the military for its original purpose. C Battery has semi-improved grounds, unimproved grounds, and land under facilities. In August 1996, the vegetation was inventoried by the Eielson AFB Natural/Cultural Resources Office.

Chena River Research Site Biotic Environment

The biotic environment of the Chena River Research Site has been documented by the Eielson AFB Natural/Cultural Resources Office and by contractors monitored by the Natural/Cultural Resources staff. The Chena River Research Site is comprised of the Chena River Annex, AFTAC Remote Operating Facility, and a 5.3-mile gravel access road. The biotic environment of the access road will not be discussed.

Wildlife Habitat—Forest Cover Type, Wildlife Species, Acres (see Map, Wildlife Habitat Types, Chena River Research Site, Appendix H)

Black Spruce and Mixed Black Spruce/Birch—Black Bear, Red Squirrel, Marten, Spruce Grouse, Moose—812 and 72 acres

The black spruce forest on the Chena River Annex is open with a significant tamarack component. The trees are small, 3-4 inches in diameter, and there is a dense shrub understory. Common shrubs include resin birch, willow, bog blueberry, and lowbush cranberry.

Feathermoss covers much of the ground. This habitat type is more closed on the AFTAC Remote Operating Facility and is intermixed with large stands of the mixed black spruce-birch forest. The mixed black spruce birch forest occurs in the west central portion of the Chena River Annex and in the valley bottoms of the AFTAC Remote Operating Facility. These are forested areas with mostly closed canopies

and trees of small stature. Because discontinuous permafrost is very common to these forest types, they have very low annual growth rates and change is slow. In these forests, black bear forage on the freshly sprouted green vegetation in the spring and lowbush cranberries in the late summer and fall. Red squirrels use the spruce cones for food and the moss for nests. Marten use the spruce trees for cover. Spruce grouse use the spruce needles in the winter for food and eat cranberries in the fall. Because black spruce forests contain little browse, moose use this habitat type only when moving from one food or shelter source to another. This forest type will continue to meet the needs of the black bear, red squirrel, marten, spruce grouse, and moose in the foreseeable future.

Mixed Paper Birch/White Spruce/Balsam Poplar (Mature)—Raptors, Black Bear, Ruffed Grouse, Red Squirrel—297 acres

This habitat type occurs at the north end of the Chena River Annex. The over-story is dominated by white spruce, paper birch, and balsam poplar up to 16 inches in diameter. The understory is comprised of green alder, prickly rose, and highbush cranberry. The large, mature trees provide good nesting habitat for raptors. The large, mature paper birch are beginning to deteriorate because of heart rot. As the large, mature paper birch deteriorate and fall, raptor nesting sites will be lost. As the smaller 2–5-inch diameter, 15-40-foot tall paper birch mature, they will become better raptor nesting sites. Eventually, white spruce will become more prevalent.

Black bear visit this forest type in search of food, particularly highbush cranberry and grasses. Ruffed grouse use this forest type primarily in the summer. Ruffed grouse have been observed nesting in this forest type, and the bases of the large trees provide many possible nesting sites. The highbush cranberry and rose hips supply food for ruffed grouse. Red squirrel use the scattered pockets of large white spruce for food, shelter, and cover. This forest type will continue to meet the requirements of raptors, black bear, ruffed grouse, and red squirrel.

Mixed Paper Birch/Quaking Aspen—Raptors, Black Bear, Ruffed Grouse—142 acres

This habitat type occurs on the unburned slopes of the AFTAC Remote Operating Facility. Quaking aspen occurs in nearly pure stands on the crests and upper slopes of the ridges, with paper birch more abundant on the lower slopes. The trees in the over-story are 40-50 feet high with a diameter of 8-10 inches. The understory of this habitat type is dominated by aspen saplings on the upper slopes. The large, mature paper birch and quaking aspen provide good raptor nesting habitat. As the older mature trees die, raptor nesting sites will be lost. As the aspen saplings mature, they will become better raptor nesting sites. Black bear forage in this habitat type for highbush cranberry and grasses. Ruffed grouse use this habitat for nesting and foraging for highbush cranberry, rose hips, and aspen buds. This forest type will continue to meet the requirements of raptors, black bear, and ruffed grouse.

Burn Area—Moose, Snowshoe Hare—2,312 acres

A fire burned through portions of the AFTAC Remote Operating Facility in 1987. These areas support paper birch saplings and green alder shrubs. Other areas appear to have burned prior to 1979, the date of the aerial photos used for the vegetation inventory. These are dominated by young green alder with an understory of American red raspberry, prickly rose, and paper birch saplings. The birch saplings provide moose browse. The snowshoe hare forages on the bark, buds, and twigs of the small birch. As the birch mature, they will grow beyond the reach of the moose and snowshoe hare. As the birch grow older, the bark will no longer be tender and succulent and appeal to the snowshoe hare. As this forest type matures, it will become increasingly poorer quality moose and snowshoe hare habitat. Eventually, this forest cover type will fail to meet their needs.

White Spruce (Mature)—Spruce Grouse, Red Squirrel, Marten, Black Bear—9 acres

The white spruce is 5 inches or larger in diameter and 40-70 feet tall. In some areas the ground cover contains lowbush cranberry. Spruce grouse use the cranberry in the fall and spruce needles in the winter for food. Red squirrel use the cones for food, and tree cavities, twigs, leaves, and moss for nests. Marten use the spruce for cover. Black bear visit this forest type in search of food and cover. This forest type will continue to meet the needs of the spruce grouse, red squirrel, marten, and black bear in the foreseeable future.

Willow—Moose, Snowshoe Hare—16 acres

This habitat type, which is about 10 years old, is located in the central portion of the Chena River Annex. In about 1988, the US Army Fort Wainwright cleared the eastern two-thirds of this habitat type during the construction of a live-fire assault house. In 1990, the project was abandoned because of unstable soil conditions. In 1993, the US Army Fort Wainwright restored the project area by removing fill material placed in 1988 and grading the surface to match the surrounding terrain. In 1997, in the western one-third of this habitat type, the Eielson AFB Installation Restoration Program removed the abandoned AFTAC Remote Operating Facility control center. This cover type is revegetating with willow, alder, and sedge and brome grasses. Of the various willow species common to the Eielson AFB area, moose prefer *Salix alexensis*, *Salix planifolia*, and *Salix arbusculoides*. *Salix bebbiana*, although common, is little used by moose. Thus, the value of the willows depends on the abundance and distribution of the three preferred species. Willow identification is very difficult, even for a willow expert, because hybridization is quite common.

Moose activity is evident in this cover type. Snowshoe hare forage on all types of willows using the twigs, buds, leaves, and bark. Because willow is an early successional species, the future of this cover type is uncertain. The surrounding habitat type to the east, which was cleared about 40 years ago, has a mixed black spruce/paper birch forest. Over the years, this willow cover type should eventually convert to mixed black spruce/paper birch forest. As this forest type matures, it will become increasingly poorer quality moose and snowshoe hare habitat. Eventually, this forest cover type will fail to meet their needs.

Chena River Research Site Marsh—Waterfowl, Moose—3 acres

This habitat type is located in the Chena River Annex in a closed-off oxbow of the Chena River. The oxbow has ponded water year-round. Waterfowl use this habitat type for nesting, loafing, and feeding. Moose forage on the grasses and pondweeds. The stability of this habitat type appears to be good, as invading tree or brush species are absent.

Bluejoint/Shrub - Black Bear, Small Mammals, Passerines, Moose—6 acres

The bluejoint/shrub community in the Chena River Annex results from wet soils. The bluejoint shrub community at the AFTAC Remote Operating Facility probably resulted from fire. Black bear forage in the freshly sprouted green vegetation in the spring. Certain species of small mammals and passerines use this habitat for food and shelter. Moose traverse this habitat type and occasionally consume the grasses. The bluejoint/shrub in the Chena River Annex is probably climax and will continue to meet the requirements of these species. The bluejoint/shrub in the AFTAC Remote Operating Facility could develop into shrub and then forest communities. As this happens the species of small mammals and passerines using this habitat in the AFTAC Remote Operating Facility will change.

Streams—Beaver, Mink—2.7 miles

The Chena River Research Site has 2.7 miles of small stream with low flow rates and all lie within the AFTAC Remote Operating Facility. In the past, beaver have colonized at the culvert for the Transmitter Road stream crossing, causing damage to the road. Beaver at this location are undesirable and are immediately removed by trapping in accordance with Alaska trapping regulations. Mink occasionally inhabit these streams.

Chena River Research Site Fish Habitat

Eielson AFB has no record of fish being caught or observed in the streams within the Chena River Research Site. The Chena River supports fish, but is not considered part of the Chena River Annex.

Blair Lake AFR Biotic Environment

The biotic environment of the Blair Lake AFR has been recorded by the Eielson AFB Natural/Cultural Resources Office and by contractors under the supervision of the Natural/Cultural Resources staff. There has been little human disturbance or alteration to the Blair Lake AFR, except for the range proper. The surrounding buffer zone is representative of the regional historic vegetation. There are no improved grounds in the range. The semi-improved grounds consist of the range proper, while the remainder of the site is unimproved grounds. In 1993, the vegetation was inventoried by a contractor.

Blair Lake AFR Habitat, Forest Cover Type, Acres (see Map, Wildlife Habitat Types, Blair Lake AFR)
Black Spruce—Black Bear, Red Squirrel, Marten, Spruce Grouse, Moose—24,936 acres

The black spruce is small to medium sized and of varying densities. Some areas are interspersed with tamarack. This forest type is interspersed with brush fields containing resin birch and Labrador tea. The ground cover contains bog blueberry, crowberry, and bluejoint grass. Because discontinuous permafrost is very common to this forest type, it has a very low annual growth rate and change is slow. Black bear forage on the freshly sprouted green vegetation in the spring, and bog blueberries in the late summer and fall. Red squirrels use the spruce cones for food and the moss for nests. Marten use the spruce for cover. Spruce grouse use the blueberries in the fall and the spruce needles in the winter for food. Because black spruce forests contain little browse, moose use the area only when moving from one food or shelter source to another. This forest type will continue to meet the needs of the black bear, red squirrel, marten, spruce grouse, and moose in the foreseeable future.

Willow—Moose, Snowshoe Hare—6,482 acres

This forest type is brush fields that contain willow and either alder or resin birch. The understory contains Labrador tea, bog blueberry, bluejoint, and horsetail. Of the various willow species common to the Blair Lake AFR area, moose prefer *Salix alexensis*, *Salix planifolia*, and *Salix arbusculoides*. *Salix bebbiana*, although common, is little used by moose. Thus, the value of the willows depends on the abundance and distribution of the three preferred species. Willow identification is very difficult, even for a willow expert, because hybridization is quite common. Moose activity is evident in the willow forest cover type on the Blair Lake AFR. Snowshoe hare forage on all types of willows using the twigs, buds, leaves, and bark. Because most of the willow occurs on old burns and is an early successional species, the future of the willow forest cover type is uncertain. Black spruce and tamarack found in adjacent forest types could eventually replace willow. Most of the willow forest cover type is found on poorly drained soils where vegetation change is slow. This forest type could burn again, as the Blair Lake AFR has a history of fires. If not killed by overuse, the willow could be present for years.

Mixed Paper Birch/Black Spruce/Quaking Aspen (Mature)—Raptors, Black Bear, Red Squirrel, Moose—1,762 acres

This forest type contains a mixture of mature paper birch, black spruce, and quaking aspen. Paper birch and black spruce are common to all stands. In this forest type, only two stands in the northeast portion of the range contain quaking aspen. Many of the paper birch are 60 feet or taller and in a state of decay. The understory contains resin birch, Labrador tea, bog blueberry, and bluejoint grass. Much of this forest type is adjacent to or near stream courses. The large, mature paper birch and quaking aspen provide good nesting habitat for raptors. As the paper birch which are in a state of decay, deteriorate and fall, raptor nesting sites will be lost. Paper birch will become less common unless the mature trees are replaced by stump sprouting or regeneration encouraged by fire. Eventually the black spruce will become more prevalent.

Black bear forage on the freshly sprouted green vegetation in the spring, and bog blueberries in the late summer and fall. Red squirrels use the spruce cones for food and the moss for nests.

Because this forest type contains little browse, moose use the area only when moving from one food or shelter source to another. This forest type will continue to meet the needs of the black bear, red squirrel, and moose in the foreseeable future. If the decaying paper birch are not replaced at some time in the future, this forest type will fail to meet the needs of raptors.

Paper Birch/Quaking Aspen—Raptors, Black Bear, Ruffed Grouse—702 acres

Most of this forest type occurs on a gentle rise west of several hills just outside the eastern boundary of the range. About half of this forest type is medium sized paper birch. The other half is medium sized paper birch and quaking aspen. The larger trees provide good raptor nesting habitat. Black bear forage in this habitat type for highbush cranberry and grasses.

Ruffed grouse use this forest type for nesting and foraging for highbush cranberry, rose hips, and aspen buds. This forest type will continue to meet the requirements of raptors, black bear, and ruffed grouse.

Streams—Beaver, Mink, Muskrat—111.1 miles

Beaver colonies are usually established where a supply of paper birch, alder, and willow occurs near a stream. Water is not a limiting factor, as the Blair Lake AFR streams have a stable supply. If beavers overuse their food and building material supply, they will have to find their needs elsewhere. Mink and muskrat can also be found along the streams on the range.

Birch Lake Recreation Area Biotic Environment

The biotic environment of the Birch Lake Recreation Area has been documented by the Eielson AFB Natural/Cultural Resources Office and contractors under the supervision of the Natural/Cultural Resources staff. There has been much human disturbance to the Birch Lake Recreation Area. There are no improved grounds. Semi-improved grounds and land under facilities comprise about 30 percent of the acreage. About 70 percent, or 35.5 acres are unimproved grounds. In 1993, the vegetation was inventoried by a contractor.

Birch Lake Wildlife Habitat

The Birch Lake Recreation Area has mature white spruce/paper birch/quaking aspen/balsam poplar forest, paper birch forest, black spruce forest, and alder/willow forest. Most of these forest types occur

within the developed recreation area. This discourages wildlife use. The only resident species is the red squirrel. Red squirrels use the spruce cones and rose hips for food and moss for nests. Transitory wildlife includes moose, grouse, ptarmigan, and snowshoe hare. The forest types within the Birch Lake Recreation Area will continue to meet the needs of the red squirrel in the foreseeable future.

2.3.2 Vegetation

The vegetative make up of Eielson AFB lands are discussed below.

2.3.2.1 Historic Vegetative Cover

The vegetative cover of most Eielson AFB lands have not changed much since European settlement. The areas that have changed are in conjunction with the development of the cantonment areas and mission related construction projects.

2.3.2.2 Current Vegetative Cover

Regional Vegetation

The vegetation of the Tanana River Valley, like most of the lowlands of interior Alaska, is comprised of boreal forest also known as taiga. Taiga forests occur in an environment characterized by strong seasonal fluctuations in day length and temperature, a short growing season (100 days or less), consistently low soil temperatures, and the occurrence of permafrost (Van Cleve and Alexander 1981). This vegetation zone is dominated by closed, open, and woodland evergreen forests of black spruce (*Picea mariana*) and white spruce (*Picea glauca*). The boreal forest also supports extensive stands of open and closed deciduous forests of paper birch (*Betula papyrifera*), quaking aspen (*Populus tremuloides*), and balsam poplar (*Populus balsamifera*). White spruce is usually dominant in upland areas with well-drained, permafrost-free soils. Black spruce is dominant in low-lying wetland areas on poorly drained organic soils usually underlain by permafrost. Balsam poplar is a common early-successional species on the floodplains near streams and rivers, while quaking aspen is a common successional species in upland areas.

In the Tanana River Valley, the presence of black spruce and bogs generally indicates that an area is underlain by permafrost. Areas where quaking aspen and white spruce occur are generally permafrost-free. Paper birch develops on permafrost-free soils or where fire or clearing has resulted in lowering the upward extent of the permafrost (Brown and Kreig 1983).

Extensive mosaics of shrub and herbaceous types occur throughout this vegetation zone. These typically occur in wetlands, lowland areas, or the active floodplain and are dominated by willows (*Salix spp.*) and other shrubs, sedges, and grasses. Successional communities following fire and alluvial deposition occupy extensive areas supporting closed and open shrublands of alder and willows. The mosaic of forest types and early successional shrub areas are largely determined by fire in upland areas, whereas flooding is the most common disturbance that determines the course of floodplain forest development.

Since the majority of lands managed by Eielson AFB lie in active floodplains or on older river terraces (including most of the main base, Blair Lake AFR, and Chena River Annex), an overall perspective on forest succession on the Tanana floodplain is helpful in understanding the vegetative patterns on these lands. Viereck *et al.* (1993) describe the general successional pattern on this floodplain as beginning on newly exposed silt bars where horsetails (*Equisetum spp*.) and the light seeded willows are the first plants to colonize. As the willows grow, thinleaf alder (*Alnus tenuifolia*) and balsam poplar invade. The alders grow more rapidly than the willows and eventually come to dominate the tall shrub stage. Next, the

balsam poplar overtakes the alder and will eventually dominate a deciduous sapling stage. White spruce seedlings become established during the shrub or balsam poplar stage. As the balsam poplar mature and die, the community transitions to a coniferous forest and white spruce become dominant. Well-developed white spruce stands may persist for one or more generations before they are replaced by the slower growing black spruce. On the older terraces, black spruce and open bogs become the predominant vegetation. Decadent, open black spruce stands intermixed with Sphagnum bogs, cottongrass (*Eriophorum vaginatum*) tussocks, and small ponds are characteristic of the climax condition. Viereck and Dyrness (1980) separated this process into twelve identifiable stages of forest succession on the Tanana floodplain. These are summarized in the Table below.

Table 2.5. Characteristics of Forest Succession Stages on the Tanana Floodplain

Stage	Vegetation	Age of Terrace (years)	Terrace Height Above Floodplain (meters)	Forest Floor Thickness (centimeters)
I	No vegetation	0	1-1.5	0
II	Scattered willows and herbs	1-2	1.5-2.0	0
III	Open young willows	2-5	1.8-2.2	0
IV	Closed alder and willow shrubs	5-10	2.0-2.4	5-10
V	Open balsam poplar with dense alder	20-40	2.0-2.7	5-10
VI	Closed balsam poplar with alder understory	80-100	2.5-2.8	8-12
VII	Mixed balsam poplar and white spruce	125-175	2.3-3.0	8-12
VIII	Mature, even-aged white spruce	200-300	3.2-3.8	6-12
IX	Old, uneven-age white spruce	300-500	3.5-4.0	4-20
X	Mixed white and black spruce	500+	4-5	18-20
XI	Open black spruce	500+	4-5	25-30
XII	Decadent black spruce, thaw ponds, and bogs	1000+?	4-5	--

Source: Viereck and Dyrness, 1980

The flood frequency in floodplain areas decreases as terrace heights are built up by deposition. Where Stage II communities may be flooded annually, the flood frequency for Stage IV is estimated to be five to ten years (Viereck *et al.* 1993). Stage VII communities are flooded about once every ten years. Stage XII areas are rarely, if ever flooded. As the flood frequency decreases, the forest canopy closes, leaf litter develops, and the forest floor thickens. As the community transitions to a spruce-dominated forest and annual leaf litter deposition decreases, a groundcover of feathermosses and other bryophytes develops. These mosses have rapid growth and slow decomposition. This results in the rapid buildup of a thick organic layer on the forest floor (Viereck *et al.* 1993). These changes create cooler soil conditions, eventually resulting in a discontinuous layer of permafrost. In Stage VII communities, lenses of frozen ground form at depths of 30-40 inches below the soil surface. By Stage IX intermittent frost is common in the soil profile and lenses of frozen soil occur at depths of 15-24 inches at the end of the growing season. Stage X communities are usually underlain by permafrost where the active layer is quite shallow, the surface soils thawing only to depths of 20–24 inches on a seasonal basis. The succession of vegetation on the floodplain of the Tanana River can be seen to follow a general progression of species that is determined in part by flooding and the life history of the plant species, but also by biological factors where the plants themselves act to modify the microenvironment and facilitate establishment of other species. All of these successional stages occur on lands managed by Eielson AFB.

Eielson AFB Vegetation

Much of the land area that comprises Eielson AFB has received little human disturbance or alteration. The majority of the current forested area is relatively intact and represents regional historic vegetation. Many of the forest stands range in age from 85-115 years.

The USAF categorizes lands as improved grounds (intensive maintenance), semi-improved grounds (periodic maintenance), unimproved grounds (no maintenance), and land under facilities (buildings, structures, roads, or pavement). In 1990, the Natural Resources Conservation Service mapped and inventoried the vegetation on improved and semi-improved grounds. The Eielson AFB Natural/Cultural Resources Section inventories and maps the unimproved grounds. The Natural/Cultural Resources vegetation inventory was last updated in 2014. A plant species list for Eielson AFB is provided in Appendix C, Plant Species List.

Vegetation on Unimproved Grounds

Eielson AFB forest inventory provides the most detailed description of the vegetation on unimproved grounds. The unimproved grounds are vegetated with black spruce forests with associated brush fields, white spruce forests, paper birch forests, balsam poplar forests, willow dominated brush fields, and marsh. These general vegetation cover types are shown in Map Vegetation Cover Types, Eielson Air Force Base, Appendix H.

C Battery Vegetation

C Battery consists of two bunkers (Buildings 809 and 810) totaling about one acre, and a parcel of land adjacent to Building 832 which is about 17 acres in size. The vegetation cover types for C Battery are shown in Map Vegetation Cover Types, C Battery, Appendix H.

Around Building 832, are several antennas in a grassed area. The dominant grass species is brome grass. The grass is interspersed with alder, 4-6 feet tall due to periodic maintenance. This vegetation type covers 4.5 acres and is classified as semi-improved grounds because of the periodic vegetation control done around the antennas. The other vegetation in the parcel adjacent to Building 832 (13.5 acres) is unimproved grounds dominated by alder.

Table 2.6. Vegetation Cover Types Occurring on Chena River Research Site

Vegetation Cover Type	Chena River Annex	AFTAC
	Acres	Acres
White Spruce: Closed	9.2	
Black Spruce: Closed		12.7
Black Spruce/Tamarack: Open/Woodland	315.0	428.6
Paper Birch/Aspen: Closed	19.3	120.5
Paper Birch: Open		1,793.9
Mixed Needleleaf/Broadleaf: Closed	240.2	532.2
Mixed Needleleaf/Broadleaf: Open	71.7	
Alder/Willow Scrub	17.1	78.5
Resin Birch/Willow Scrub	1.7	18.6
Graminoid/Herbaceous	2.9	6.5
Beach	6.2	
Man-made	6.7	3.5

Chena River Research Site Vegetation

There has been little human disturbance or alteration to the Chena River Research Site, therefore, the site vegetation is representative of the regional historic vegetation. There are no improved grounds in the site. The semi-improved grounds include areas under overhead electric and communication lines, road ditches, and campsites. In 1993, the vegetation was inventoried by a contractor under the supervision of the Eielson AFB Natural/Cultural Resources Office. The vegetation types on the unimproved grounds were identified following the system developed by Viereck *et al.* (1992) in *The Alaska Vegetation Classification*. For the most part, vegetation was classified to Level IV of this classification system, meaning that either the dominant tree or shrub species was identified, depending on which comprised the overstory. The vegetation cover types for the Chena River Annex and the AFTAC Remote Operating Facility are shown in Map Vegetation Cover Types, Chena River Research Site, Appendix H and summarized in Table Vegetation Cover Types Occurring on Chena River Research Site.

Chena River Annex Vegetation

The Chena River Annex is rectangular in shape and oriented perpendicular to the Chena River (see Map, Vegetation Cover Types, Chena River Research Site, Appendix H). The vegetation in the northern third and western lobe is classified as Closed Mixed, with white spruce, paper birch, and balsam poplar comprising the overstory. Trees are typically up to 16 inches in diameter. Common understory shrub species include green alder (*Alnus crispa*), prickly rose (*Rosa acicularis*), and highbush cranberry. The herbaceous understory is comprised mostly of bluejoint and horsetail.

The vegetation in the eastern portion and southern half of the Chena River Annex is an open black spruce and tamarack forest. Trees in this area are 10-20 feet in height, with a diameter of 3-4 inches. The shrub species include resin birch (*Betula glandulosa*), willow species, bog blueberry, lowbush cranberry, and Labrador tea (*Ledum groenlandicum*). Common herbaceous species include bluejoint, cottongrass (*Eriophorum vaginatum*), horsetail, and sweet coltsfoot (*Petasites hyperboreus*).

In the 1960s, the majority of the central portion of the Chena River Annex was bulldozed during construction of a control center for the AFTAC Remote Operating Facility. This area is in the early stage of mixed broadleaf-needleleaf forest, with patches of willow species. The control center was closed in 1976 and demolished in 1999. The area of building demolition was leveled and seeded with a mixture of creeping red fescue and Kentucky bluegrass for erosion control. The building demolition area will not be maintained allowing for the reestablishment of natural occurring vegetative species.

AFTAC Remote Operating Facility Vegetation

The AFTAC Remote Operating Facility is situated on two ridges, oriented northwest-southeast that rise approximately 1,000 feet in elevation to the south of the Chena River. The site includes valley bottom, northeast and southwest facing slopes, and ridge crests. A fire that occurred in 1987 burned much of the site, as well as much of the surrounding area.

The vegetation of the AFTAC Remote Operating Facility is diverse due to topographic variability and the effects of fire. On the crests and southwest facing slopes of ridges that have not been recently burned, vegetation is generally closed broadleaf forest dominated by paper birch and/or quaking aspen. Quaking aspen occurs in nearly pure stands on the crests and upper slopes of the ridges, with paper birch more abundant on the lower slopes. Trees are typically 40-50 feet high with diameters of 8-10 inches. The understory of these closed forests is dominated by aspen saplings on the upper slopes. The understory of the closed broadleaf forests on the lower slopes was not sampled.

Portions of the southwest facing slope on the southern ridge of the site appeared to have burned in a fire prior to 1979. These areas are dominated by dense stands of green alder with American red raspberry (*Rubus idaeus var. melanolasius*), prickly rose, and abundant saplings of paper birch comprising a lower stratum.

The northeastern slope of the southern ridge and the southwestern facing slope of the northern ridge have extensive areas that were burned in the 1987 fire. These areas appeared to be primarily open or closed black spruce forest prior to the burn. Since the fire, paper birch saplings have established, ranging in height in 1993 from 2-8 feet. Other species common in these post-fire stands include green alder, horsetail, bluejoint reedgrass, and fireweed.

These young stands do not fit well into *The Alaska Vegetation Classification system* (Viereck *et al*. 1992). Although this system is described as classifying existing vegetation, rather than potential vegetation, there are no classes that include early successional plant communities, such as those dominated by paper birch saplings. In the vegetation inventory of 1993, these areas were generally classified as woodland or open broadleaf paper birch. However, the saplings were mostly less than 10 feet tall, the minimum tree height for open forest or woodland vegetation classes in Viereck *et al.* (1992). These early post-fire stands also do not fit into a classification system recently developed by Youngblood (1993) for young, mixed forested stands in interior Alaska.

Vegetation in burned areas of the site is, however, consistent with descriptions of post-fire vegetation provided by Foote (1983). These areas appeared to be in transition between the moss-herb and tall shrub-sapling stages of plant succession on mesic black spruce sites described by Foote. Foote characterized the moss-herb stage as occurring from 1-5 years after fire and the tall-shrub-sapling stage 5-30 years after fire. According to Foote's classification of post-fire successional vegetation in interior Alaska, these areas are expected to become dominated by dense black spruce around 55 years after fire, by mixed hardwoods and spruce 56–90 years after fire, and by mature black spruce 90+ years after fire. Given the pattern and rate of post-fire succession in interior Alaska, it is evident that the vegetation in the burn areas on the AFTAC Remote Operating Facility is transitional and will likely be considerably different in 25-30 years. The bottoms of the two valleys in the AFTAC Remote Operating Facility area were partially burned in the 1987 fire. Unburned areas are closed black spruce or mixed black spruce and paper birch forest. There are some valley bottom areas that were not sampled but appeared to be in the mesic graminoid herbaceous class of Viereck *et al.* (1992).

The pattern of burn from the 1987 fire shows that most burned areas were previously dominated by black spruce or mixed black spruce and paper birch. The burned areas are bordered by unburned paper birch, quaking aspen, or green alder stands, indicating that these areas were much less susceptible to combustion than the black spruce stands. This burn pattern is typical of forest vegetation in interior Alaska, in which coniferous forested areas, particularly those dominated by black spruce, have a much higher frequency of fire than do forests dominated by broadleaf species (Viereck 1973).

Blair Lake AFR Vegetation

The Blair Lake AFR is a rectangular shaped tract, 33,964 acres in size. Approximately 1,316 acres in the central portion of the range have been modified by vegetation control and by construction of buildings, roads, and target pads. The rest of the range is in relatively natural condition. Vegetation cover types on the range are shown in Map Vegetation Cover Types, Blair Lake Air Force Range, Appendix H, and summarized in the Table Vegetation Cover Type Occurring on Blair Lake AFR.

Vegetation in the Blair Lake AFR is generally dominated by black spruce and tamarack, but there is considerable variability in plant community types due to patterns of surface water drainage and fire disturbance. This variability is readily apparent from color infrared aerial photographs, which show a complex network of small drainage courses and a patchy distribution of vegetation. There are extensive areas of early post-fire successional plant communities on the site resulting from at least two fires reported to have occurred in the early 1980s.

Unburned forest in the Blair Lake AFR is typically open needleleaf forest or woodland of black spruce and tamarack. Tree height is usually between 15 and 30 feet, with diameters between 4-5 inches. Resin birch, willow, bog blueberry, crowberry (*Empetrum nigrum*), and Labrador tea are common species in the shrub understory. Herbaceous species are relatively few, with bluejoint reedgrass the only consistently common species found in unburned areas.

Burned forest that appeared to be about ten years post fire in 1993 occurs over an area of approximately 14,400 acres. The overstory in this burned area is dominated by resin birch and willow species. Labrador tea and bog blueberry are also common as lower stature shrubs. Herbaceous species in the burned areas are not abundant or diverse, consisting primarily of bluejoint reedgrass and horsetail. There are also some dense green alder stands that are probably post-fire successional communities resulting from fairly small fires of 10-30 years ago.

Along small stream courses, the vegetation is quite different. There are two basic types of plant communities along the braided network of channels that cross much of the Blair Lake AFR.

One is dominated by green alder and the other by paper birch. The green alder communities are comprised of many of the same species found in the burned and unburned black spruce forests that occur throughout the site, including willows, resin birch, Labrador tea, and bluejoint reedgrass. In addition, herbaceous species characteristic of marshy conditions are also present, particularly water sedge and varied-leaved cinquefoil (*Potentilla diversifolia*). The paper birch dominated communities tended to be greater in extent and stature. Many of the paper birch trees are 60 feet or taller and in a state of decay. Mature black spruce is also present. Understory species are not notably different from surrounding black spruce-tamarack stands, although because of a denser overstory, the understory has lower cover and is less diverse. In some of the small watercourses, particularly where clearing and winter tracks had disturbed the peat surface, marsh areas occur, dominated by dense water sedge.

Immediately to the east of the site, several hills rise about 500 feet above the valley floor. The range extends just to the lower portion of these hills. In this area, mixed broadleaf forest of paper birch and quaking aspen occurs.

Table 2.7. Vegetation Cover Type Occurring on Blair Lake AFR

Vegetation Cover Type	Acres
Black Spruce: Closed	540.1
Black Spruce/Tamarack: Open/Woodland	15,468.3
Paper Birch/Aspen: Closed	337.8
Paper Birch: Open	547.3
Mixed Needleleaf/Broadleaf: Closed	607.4
Mixed Needleaf/Broadleaf: Open	971.0
Alder/Willow Scrub	1,112.8
Resin Birch/Willow Scrub	14,259.5
Graminoid/Herbaceous	37.8

Vegetation Cover Type	Acres
Ponds	6.7
Gravel Pit	6.2
Man-made	68.0

Birch Lake Vegetation

The Birch Lake Recreation Area is located on a triangular peninsula on the east side of Birch Lake. Unpaved roads dissect the recreation area into small wooded tracts. Some areas have been cleared for campsites and cabins. Vegetation cover types are shown in Map Vegetation Cover Types, Birch Lake Recreation Area, Appendix H, and summarized in the Table Vegetation Cover Types Occurring on Birch Lake Recreation Area.

Closed mixed forest communities comprised of white spruce, paper birch, quaking aspen, and balsam poplar dominate the upland areas and pure paper birch stands are present near the shoreline in the northwest corner of the recreation area. The largest trees reach 100 feet in height and 20-28 inches in diameter. Dense canopies limit shrub development; however, in areas where canopy cover is less than 65 percent, prickly rose, highbush cranberry, lowbush cranberry, and Labrador tea are all represented. Horsetail dominates the herbaceous layer and tall bluebell (*Mertensia paniculata*), sweet coltsfoot, fireweed, and bluejoint reedgrass are present in trace amounts. The disturbed areas for cabins, campsites, etc., within this forest type are surrounded by narrow margins of closed tall shrub communities, which include green alder, willow, and paper birch saplings. These fringe areas are not shown on the vegetation cover type map (Map Vegetation Cover Types, Birch Lake Recreation Area, Appendix H).

The northeast section and areas east and west of the entrance gate of the recreation area have closed black spruce stands. The tree density is high and canopy cover approaches 70 percent. Black spruce trees average 20-30 feet tall and 4 inches in diameter. A low shrub layer includes Labrador tea, prickly rose, and lowbush cranberry. The herbaceous layer is comprised of horsetail, bluejoint reedgrass, bunchberry dogwood (*Cornus canadensis*), and sweet coltsfoot. West of the entrance gate and in the east central section of the recreation area are alder/willow stands. The understory of the stand west of the entrance gate includes sedge grasses.

Table 2.8. Vegetation Cover Types Occurring on Birch Lake Recreation Area

Vegetation Cover Type	Acres
Black Spruce: Closed	5.7
Paper Birch/Aspen: Closed	1.8
Mixed Needleleaf/Broadleaf: Closed	26.8
Alder/Willow Scrub	4.1
Man-made/Beach	12.6

2.3.2.3 Turf and Landscaped Areas

Vegetation on Improved Grounds

Improved grounds include the athletic fields, lawn areas, and mowed fields adjacent to housing, administrative buildings, and associated facilities that comprise the core of the base. Lawns around housing and most other buildings are composed primarily of Kentucky bluegrass (*Poa pratensis*), creeping red fescue (*Festuca rubra*) with common dandelion (*Taraxacum officinale*), alsike clover

(*Trifolium hybridum*), and a variety of other weeds scattered throughout. Around most residential neighborhoods, where intensive fertilization and individual lawn care are applied, weeds are less common. The base has a variety of ornamental trees and shrubs. The most common trees are white spruce, paper birch, and chokecherry (*Prunus virginiana*). The less common trees are lodgepole pine (*Pinus contorta*), scotch pine (*Pinus sylvestris*), balsam poplar, and quaking aspen. The most common shrubs are cotoneaster (Cotoneaster spp.), lilac (*Syringa spp.*), and shrubby cinquefoil (*Potentilla fruticosa*).

Athletic and other mowed fields, which receive less intensive management than most lawns, are dominated by Kentucky bluegrass. Alsike clover and dandelion are also well represented to abundant throughout. Other common field plants found primarily in disturbed areas, infrequently mowed areas, and areas with little or no topsoil include foxtail barley (*Hordeum jubatum*), common plantain (*Plantago major*), knotweed (*Polygonum aviculare*), lamb's quarters (*Chenopodium album*), pineapple weed (*Matricaria matricarioides*), and alpine milkvetch (*Astragalus alpinus*).

Vegetation on Semi-Improved Grounds

Semi-improved grounds include most unpaved areas within and around the airfield, tank farms, and associated facilities. In general, vegetation on semi-improved ground is not well organized into discrete plant communities. Instead, the vegetation consists of a heterogeneous mix of a wide variety of native and introduced plant species, the composition of which varies considerably over relatively short distances. This heterogeneity is due in part to soil and site conditions which range from relatively undisturbed native soils, to shallow topsoil over coarse textured fill, to deep fill without topsoil. In addition to varying degrees of soil disturbance, semi-improved grounds receive periodic mowing on varying schedules and plant establishment occurs through a combination of introduction and spread of numerous non-native forage plants and weeds, and natural revegetation by native plants.

During the 1990 Natural Resources Conservation Service plant inventory of semi-improved grounds, 106 taxa were identified. Only 14 percent of the plants identified are common throughout most areas of semi-improved ground. Another 36 percent are found in most areas but are usually uncommon, or occasionally common. The remaining 50 percent occur only occasionally or are restricted to particular sites, such as ditches or other wet areas. Approximately 50 percent of the plants on semi-improved grounds are either introduced weeds or native species well adapted to invade or otherwise increase on disturbed sites.

Vegetation composition on semi-improved grounds displayed patterns that vary depending on whether the site consists of natural soils or fill, the frequency and degree of disturbance, and the age of the stand. Natural soils, which had been cleared long ago and subsequently have received only annual mowing, tend to have a greater relative abundance of bluejoint reedgrass and other native plants characteristic of early-to mid-seral forest. At the other extreme are periodically disturbed areas of fill that tend to be dominated more by native and introduced weeds. Tickle grass (*Agrostis scabra*), foxtail barley, Kentucky bluegrass, alsike clover, Canada goldenrod (*Solidago canadensis*), yarrow (*Achillea millefolium*), and a number of other species are most common. Along the runway, common fireweed (*Epilobium angustifolium*) and alpine sweet-vetch (*Hedysarum alpinum*) are particularly abundant.

As a result of annual mowing and brush control, most, if not all, semi-improved ground is maintained in an early stage of vegetation succession. Left unmowed, this vegetation would rapidly progress to tall scrub and eventually to forest. Annual mowing maintains the shrubs and tree saplings at or below the height of the associated herbaceous vegetation.

2.3.3 Fish and Wildlife

Many species of birds, mammals, and fish occur in the Tanana Valley. Following is a discussion of the most common species that occur on Eielson AFB managed lands and their habitat needs. A more inclusive list of fish and wildlife species present in the area can be found in Appendix D Fish and Wildlife Species List.

Birds

Several species of birds are year-round residents of the interior of Alaska. The Tanana Valley provides summer breeding habitat for a wide variety of migratory bird species. Following is a brief description of the habitat requirements for each bird commonly observed on Eielson AFB lands.

***Spruce Grouse*—**During the summer, spruce grouse (*Dendragapus canadensis*) feed on a variety of flowers, green leaves, and berries, particularly blueberries and cranberries. Spruce needles are their primary source of nourishment in the winter. Nests are usually located at the base of spruce trees. Spruce grouse populations are very cyclic, but causes of the fluctuations are not understood.

***Ruffed Grouse*—**In the summer and fall, ruffed grouse (*Bonasa umbellus*) are often found in alder thickets and willow bottoms, as well as in spruce-birch forests and aspen groves. During the winter, aspen forests are preferred. Principal fall foods include blueberries, highbush cranberries, bearberries, rose hips, and aspen buds. In the winter, ruffed grouse rely primarily on the buds and twigs of aspen, and secondarily on the buds and twigs of willow and soapberry. The nests are often located at the base of large trees. Ruffed grouse populations are very cyclic, but the causes of the fluctuations are not understood.

***Raptors*—**The northern goshawk (*Accipiter gentilis*) and great horned owl (*Bubo virginianus*) are year-round residents. The Osprey (*Pandion haliaetus*), red-tailed hawk (*Buteo jamaicensis*), sharp-shinned hawk (*Accipiter striatus*), and American kestrel (*Falco sparverius*) are summer residents. Stick nests are built in large trees by the northern goshawk, red-tailed hawk, and sharp-shinned hawk. The great horned owl will use an old stick nest of the larger hawks. American kestrels often nest in tree cavities. Typical prey for these raptors include snowshoe hare (*Lepus americanus*), grouse, several species of small birds, rodents, and fish species. Raptor populations in Alaska fluctuate annually in response to prey abundance and other environmental factors.

***Waterfowl*—**Waterfowl require stable water conditions and waterholes that vary in depth and configuration. Aquatic and shoreline vegetation is needed for cover, food, and nest construction. Most of the area lakes and ponds meet the needs of migrating, resident, and nesting waterfowl. The marshes with their fluctuating water levels are more important in the early spring when snowmelt produces the highest water level. Over 20 species of waterfowl are known to occur on Eielson AFB lands, including geese, ducks, loons, grebes, and scoters.

***Rock and Willow Ptarmigan*—**When snow covers the ground, willow ptarmigan (*Lagopus lagopus*) primarily feed on willow buds and twigs, and occasionally consume small amounts of birch buds and catkins. The reverse is true for rock ptarmigan (*Lagopus mutus*), which primarily feed on birch catkins and buds and consume only small amounts of willow. In the spring ptarmigan eat a blend of insects, dried berries, new leaves, and flowers. The birds eat a potpourri of vegetable matter in summer and occasionally take advantage of a particularly abundant crop of caterpillars or beetles. Gradually as insects disappear and plants become dormant, these birds rely increasingly on berries, seeds, and buds. Ptarmigan nest on the ground. Ptarmigan populations are very cyclic, but causes of the fluctuations are not understood.

Mammals

Approximately 32 species of mammals play key roles in the ecosystems occurring in the vicinity of Eielson AFB managed lands. Following is a brief description of the habitat requirements for the most common/important mammals.

***Moose*—**Fall and winter foods are primarily the terminal shoots of willow, birch, and aspen. Spring and summer foods include sedges, horsetails, pond weeds, grasses, and leaves of birch, willow, alder, and aspen. Aspen is a secondary food choice in interior Alaska. Moose (*Alces alces*) move seasonally to different calving, rutting, and wintering areas. These moves may cover 20-40 miles.

***Black Bear*—**After emerging from dens in May, black bear (*Ursus americanus*) forage on freshly sprouted green vegetation such as grasses, sedges, and equisetum. Summer-fall foods include berries such as bog blueberry (*Vaccinium uliginosum*), lowbush cranberry (*Vaccinium vitis-idaea*), highbush cranberry (*Vaccinium edule*), and bearberry (*Arctostaphylos uva-ursi*). Bear consume fish, carrion and opportunistically prey on moose calves.

***Brown/Grizzly Bear*—**The brown/grizzly bear (*Ursus arctos*) is omnivorous. Common foods include berries, grass, sedge, horsetail, cow parsnip, fish, and roots of many plants. Flesh of game or domestic animals is eaten when it is available. The brown/grizzly bear is probably not a significant predator on big game species, except possibly during spring when the young are most vulnerable. Brown/grizzly bears are fond of carrion and will feed on carcasses of any animals they find.

***Snowshoe Hare*—**Snowshoe hare (*Lepus americanus*) feed on succulent grasses, buds, twigs, and leaves during the summer. During winter, they consume the twigs and needles of spruce and the bark and buds of many hardwood species. Populations of snowshoe hare are subject to cycles of very high abundance and relative scarcity. According to extensive research in Canada, declines in the snowshoe hare population result from a period of starvation followed by a more prolonged period in which predation and malnutrition act jointly to produce high mortality.

***Marten*—**Marten (*Martes americana*) inhabit mature spruce forests, using the spruce trees for cover. Their primary food sources are meadow voles (*Microtus pennsylvanicus*), red-back voles (*Clethrionomys rutilus*), and meadow jumping mice (*Zapus hudsonius*). Fluctuations of prey populations often create corresponding variations in marten populations. Probably the second most important food source is berries, especially blueberries, followed by small birds, eggs, and vegetation. Carrion will be eaten at times.

***Red Squirrel*—**Red squirrel (*Tamiasciurus hudsonicus*) populations are dependent on spruce cone production. Cone production, affected by weather, disease, and insects, is variable from year to year. The secondary food source is mushrooms. Other food sources include seeds, berries, and occasionally insects and birds eggs. Spruce buds are the main source of winter food in years of low cone production. Low cone production forces the squirrels to rely on other food sources such as spruce buds, or to immigrate into surrounding spruce stands in search of cones. Nesting habitat and wintering cavities are not important as limiting factors. Nests are commonly built in holes of trees or from twigs, leaves, or moss which are readily available.

***Beaver*—**The most productive beaver habitat is characterized by a dependable water supply with little fluctuation in stream flow. Beavers (*Castor canadensis*) must have 2-3 feet of water year-round. Productive habitat must also have willow, aspen, balsam poplar, and birch vegetation. Beaver consume the leaves and bark of willow, aspen, balsam poplar, and birch, as well as roots and stems of aquatic vegetation and sedges.

***Muskrat*—**Muskrats (*Ondatra zibethicus*) are primarily herbivorous and feed mainly on aquatic plants such as the roots and stems of cattails, lilies, sedges, and grasses. They also occasionally eat aquatic invertebrates and small fish. Muskrats are vulnerable during winters with little snow and very cold temperatures when shallow ponds and underwater passages may freeze. Populations are reduced by winterkill when the ice becomes too thick and muskrats are forced into limited forage areas. In years of heavy snow, muskrats may be flooded out in the spring. Losses to predation and starvation increase under such situations. Muskrat populations respond quickly following adverse conditions because of their high reproductive capability.

***Mink*—**Virtually anything that can be caught and killed by a mink (*Mustella vison*) will be used as food. This includes a wide variety of fish, birds, bird eggs, insects, and small mammals. Mink are most common around streams, ponds, or marshes.

Fish

Numerous species of fish occur naturally in the streams and lakes of interior Alaska. The ADF&G stocks rainbow trout (*Oncorhynchus mykiss*), arctic grayling (*Thymallus arcticus*), arctic char (*Salvelinus alpines*), and Chinook salmon (*Oncorhynchus tshawytscha*) in seven lakes and one stream on Eielson AFB. The ADF&G stocks Birch Lake at the location of the Birch Lake Recreation Area with rainbow trout, grayling, arctic char, and Chinook salmon.

Winter dissolved oxygen levels are an important limiting factor for fish survival in the lakes of interior Alaska. Snow depth, ice depth, lake depth, and biological action before freeze-up all affect winter dissolved oxygen levels. Trying to maintain winter dissolved oxygen at predetermined levels through the use of an aeration system is not feasible due to cost.

Deepening of lakes might provide areas with adequate winter dissolved oxygen for over wintering fish, but may be cost prohibitive. Fish management must accommodate nature's winter dissolved oxygen levels. A lake can be managed only for the fish species for which the winter dissolved oxygen level over the years has been adequate to prevent winterkill.

Predatory and competing fish such as northern pike (*Esox lucius*), lake chubs (*Ouesius plumbeus*), and longnose suckers (*Catostomus catostomus*) can be a limiting factor for the survival of any game fish species that are stocked in interior Alaska. Northern pike deplete game fish populations by preying on them. Lake chubs and longnose suckers outcompete game fish species for food, space, and oxygen. The ADF&G stocks larger fish reared to subcatchable and adult size in lakes containing predatory and competing fish to improve the survival rate of the stocked species.

Fish Habitat—Lake or Stream, Species to be Managed for, Acres or Miles

<u>Bear Lake—Rainbow Trout and Northern Pike—64.8 acres</u>

Bear Lake is a reclaimed borrow pit from which gravel was first excavated in the early 1950's. The excavation created a 51-acre lake with two distinct portions separated by land. The main lake portion (about 46 acres) was shallow and normally contained no winter dissolved oxygen. The small portion (about 5 acres) was deep and normally contained winter dissolved oxygen. Three very shallow channels (1-2 feet deep) connected the two portions. Fish movement between the two portions was prevented in the winter when the channels would freeze to the bottom. In 1976, 230 feet of dike was built to block a man-made channel connecting Bear Lake to French Creek. The dike protects Bear Lake from French Creek floodwaters.

In 1987, a pit (lake) expansion about 12 acres in size began on the west side of Bear Lake. The primary purpose of the expansion was to provide a source of gravel for construction. The secondary purpose was to attempt to improve fish habitat by enlarging and deepening the lake and connecting the lake to a 3-acre pond to the immediate northwest that had over the years sporadically maintained sufficient winter dissolved oxygen to over winter fish. From 1987-2002, gravel excavation enlarged the main lake portion by about 10.8 acres. In 2001, the lake and the pond were finally connected.

In 1994, as part of a Gravel Pit Dissolved Oxygen and Wetlands Enhancement Demonstration Project, the two portions of Bear Lake were connected with a channel a minimum of 10 feet deep below normal water level. The 10-foot deep channel between the portions ensures adequate water exchange in the winter, providing access to a winter dissolved oxygen source and allowing the fish to move freely between the portions. In 1995, 150,000 cubic yards of material were removed just north of the center of Bear Lake using two sauerman draglines. The draglines excavated about a 5-acre circular shaped hole that was 66-74 feet deep in the center. After the excavation, no change was found in Bear Lake's winter dissolved oxygen levels during the annual winter dissolved oxygen inventory conducted in March 2017.

Campground and picnic pavilions are located on Bear Lake. Rainbow trout are stocked to enhance the sport fishing potential. The heavy daily use from the campground and picnic pavilion justifies the need for stocking Bear Lake, even though the lake probably lacks adequate winter dissolved oxygen to effectively over winter rainbow trout.

Grayling Lake—All Species Present Except Lake Chub—10.3 acres

Grayling Lake was excavated in the early 1970s. Prior to stocking in 1975, Grayling Lake offered no sport fishing opportunities. Since 1976, the winter dissolved oxygen level has been adequate for all species. In 1982, lake chubs were found in Grayling Lake. Grayling, arctic char, and rainbow trout are stocked to enhance the sport fishing potential. The arctic char and rainbow trout will possibly prey on the lake chubs.

Hidden Lake—All Species Present—17.5 acres

Hidden Lake was excavated in the early 1970s. Prior to stocking in 1975, Hidden Lake offered no sport fishing opportunities. Since 1976, the winter dissolved oxygen level has been adequate for all species. In 1981, lake chubs were found in Hidden Lake. By 1987, the lake chubs prevented adequate survival of stocked species. In October 1987, Hidden Lake was chemically treated to remove the fish population. In 1988, Hidden Lake was stocked with adult sized rainbow trout to immediately return the lake to sport fisheries production. In 1989, northern pike were found in Hidden Lake. Arctic char, rainbow trout, and grayling are stocked to enhance the sport fishing potential.

Lily Lake—No Fish Present—25.7 acres

Lily Lake is a shallow lake containing lily pads, relying on surface runoff for water replenishment. It is not uncommon for the winter dissolved oxygen level of such lakes to be related to water depth. A series of years having low annual precipitation can decrease both the water depth and the winter dissolved oxygen level. Low water depth encourages lily pad growth. In 1968, Lily Lake was 45 acres in size. Lily Lake is being filled in with lily pads and other vegetation through natural succession. Currently Lily Lake is 25.7 acres in size.

In 1976, Lily Lake was chemically treated to remove the existing lake chub population. In 1977, 50,000 grayling fry were stocked. The grayling exhibited excellent growth. From 1975 to 1980, the winter

dissolved oxygen level was adequate for grayling. Nine feet was the greatest depth in the lake. Aerial photography from 1975 shows 51 percent of the lake surface was open water uninhabited by lily pads and other aquatic plants. In the winter of 1981, the grayling were killed due to a very low winter dissolved oxygen level. It is believed this was caused by a series of years having low annual precipitation, dating back to 1979.

By 1981, the greatest depth in the lake was 6.5 feet and lily pads flourished, covering most of the lake surface. By 1986, the greatest depth in the lake was again 9 feet. Since 1987, the greatest depth in the lake has varied from 8-9.5 feet deep. Lily pad growth did not recede. Aerial photography from 1986 shows approximately 19 percent of the lake surface to be open water uninhabited by lily pads and other aquatic plants. The large increase in winter decaying vegetative matter probably keeps the winter dissolved oxygen readings from returning to pre-1980 levels.

Prior to rehabilitation no sport fishing opportunities existed. Afterwards Lily Lake provided some of the larger lake-grown grayling on base. Presently, Lily Lake is not suitable grayling habitat. Lily Lake cannot be considered for stocking until there is a natural or man-made decrease in the lily pad growth, hopefully improving the winter dissolved oxygen level.

Moose Lake—All Species Present—30.4 Acres

Moose Lake is an abandoned gravel pit within the housing area. The northern two thirds of the lake was excavated in the early 1950s. Prior to 1979, the lake consisted of two portions. The north portion had good winter dissolved oxygen readings, whereas the south portion contained no winter dissolved oxygen. In 1979, a channel was dug through the peninsula separating the portions to ensure water exchange in the winter, and to hopefully provide oxygen for the south portion. To prevent French Creek from overflowing into Moose Lake and introducing unwanted fish, 540 feet of dike was built. The 1980 winter dissolved oxygen readings showed dissolved oxygen in both portions.

The northern pike in the lake were chemically removed in September 1980. The lake was stocked with silver salmon in 1981. The dike breached each spring from 1979-88. The length and height of the dike was increased each time. By 1988 Moose Lake was protected by 1,500 feet of dike. Breaching of the dike continued and the need for a significantly larger diking system became apparent. In 1986, nets set by the ADF&G confirmed the reoccurrence of northern pike in the lake, presumably due to the recurrent breaching of the dike.

Moose Lake benefited from the 1993-1994 wetlands mitigation for the 801 Replacement Housing Project. About 11,300 feet of 10-foot high diking was built, isolating Moose Lake and Polaris Lake from French Creek floodwaters. An addition, about 6.8 acres in size, was excavated on the south end of the lake. The addition is connected to the lake by a channel ranging 10-20 feet in depth. The greatest depth of the addition ranges from 25-30 feet deep. The north end of the lake was excavated with a sauerman dragline creating a hole that is 60 feet at the deepest point. These habitat improvements have contributed to a slight increase in the winter dissolved oxygen levels of Moose Lake. From 1995-1998, the winter dissolved oxygen level was adequate for all species. From 1999-2017, the winter dissolved oxygen level has been marginally adequate for all species. Rainbow trout, grayling, and arctic char are stocked to enhance the sport fishing potential.

Mullins Pit—All Species Present—84.7 acres

In 1956, S.S. Mullins Contractor, Seattle, Washington opened the pit to construct the loop taxiway. Locally the pit became known as Mullins Pit. In 1974, Mullins Pit was a 25-acre borrow pit consisting of two portions. Over the years a 10-foot-deep channel was dug connecting the two portions and ensuring

oxygen exchange between the portions during the winter. Between 1974-2009 gravel excavation has enlarged the pit by 59.7 acres. The average depth of excavation was 20 feet below the water level. Prior to 1987, the large portion of the original pit contained winter dissolved oxygen and the small portion did not. Since 1987, both portions have contained winter dissolved oxygen. Since 1991, about 5,163 feet of dike has been built along the east side of the pit to protect Mullins Pit from French Creek floodwaters. Since 1976, the winter dissolved oxygen level has been adequate for all species. Arctic char, grayling, and Chinook salmon are stocked to enhance the sport fishing potential.

Pike Lake—Northern Pike—25.0 acres

Pike Lake is an old borrow pit excavated in the early 1950s. Since 1976, winter dissolved oxygen readings have been near zero. Gill nets set in June 1975 contained a few small northern pike. There probably is a small pocket of dissolved oxygen somewhere in the lake that enables the fish to overwinter. The lake will be managed for northern pike based on the 1975 netting indicating the potential for overwintering northern pike.

Polaris Lake—All Species Present—51.2 acres

Polaris Lake was completed in 1995. Polaris Lake is a borrow pit that was a source of gravel for four large construction projects over a 30-year period. Polaris Lake was begun in the mid-1950s when two bodies of water about 4 and 8 acres in size were excavated. In the late 1960s, two more bodies of water about 4 and 6 acres in size were excavated southeast of the original two for the Polaris Street Housing Project. In 1984, about 28 acres of excavation for the Cool Homes Housing Project connected the original 8-acre body of water and the 6-acre pond created by the Polaris Street Housing Project. In 1995, wetlands mitigation for the 801 Replacement Housing Project connected all the portions into one large lake. The excavation in 1984 and 1995 was done to leave a water depth of 20 feet or more and create a littoral zone, peninsulas, an island, and bays.

French Creek used to overflow into Polaris Lake every spring, providing possible escapement for fish in the lake and introduction of unwanted fish from the creek. To allow for fisheries development, about 3,700 feet of dike was built using overburden from the Cool Homes borrow pit activities, and about 11,300 feet of 10-foot high diking was built for the 801 Replacement Housing Project. Polaris Lake is now protected from French Creek floodwaters. Since 1996, the winter dissolved oxygen level has been adequate for all species. Arctic char, rainbow trout, and Chinook salmon are stocked to enhance the sport fishing potential.

Rainbow Lake—Northern Pike, Burbot, Whitefish—18.8 acres

Rainbow Lake is an old borrow pit excavated in the early 1950s. Since 1975, the winter dissolved oxygen level has been adequate for the indigenous northern pike, burbot, and whitefish.

Scout Lake—Northern Pike, Burbot—30.2 acres

Scout Lake is an old borrow pit excavated in the early 1950s. Since 1975, the winter dissolved oxygen level has been adequate for the indigenous northern pike and burbot.

Tar Kettle Lake—No Fish Present—20.6 acres

Tar Kettle Lake is an old borrow pit. The south half was excavated in the early 1950s, and the north half was excavated in the early 1970s. In 1975, the Sport Fish Division of the ADF&G stocked the lake with 35,000 grayling fry as part of an experimental stocking program to attempt to establish grayling fisheries

in waters not suitable for other species, and also to determine growth and survival under various marginal conditions. Since 1976, the winter dissolved oxygen readings have indicated little or no dissolved oxygen. No fish were caught in gill nets set in 1977, indicating a possible winterkill.

28 Mile Pit—All Species Present Except Lake Chub—7.4 acres

28 Mile Pit was excavated in the early 1970's. Prior to stocking in 1977, 28 Mile Pit offered no sport fishing opportunities. Since 1976, the winter dissolved oxygen level has been adequate for all species. In 1984, lake chubs were found in 28 Mile Pit. In 1993, northern pike were reported to be in the lake. Rainbow trout and arctic char are stocked to enhance the sport fishing potential. The pike, rainbow trout, and arctic char will prey on the lake chubs.

Piledriver Slough—All Species Present—12.6 miles

Piledriver Slough has good water quality and provides good fish habitat. Piledriver Slough receives no runoff from the urban developed area of base. Piledriver Slough discharges into Moose Creek. Piledriver Slough has been documented as waters important for the spawning, rearing, or migration of anadromous fish. Chum salmon have been known to spawn in Piledriver Slough.

French Creek—All Species Present—8.1 miles

French Creek has good water quality and provides suitable fish habitat. French Creek receives some runoff from the urban developed area of base. French Creek is a tributary to Moose Creek. French Creek has been documented as waters important for the spawning, rearing, or migration of anadromous fish. Chum salmon have been known to spawn and rear in French Creek.

Garrison Slough—All Species Present—4.5 miles

Garrison Slough flows through and receives runoff from the urban developed area of base. Although the water is discolored, contains algae growth and has a high concentration of minerals, the slough meets present USEPA standards. During remedial investigation PCB contamination was discovered in sediments and the tissue of fish using Garrison Slough between the railroad crossing near Bear Lake and Building 2258. A risk calculation indicates a 50-pound child would have to consume in excess of 22 pounds of fish caught in Garrison Slough annually for six years to pose a risk of contracting cancer from the contaminated fish. In 1997-1998, the Eielson AFB Installation Restoration Program removed PCB contaminates to levels that comply with an industrial use scenario. USEPA and the ADEC concurred with the removal through a signed record of decision. Since 1998, fish access to the section of the slough between the railroad crossing near Bear Lake and Building 2258 has been restricted by screens. The Installation Restoration Program continues to sample fish and monitor the PCB levels in the slough. Fishermen obtaining an Eielson AFB Fishing Permit are briefed of this information. Garrison Slough is a tributary to Moose Creek. The other streams on base are more suitable as fish habitat.

Moose Creek—All Species Present—1.3 miles

Moose Creek has good water quality and provides suitable fish habitat. The portion of Moose Creek that flows through base receives no direct runoff from the urban developed area. Garrison Slough, which receives direct runoff from urban developed portions of the base, flows into Moose Creek downstream from the base boundary. Moose Creek discharges into the Tanana River. Moose Creek has been documented as waters important for the spawning, rearing, or migration of anadromous fish. Chum salmon have been known to migrate through Moose Creek.

Knokanpeover Creek—All Species Present—2.4 miles

Knokanpeover Creek has good water quality and provides suitable fish habitat. Knokanpeover Creek receives no runoff from the urban developed area of base. Knokanpeover Creek is a tributary to French Creek.

Table 2.9. Fish Habitat Occurring at Eielson AFB

Habitat Type	Fish Species Present	Acres/ Miles	Managed Species
Bear Lake	Rainbow trout, northern pike	64.8 acres	Rainbow trout, northern pike
Cathers Lake	Working gravel pit	24.2 acres	Lake chub present
Grayling Lake	Grayling, rainbow trout, arctic char, northern pike, whitefish, burbot, least cisco, lake chub	10.3 acres	All species present except lake chub
Hidden Lake	Rainbow trout, arctic char, grayling, northern pike	17.5 acres	All species present
Lily Lake*	Winter kills because of low winter dissolved oxygen levels	25.7 acres	No fish present
Moose Lake	Grayling, rainbow trout, arctic char, northern pike	30.4 acres	All species present
Mullins Pit	Arctic char, grayling, Chinook salmon, northern pike, burbot	84.7 acres	All species present
Pike Lake	Northern pike	25.0 acres	Northern pike
Polaris Lake	Northern pike, rainbow trout, arctic char, Chinook salmon	51.2 acres	All species present
Rainbow Lake	Northern pike, whitefish, longnose sucker, burbot	18.8 acres	Northern pike, burbot, whitefish
Scout Lake	Northern pike, longnose sucker, burbot	30.2 acres	Northern pike, burbot
Tar Kettle Lake	Winter kills because of low winter dissolved oxygen levels	20.6 acres	No fish present
28 Mile Pit	Arctic char, rainbow trout, lake chub, northern pike	7.4 acres	All species present except lake chub
French Creek	Northern pike, grayling, whitefish, burbot, rainbow trout, chum salmon	8.1 miles	All species present
Knokanpeover	Northern pike, grayling	2.4 miles	All species present
Moose Creek	Northern pike, grayling, whitefish, burbot, rainbow trout, sheefish, chum salmon	1.3 miles	All species present
Garrison Slough	Northern pike, grayling, whitefish, burbot, rainbow trout	4.5 miles	All species present
Piledriver Slough	Northern pike, grayling, whitefish, burbot, rainbow trout, sheefish, chum salmon, king salmon	12.6 miles	All species present

* Only natural lake on base; all others are old gravel borrow pits

Blair Lake AFR Fish Habitat—Stream, Species to be Managed for, Miles

Clear Creek—All Species Present, 28.3 miles

The Clear Creek streams in the Blair Lake AFR are headwater tributary streams for the main creek channel. Clear Creek has good water quality and provides suitable fish habitat. The fish species present are arctic grayling, northern pike, and white fish.

Willow Creek—All Species Present, 56.2 miles

The Willow Creek streams in the Blair Lake AFR are headwater tributary streams for the main creek channel. Willow Creek has good water quality and provides suitable fish habitat. The fish species present are arctic grayling, northern pike, and whitefish.

Unnamed Creek—All Species Present, 26.6 miles

The streams in the unnamed drainage in the Blair Lake AFR are headwater tributary streams for the main creek channel. The unnamed drainage has good water quality and provides suitable fish habitat. The fish species present are arctic grayling, northern pike, and whitefish.

C Battery Wildlife Habitat

About 75 percent of C Battery is alder forest and about 25 percent is grassland dominated by brome grass. Songbirds use the seeds from the small cone-like structures on the alder during the fall and winter. The small size and developed nature of C Battery discourages wildlife use.

Moose, bear, grouse, ptarmigan, and hare inhabit the surrounding forest and use C Battery when moving from one food or shelter source to another. The forest types within C Battery will continue to meet the needs of songbirds and the transitory wildlife species in the foreseeable future.

C Battery Fish Habitat

There are no bodies of water within the boundaries of C Battery.

Birch Lake Fish Habitat

There are no bodies of water within the boundary of the recreation area.

2.3.4 Threatened and Endangered Species and Species of Concern

Regional Threatened and Endangered Species

In FY93, Eielson AFB contracted a biological survey for all base managed lands. One objective of the survey was to inventory and map the occurrence of all federal and state listed and proposed endangered and threatened species and their habitats. A final report was published in August 1994 (EA 1994). No listed or proposed threatened and endangered species and critical habitats were found on Eielson AFB managed lands. As of March 2016, the USFWS has not listed any new federally listed species or critical habitat that may occur on Eielson AFB or its training lands.

2.3.5 Wetlands and Floodplains

Wetlands dominate the landscape of the Tanana River Valley. They typically form in low-lying areas where permafrost underlays the soils and impedes drainage. The wetlands are replenished by runoff from precipitation and snowmelt. Evapotranspiration is the primary mechanism for moisture loss. Low average temperatures result in low rates of evapotranspiration and water is therefore retained in the wetlands for long periods of time. These extensive periods of saturation or ponding have resulted in the formation of organic soils in most of the wetlands in the valley. Wetland vegetation is dominated by open black spruce woodland, although sedge and sedge/grass meadows are common.

Eielson AFB Wetlands and Floodplains

About 51.7 percent (10,227 acres) of Eielson AFB is wetlands. On Eielson AFB there are 9,435 acres of vegetated wetlands and 792 acres of lakes, ponds, and streams. Black spruce wetlands are the most common of the vegetated wetlands. The vegetation in the black spruce wetlands consists primarily of black spruce interspersed with small accounts of paper birch and tamarack. Brush such as dwarf arctic birch (*Betula nana*), resin birch, and bog rosemary (*Andromeda polifolia*) grow in the more open areas. Quite often the ground is covered with lowbush cranberry (*Vaccinium vitis-idaea*). Most of the ground is covered with a thick layer of moss. The brush-covered wetlands are vegetated with willow, resin birch, dwarf arctic birch, alder, and bog rosemary. The marsh wetlands have standing water for varying portions of the year. The primary vegetation is sedges (*Carex spp.*), bulrushes (*Scirpus spp.*), and cattails (*Typha latifolia*). The dryer portions of marsh wetlands can be invaded by willow, dwarf arctic birch, resin birch, and bog rosemary.

Most of the base wetlands have wet soils due to poor drainage caused by permafrost. Water is trapped in the thawed layer between the moss covered surfaces and perennially frozen subsurfaces. Precipitation fills/floods depressions within the marsh wetlands. Water covered areas in the marsh wetlands increase greatly in size after snowmelt and slightly in size after a rain event. Evaporation during dry periods reduces their size. The wetlands occurring on Eielson AFB are shown on Map Wetlands and Floodplains, Eielson Air Force Base Appendix H.

Eielson AFB Floodplains

About 32.6 percent of Eielson AFB is within the 100-year floodplain. The floodplain information was obtained from Flood Insurance Rate Maps prepared for the Fairbanks North Star Borough by the US Department of Housing and Urban Development. The floodplains occurring on Eielson AFB are shown on Map Wetlands and Floodplains, Eielson Air Force Base, Appendix H.

C Battery Wetlands and Floodplains

There are no wetlands at C Battery.

C Battery Floodplains

C Battery is not within the 100-year floodplain. The floodplain information was obtained from Flood Insurance Rate maps prepared for the Fairbanks North Star Borough by the US Department of Housing and Urban Development.

Chena River Research Site Wetlands and Floodplains

About 29 percent of the Chena River Research Site is wetlands. Wetland types occurring at the Chena River Annex include black spruce wetlands, mixed scrub-shrub wetlands, and an old oxbow meander of the Chena River. The vegetation in the black spruce wetlands consists primarily of black spruce interspersed with small amounts of paper birch and tamarack. Shrubs such as dwarf arctic birch, resin birch, and bog rosemary grow in the more open areas. Lowbush cranberry is common and most of the ground is covered with a thick layer of moss. The mixed scrub-shrub wetlands are vegetated with willow, alder, small black spruce saplings, and small patches of balsam poplar. Sedge grasses are found in the more open areas within this wetland type. On the AFTAC Remote Operating Facility, wetlands occur in the valley bottom, on north facing slopes, and in drainages. About 90 percent are vegetated with black spruce and 10 percent with a black spruce and paper birch mixture. Most of the Chena River Research Site wetlands have wet soils due to poor drainage caused by permafrost. Wetlands in the Chena River Research Site total 1,099 acres. The wetlands occurring in the Chena River Research Site are shown on Map Wetlands and Floodplains, Chena River Research Site, Appendix H.

Chena River Research Site Floodplains

About eight percent of the Chena River Research Site is within the 100-year floodplain. All floodplain is located within the Chena River Annex. The floodplain information was obtained from Flood Insurance Rate maps prepared for the Fairbanks North Star Borough by the US Department of Housing and Urban Development (2015). The floodplains occurring within the Chena River Research Site are shown on Map Wetlands and Floodplains, Chena River Research Site, Appendix H.

Blair Lake AFR Wetlands and Floodplains

Wetlands comprise 99.8 percent of the Blair Lake AFR. The unmaintained portion of the range is black spruce wetlands. The dominant species is black spruce that are 15-30 feet tall and 4-5 inches in diameter. Paper birch and alder are abundant along the watercourses. Other common species include Labrador tea, resin birch, dwarf arctic birch, willows, fireweed, sedges, grasses, and a variety of mosses.

The range proper is covered with black spruce wetlands maintained in an early stage of succession as the result of brush control. The vegetation is comprised of small black spruce, Labrador tea, resin birch, dwarf arctic birch, and willow, all approximately 10-40 inches tall due to the maintenance practices. These areas also support similar herbs and graminoids as the uncleared areas. The range proper includes 6.7 acres of man-made pond. The Blair Lake AFR wetlands have wet soils due to poor drainage caused by permafrost. Water is trapped in the thawed layer between the moss covered surface and perennially frozen subsurface. Wetlands within Blair Lake AFR total 33,889 acres. The wetlands occurring on the range are shown in Map Wetlands, Ponds, and Floodplains, Blair Lake Air Force Range, Appendix H.

Blair Lake AFR Floodplains

About 4.4 percent of the Blair Lake AFR is within the 100-year floodplain. The floodplain information was obtained from Flood Insurance Rate maps prepared for the Fairbanks North Star Borough by the US Department of Housing and Urban Development. The floodplains occurring within the range are shown on Map Wetlands, Ponds, and Floodplains, Blair Lake Air Force Range, Appendix H.

Birch Lake Wetlands and Floodplains

Wetlands comprise eight acres or approximately 16 percent of the Birch Lake Recreation Area. The recreation area has 5.7 acres of black spruce wetlands and 2.3 acres of alder/willow wetlands. The black

spruce wetlands are primarily vegetated with black spruce, lowbush cranberry, and mosses. The alder/willow wetlands are vegetated with alder, willow, pockets of resin birch, and sedge grasses.

The black spruce wetland has wet soil due to poor drainage caused by permafrost. Water is trapped in the thawed layer between the moss covered surface and perennially frozen subsurface ground. Snowmelt and rainfall floods the alder/willow wetland annually. The depth of flooding varies with the amount of precipitation. A small ponded area lies within the alder/willow wetland. The wetlands occurring in the Birch Lake Recreation Area are shown in Map Wetlands, Birch Lake Recreation Area, Appendix H.

Birch Lake Floodplains

There are no 100-year floodplains within the Birch Lake Recreation Area. The floodplain information was obtained from Flood Insurance Rate maps prepared for the Fairbanks North Star Borough by the US Department of Housing and Urban Development.

2.3.6 Other Natural Resource Information

In 2014, Eielson AFB had an in-depth forestry survey accomplished resulting in an updated vegetation map.

2.4 Mission Impacts on Natural Resources

2.4.1 Natural Resource Constraints to Mission and Mission Planning

The mission-related activities at Eielson AFB have the potential to impact the ecosystem and biological diversity, air quality, water quality, and noise levels. Problems can arise from the use, storage, and disposal of hazardous wastes. The environment can be affected by changes in mission and facility expansion. New construction can replace native vegetation with pavement and buildings, fill wetlands, alter natural drainage patterns, and construct dikes and levees for flood control measures. The impacts from new construction are typically related to development and are not unique to military installations. To protect nesting birds, construction projects such as land clearing, are timed to avoid the USFWS recommended nesting times to minimize any disturbance to those species. The following discussion will focus on the major impacts that are unique to mission activities at Eielson AFB.

2.4.2 Land Use

A land use map is needed to effectively manage the natural resources on Eielson AFB managed lands. Natural resources were identified, classified, and mapped using the three following categories that range from very general to site specific.

- Grounds Categories, the most general, follow the traditional USAF grounds classifications of improved, semi-improved, and unimproved grounds.
- Land Use Categories are subunits of Grounds Categories.
- Land Management Units are the smallest units used in developing natural resources management goals. Land Management Units are subunits of Land Use Categories.

Grounds Categories

Grounds categories are the broadest classification of base lands. This category classifies base lands into three general categories; improved, semi-improved, and unimproved. This classification is based on the

level of grounds maintenance conducted to maintain an area. The grounds categories are shown in Map Land Management, Eielson Air Force Base, Map Land Management, Chena River Research Site, Map Land Management, Blair Lake Air Force Range, and Map Land Management, Birch Lake Recreation Area (land management maps), Appendix H. The categories are defined as follows:

Improved Grounds

Includes land occupied by buildings and other permanent structures as well as lawns and landscape plantings on which personnel annually plan and perform intensive maintenance activities. Improved Grounds include the cantonment area, parade grounds, drill fields, athletic areas, golf courses (excluding roughs), and housing areas. Grass in these areas are normally maintained at a height of 2-4 inches during the growing season.

Semi-improved Grounds

Grounds where periodic maintenance is performed primarily for operational reasons (such as erosion and dust control, bird control, and visual clear zones). This land use classification includes areas adjacent to runways, taxiways and aprons, runway clear zones, lateral safety zones, rifle and pistol ranges, weapons firing and bombing ranges, picnic areas, ammunition storage areas, antenna facilities, bulk fuel storage areas. Semi-improved grounds areas are mowed less often than the maintained turf grass on improved grounds.

Unimproved Grounds

Unimproved grounds are areas not classified as ‘improved’ or ‘semi-improved’. Unimproved grounds include forest lands, lakes, ponds, wetlands, and any areas where natural vegetation is allowed to grow unimpeded by maintenance activities.

Land Use Categories

Land use categories break the ground categories into subunits where broad functions or the management of multiple natural resources occur. Other compatible uses should present no conflicts and contribute to the fullest use of the land resource. Future changes in federal, state, and community requirements could result in new priorities and obligations for Eielson AFB. Compelling factors may arise that would result in the need for revisions in the land use designations in this plan. The land use categories are shown in Map Land Management, Eielson Air Force Base, Map Land Management, Chena River Research Site, Map Land Management, Blair Lake Air Force Range, and Map Land Management, Birch Lake Recreation Area (land management maps), Appendix H. The land use categories on Eielson AFB managed lands are:

Airfield

This land use category includes parking/maintenance/arming aprons, runway, taxiways, infields, and grassed areas adjacent to runway and taxiways, etc.

Airfield Operations and Maintenance

This category includes all the facilities that directly support the flying mission such as aircraft hangars, nose docks, aircraft maintenance shops, airfield operations, and passenger and freight terminals, etc.

Industrial

Industrial lands include warehouses, civil engineer maintenance shops, munitions storage, bulk fuel storage, supply facilities, asbestos landfill, CH&PP, water treatment plant, base railroad, sewage treatment facility, vehicle operations and maintenance, etc.

Administrative

This land use category includes the functions that serve as the primary decision-making and personnel support centers of an USAF installation. Functions include, consolidated base personnel offices, finance, wing, group, and squadron administration, contracting, medical, etc.

Community Centers

This category includes the major commercial and service facilities such as the base theater, base exchange/commissary complex, Burger King, Post Office/AAFES Shoppette/Clothing and Sales/Class Six Complex, child care center, and the clubs. Also included are facilities that provide specific services for base occupants such as telephone maintenance, base gym, bowling center, credit union, base library, Arts and Crafts Center, Auto Hobby Shop, Two Seasons Dining Facility, base chapel, and public schools.

Housing

This category includes family housing, dormitories, temporary lodging facilities, etc.

Outdoor Recreation

This category consists of lands on which outdoor recreation management will be given priority. These lands include athletic fields, playgrounds, picnic sites, parcours trail, cross-country ski trails, campgrounds, winter sports site, water sports site, shooting ranges, self-guided nature trail, etc.

Fish and Wildlife

This category consists of lands on which fish and wildlife management will be given priority. These lands include stocked lakes and streams, wildlife management areas, mineral licks, etc.

Training Areas

Areas used to provide training for the military mission.

Borrow Pits

Areas from which gravel, topsoil, and unclassified material can be removed for construction and maintenance projects.

Open Space

Areas categorized as open space include forested land, lakes, ponds, streams, wetlands, etc., without any specific assigned function or natural resources management category. Generally these lands support a variety of activities.

Land Management Units

Land management units break the land use categories into subunits where site specific functions or management occurs. The natural resources management for these units is briefly described below. The land management units are shown in Map Land Management, Eielson Air Force Base, Map Land Management, Chena River Research Site, Map Land Management, Blair Lake Air Force Range, and Map Land Management, Birch Lake Recreation Area (land management maps), Appendix H.

Turf Grass and Landscaped Areas

Turf grass and landscaped areas occur in virtually all the land management categories. The most intensive maintenance of this land management unit occurs in the housing, airfield, airfield operations and maintenance, industrial, administrative, and community center land use categories. The outdoor recreation, fish and wildlife, training areas, borrow pits, and open space land management categories receive only periodic maintenance. This land management unit is managed according to the guidelines in Section 7.5 - Grounds Management Plan, under the 354 CES Performance Work Statement for Grounds Maintenance, and the Eielson AFB Tree Ordinance.

Athletic Fields

Athletic fields are managed to provide recreational sporting opportunities. The athletic fields are maintained by 354 FSS and the Fairbanks North Star Borough Schools.

Wetlands and Floodplains

Wetlands and Floodplains are shown on maps in Section 2.3.5. This land management unit is managed according to the guidelines in Section 7.6.

Family Picnic Sites

Family picnic sites are managed to provide picnic and, at some locations, camping opportunities for individuals or small groups. They have a first-come-first-serve policy.

Group Picnic Sites

Group picnic sites are managed to provide picnic and related recreational opportunities for large groups. Use is controlled through a reservation system administered by 354 FSS.

FAMCAMP

The FAMCAMP is managed to provide camping opportunities that include improved camper pads, primitive camp sites, electricity, water, sewage dump station, laundry facilities, canoe/boat rentals, computer website connections, and dumpster service. Use is controlled through a reservation system administered by 354 FSS.

Birch Lake Recreation Area Campground

The Birch Lake Recreation Area campground is managed to provide camping opportunities that include cabins, improved camper pads with electricity, and primitive campsites. Utilities available include electricity, water, sewage, and dumpster service. Use is controlled through a reservation system administered by 354 FSS.

Chena River Campground

The Chena River campground is managed to provide camping opportunities that include primitive campsites, outhouses, and dumpster service. The campground has a first-come/first-serve policy.

Birch Lake Recreation Area Water Sports Site

The Birch Lake Recreation Area water sports site is managed to provide recreational boating, fishing, and other water recreational opportunities. The site is managed and operated by 354 FSS.

Parcours Trail

The parcours trail is managed to provide physical fitness opportunities. In the summer the parcours provides jogging, exercise stations, and is connected with the base wide bicycle trail system. In the winter the parcours becomes a groomed cross-country ski trail.

Cross-Country Ski Trails

The cross-country ski trails are managed to provide physical fitness opportunities. In the winter the trails are groomed for skiing. In the summer the ski lodge trails are used for hiking and mountain biking.

Downhill Ski Slope

The downhill ski slope is managed to provide downhill skiing opportunities in the winter and if manpower allows golf driving range opportunities in the summer. The activities at the slope are managed and operated by 354 FSS.

Winter Sports Site

The winter sports site is managed to provide winter recreational opportunities that include a lodge, downhill ski slope, cross-country ski trails, ski rentals, sledding slope, and outdoor ice rink. All activities except the cross-country ski trails are managed and operated by 354 FSS.

Archery Range

Archery ranges are managed to provide recreational archery opportunities. The outdoor archery range is maintained by the Natural Resources Office. The indoor range is operated by the 354 FSS.

Skeet/Trap Range

The skeet-trap range is managed to provide recreational shooting opportunities. The skeet/trap range is managed and operated by 354 FSS.

Recreational Rifle and Pistol Shooting

The recreational rifle and pistol shooting program at the combat arms training range is managed to provide recreational shooting and sanctioned rifle and pistol match opportunities. The program is operated by the 21 Mile Rifle and Pistol Shooting Club.

Dog Mushing Trail

The mushing trail is managed to provide recreational dog mushing opportunities. The trail is maintained by the Salcha Dog Mushers Association.

Nature Trail

The nature trail is managed to provide a self-guided natural resources learning experience. Individuals can learn about local trees, shrubs, berry producing plants, a few animals, and arctic environmental concepts. The nature trail is maintained by the natural/cultural resources section.

Lady of the Lake

The Lady of the Lake (a B-29 WWII-era bomber) lies in a pond at 0.9-mile Transmitter Road and is managed to provide an information/historical learning opportunity via an interpretive display.

Watchable Wildlife/Salmon Spawning Area

The watchable wildlife/salmon spawning area is managed to provide education and salmon viewing opportunities located at the Chena Annex Campground.

Ski/Hiking Cabin

The ski/hiking cabin is managed to provide camping opportunities and a rest stop on the ski lodge cross-country ski trails. The cabin has a first-come/first-serve policy.

Heritage Park

Heritage Park is managed to provide information on the various aircraft that have been assigned to Eielson AFB.

Stocked Lakes and Streams

Stocking will be accomplished to maintain optimum population numbers and to enhance the sport fishing potential. The ADF&G will do all stocking in accordance with the department's stocking recommendations and policies.

Mineral Licks

The mineral licks on base will be protected from disturbance or destruction. Relative to the total range of big game animals, mineral licks are relatively rare and site-specific and elements commonly found in mineral licks are essential to the health of wild ungulates.

Mullins Pit Wildlife Management Area

Mullins Pit Wildlife Management Area is managed to provide fish and wildlife habitat, and fishing, watchable wildlife, and hunting opportunities.

Scout Lake Wildlife Management Area

Scout Lake Wildlife Management Area is managed to provide northern pike spawning habitat, wildlife habitat, and provide fishing, watchable wildlife and hunting opportunities.

Bear Lake Wildlife Management Area

Bear Lake Wildlife Management Area is managed to provide wildlife habitat and provide watchable wildlife opportunities.

Manchu Ponds Wildlife/Wetlands Management Area

Manchu Ponds Wildlife/Wetlands Management Area is managed to preserve quality wetlands as required by the Construct Replacement Housing Section 801 Build/Lease wetlands permit, and provide wildlife habitat and watchable wildlife opportunities.

Arctic Survival Field Training Area

The Arctic Survival Field Training Area is managed to provide training on how to survive in arctic conditions. The natural resources in this land management unit are managed according to the guidelines in Natural Resources Operating Plan for the Arctic Survival Field Training Area, Appendix F.

Combat Arms Training Range

The Combat Arms Training Range is managed to provide qualification for military personnel on hand-held small arms ranging from handguns to 50 caliber machine guns.

Readiness Training Area

The Readiness Training Area is managed to provide a simulated, deployed, field mobile living environment. Military units use the area to familiarize themselves with operating in this environment.

Security Police Obstacle Course

The Security Police Obstacle Course is managed to provide physical training for ground combat skills.

Wing Survival Field Training Area

The Wing Survival Field Training Area is managed to provide evasion and escape, navigation, and arctic survival training to fighter pilots and flight surgeons assigned to Eielson AFB.

Fire Training Area

The Fire Training Area is managed to provide simulated fire suppression training to the base fire department personnel.

Target Array—Blair Lake AFR

The target array at the Blair Lake AFR is managed to provide aircraft air-to-ground gunnery training.

Mullins Pit Borrow Pit

The Mullins Pit Borrow Pit is managed to provide gravel, topsoil, and unclassified material for construction and maintenance projects.

Cathers Lake Borrow Pit

The Cathers Lake Borrow Pit is managed to provide gravel, topsoil, and unclassified material for construction and maintenance projects.

Forest Compartments and Stands

The forest on Eielson AFB is divided into five compartments for orderly management and administration. Each compartment is divided into timber stands. Each stand is an aggregation of trees occupying a specific area and sufficiently uniform in species composition, age, arrangement, and condition as to distinguish it from adjoining areas. The compartments and stands are managed according to the guidelines in Section 7.8. Maps showing the forest types, compartments, and stands are found in Forest Inventory Maps, Appendix H.

2.4.3 Current Major Impacts

The mission-related activities at Eielson AFB have the potential to impact the ecosystem and biological diversity, air quality, water quality, and noise levels. Problems can arise from the use, storage, and disposal of hazardous wastes. The environment can be affected by changes in mission and facility expansion. New construction can replace native vegetation with pavement and buildings, fill wetlands, alter natural drainage patterns, and construct dikes and levees for flood control measures. The impacts from new construction are typically related to development and are not unique to military installations. The following discussion will focus on the major impacts that are unique to mission activities at Eielson AFB.

Biological Impacts

The goal of the bird/aircraft strike hazard (BASH) reduction program is to minimize bird/aircraft strikes by reducing the number of birds, particularly Canada geese, in the vicinity of the Eielson AFB airfield. To achieve this goal, the BASH program outlines natural resources practices that are not compatible with the ecosystem management objective of promoting natural biological diversity. The practices include allowing the airfield grass to attain a height of 14 inches or taller by one August and filling ponds within the Airfield Bird Exclusion Zone to reduce habitat diversity, food sources, and loafing areas. Surveys conducted by the base Natural/Cultural Resources office have shown these practices reduce the number of birds, especially Canada geese, using the airfield environment.

Air Quality

Air quality can be impacted by emissions to the atmosphere of criteria pollutants (carbon monoxide, nitrogen oxide, sulfur dioxide, particulate matter of diameter less than 10-microns [PM10] and particulate matter of diameter less than 2.5-microns [PM2.5], ozone, and lead). Additionally, emissions of hazardous air pollutants (HAPs), ozone depleting substances (ODCs), and volatile organic compounds (VOCs) are a concern. Eielson AFB is considered a major facility because the base has the potential to emit more than 100 tons per year of a criteria air pollutant. Due to the bases potential to emit, a Title V air operating permit application was prepared and submitted to the ADEC in December 1997 and the permit was issued in 2003. A renewal application was approved in April 2013 until April 2018. The renewal application for

2018 is currently in progress for submission by October 2017. The Title V permit lists emission sources subject to conditions designed to limit facility wide potential and actual emissions, and conditions to track compliance. Eielson AFB is consider an attainment area since 2008 with all criteria pollutants, even though it is at approximately three miles from the non-attainment maintenance area for PM less than 2.5-microns in diameter of the town of North Pole. Based on its location, the typography, and prevailing meteorological conditions, Eielson AFB is not expected to become enveloped into the non-attainment maintenance areas.

The CH&PP is the primary source of electrical power and heat for all base facilities. The CH&PP has six coal-fired boilers, which are the largest air emission sources. Other emission sources include emergency fire pumps, backup generators, diesel boilers, compressor engines, painting and fueling operations, and aircraft engine testing.

Eielson AFB is limited to burning 220,000 tons of coal per year to maintain its synthetic hazardous air pollutants (HAPs) minor status. The most significant HAPs emissions are hydrochloric acid and hydrofluoric acid from the coal fired boilers. Since Eielson AFB was a major HAPs source, the aircraft painting operations conducted at the Corrosion Control facility (Building 1348) are subject to Aerospace Maximum Achievable Control Technology (MACT) requirements for Aerospace Manufacturing and Rework Facilities under 40 Code of Federal Regulations (CFR) 60, Subpart GG. Eielson AFB successfully petitioned USEPA to separate the 168 WG from its Title V permit. Eielson AFB has an inter-service agreement with the 168 WG and AAFES to provide regulatory guidance for environmental issues.

Ozone depleting substances are used on a limited basis at Eielson AFB. Ozone depleting substances used on base include chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs). CFCs and HCFCs are contained in some of the chemicals and products used in Halon fire suppression, recharging air conditioning and compressor equipment, solvents used in cleaning parts and precision instruments, and sterilization equipment at the clinic.

Water Quality

Eielson AFB was constructed within a floodplain and a large wetland area. Wetlands currently comprise over 51 percent of the base. Topography at the site is relatively flat, with the elevation ranging from 548 feet to 556 feet in the main industrial area surrounding the flight line. The outlying areas such as Engineer Hill and Quarry Hill have greater changes in elevation. The main bodies of water include French Creek, Garrison Slough, Piledriver Slough, and numerous lakes and ponds.

The Alaska Pollution Discharge Elimination System (APDES) AK-000134-1 permit is used for the discharge of CH&PP cooling water. Eielson AFB has three state of Alaska Discharge Permits, one each for the waste water and water treatment plants. The APDES permit allows for the discharge of the CH&PP cooling water into a manmade drainage ditch that drains into French Creek. The state of Alaska Discharge Permit for the wastewater treatment plant allows for the discharge of treated wastewater into an infiltration pond (retired gravel borrow pit) for eventual groundwater recharge. The water treatment facility permit allows for discharge into Garrison Slough.

Eielson AFB operates under an APDES multi-sector storm water general permit (#AK060000). The base prepared a Storm Water Pollution Prevention Plan (SWPPP) which identifies existing and potential sources of storm water pollution at Eielson AFB and describes good management practices to reduce pollution and ensure compliance with permit requirements (Hoefler Consulting 2009).

Groundwater has been investigated as part of the Installation Restoration Program (IRP) studies. Eielson AFB is served by one shallow unconfined groundwater aquifer extending from approximately 12 feet to

over 300 feet below ground surface. This shallow aquifer is the primary source for the base potable drinking water supply and, during investigation, was found to be impacted at a number of the IRP sites. Results of sitewide groundwater monitoring indicate that in general, contaminant plumes are not expanding, and levels are either constant or are decreasing. Drinking water supply wells are routinely tested for contaminants and drinking water quality by bioenvironmental engineering. Contaminant levels in drinking water supply wells have been found to be below Maximum Contaminant Levels (MCL's) established by the USEPA. Monitoring results have supported that no contaminants above regulatory MCL's have been detected in shallow groundwater at the north (down gradient) edge of the base in the area of the North Boundary Wells.

The base's IRP has identified the locations and contents of several potential environmental contamination sites. These sites present a potential source of surface and groundwater contamination, as discussed above. The sites are in various stages of remediation. A detailed description and explanation of the contamination at each site may be found in the IRP Administrative Record in the Installation Management Environmental Office or online at http://afcec.publicadmin-record.us.af.mil/. Eielson AFB monitors the sites for compliance with Institutional Controls, as stated in the Record of Decision documents, having controlled access to the contaminated media at the site (e.g. contaminated groundwater, soil, and/or surface water).

Noise

Noise, defined as unwanted sound, is produced primarily by aircraft operations on Eielson AFB. The most recent calculations of noise contours for Eielson AFB were completed during the 2016 US Air Force Air Installation Compatible Use Zone (AICUZ) Study through the F-35A beddown Environmental Impact Statement. The AICUZ concept was developed to assist local governments in achieving compatibility between air bases and neighboring communities, and to assist in the land use planning and control process. The AICUZ program designates Noise Zones and Accident Potential Zones that are overlaid on area maps to define Compatible Use Districts for which land-use compatibility guidelines are provided (Eielson AFB 2016).

Noise zones are based on computerized Day-Night Average Weighed Sound Levels. The highest Day-Night Average Weighted Sound Levels occur on the runway and taxiways and were measured at 85 decibels (dB). The noise levels decrease at 5 dB intervals from the runway and taxiways to 65 dB. USAF land use recommendations suggest residential areas be located outside of the 65 dB contour. All of Eielson's accompanied housing areas fall outside of the 65 dB area. Unaccompanied quarters and billeting fall into the 65 dB range, but do not pose a deviation from recommended land use guidelines. There are no residential areas located off the installation that fall into the 70 dB contour. Moose Creek, which has low density housing, is within the 65 dB contour off the north end of the runway. All future expansion to base housing has been planned to fall outside of the 65 dB zone. Current and projected noise levels are taken into consideration to determine compatibility and design of new construction or movement of functions on base (Eielson AFB 2016).

Solid and Hazardous Waste

The mission-related activities at Eielson AFB have the potential to impact the ecosystem and biological diversity, air quality, water quality, and noise levels. Problems can arise from the use, storage, and disposal of hazardous wastes. The environment can be affected by changes in mission and facility expansion. New construction can replace native vegetation with pavement and buildings, fill wetlands, alter natural drainage patterns, and construct dikes and levees for flood control measures. The impacts from new construction are typically related to development and are not unique to military installations.

The following discussion will focus on the major impacts that are unique to mission activities at Eielson AFB.

Eielson AFB operates two active permitted solid waste landfills to manage coal ash, asbestos contaminated materials, and some construction and demolition debris. Treated sewage biosolids are spread in designated areas under an additional solid waste permit. Additionally, clean concrete from demolitions and vegetation wastes are managed on base without the need of specific permitting for purposes such as filling in historic ponds near the airfield that attract waterfowl, thereby reducing bird strike risks for aircraft. All municipal solid wastes are transported to the Fairbanks North Star Borough Landfill for disposal.

Eielson AFB is in compliance with all applicable federal regulations pertaining to the collection and disposal of hazardous waste. By regulation, Eielson AFB is considered a Large Quantity Generator (LQG) because 2,200 pounds or more of hazardous wastes or 2.2 pounds of acute hazardous waste are generated per calendar month.

Hazardous wastes are initially accumulated at one of the designated Satellite Accumulation Points (SAP), and then transferred to the Hazardous Waste Facility where storage is limited to 90 days. The Hazardous Waste Facility identifies and prepares the wastes for shipment. Waste is shipped by a contractor through a contract with the Defense Logistics Agency Disposition Services (DLA-DS). The contractor comes directly to base to receive the shipment and take the waste for final disposition.

All non-hazardous solid waste is managed in accordance with the Integrated Solid Waste Management (ISWM) program. This program encompasses waste prevention, recycling, composting, and disposal programs. Through ISWM, Eielson AFB seeks to determine the most cost effective, energy efficient, least polluting ways to handle waste streams in order to protect human health and the environment. Additionally, Eielson AFB is evaluating the feasibility of an installation-wide Qualified Recycling Plan (QRP), although the high cost of transportation and distance to markets are challenges to the installation's location in Interior Alaska.

2.4.4 Potential Future Impacts

The 5-Year MILCON Plan contains proposed projects that may result in potential future mission impacts to natural resources. The potential impacts can be found in the Table below. This list is tentative and subject to change or cancellation at any time.

Table 2.10. Eielson AFB 5-Year MILCON Plan

Fiscal Year	Project Title	Wetlands	Flood Plains	Threatened & Endangered Species
2017	Construct 6-Bay Flight Simulator			
2017	F-35 Hangar/Propulsion Maint/Dispatch		X	
2018	F-35 Aircraft Weather Shelter SQD #1		X	
2018	F-35 ADAL Field Training Detachment Facility			
2018	F-35 Hangar/SQD OPS/AMU SQD #2		X	
2018	F-35 Aircraft Weather Shelter SQD #2		X	
2018	F-35 Earth Covered Magazines			

Table 2.10. Eielson AFB 5-Year MILCON Plan (Continued)

Fiscal Year	Project Title	Wetlands	Flood Plains	Threatened & Endangered Species
2018	F-35 Missile Maintenance Facility	X	X	
2018	F-35 Construct South Loop Steam Line	X	X	
2018	F-35 Construct AGE Storage Facility/Fill Stand		X	
2018	F-35 Construct OSS/Weapons/Intel Facility		X	
2018	F-35 Construct Consolidated Munitions Facility			
2018	F-35 Construct Flight Kitchen			
2018	F-35 Construct ADAL Conventional Maintenance		X	
2018	F-35 Construct R-11 Fuel Truck Shelter		X	
2019	F-35 Construct School Age Facility			
2019	F-35 Construct 14-point Indoor CATM Range		X	
2019	AME (alternate mission equipment) Storage Facility			

2.4.5 Natural Resources Needed to Support the Military Mission

Eielson AFB natural resources are critical to the military mission. The USAF uses natural areas as a buffer for airfield activities while Detachment 1, 66th Training Squadron (Cool School) uses natural areas to conduct survival training exercises. Natural resources are managed to minimize aircraft-wildlife conflicts and human conflicts with dangerous animals. In addition, the military mission relies on natural resources to provide relaxation and recreation opportunities for those training and working on Eielson AFB. Implementation of an ecosystem-based management plan ensures that natural resources will provide the proper arena for supporting the military mission and personnel.

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The USAF environmental program adheres to the Environmental Management System (EMS) framework and it's Plan, Do, Check, Act cycle for ensuring mission success. EO 13693, *Planning for Federal Sustainability in the Next Decade*, DoDI 4715.17, *Environmental Management Systems*, AFI 32-7001, *Environmental Management*, and international standard, ISO 14001:2004, provide guidance on how environmental programs should be established, implemented, and maintained to operate under the EMS framework.

The natural resources program employs EMS-based processes to achieve compliance with all legal obligations and current policy drivers, effectively managing associated risks, and instilling a culture of continuous improvement. The INRMP serves as an administrative operational control that defines compliance-related activities and processes.

4.0 GENERAL ROLES AND RESPONSIBILITIES

General roles and responsibilities that are necessary to implement and support the natural resources program are listed in the table below. Specific natural resources management-related roles and responsibilities are described in appropriate sections of this plan.

Table 4.0. Roles and Responsibilities

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
Installation Commander	The 354 FW is the host unit at Eielson AFB, with responsibilities to maintain daily operation and furnish services and support to Eielson AFB military personnel, supported and tenant organizations, civilian staff, family members, and the surrounding community. The Commander, 354 FW bears ultimate approval authority for this INRMP.
AFCEC Natural Resources Media Manager/Subject Matter Expert (SME)/ Subject Matter Specialist (SMS)	AFCEC
Installation Natural Resources Manager/POC	354 CES Environmental (CEIEA)
Installation Security Forces	354th Security Forces will work with the 354 CES Conservation Law Enforcement Program managers and officers in establishing and defining operational support and reporting procedures for the conservation law enforcement officers (CLEOs).
Installation Unit Environmental Coordinators (UECs); see AFI 32-7001 for role description	354 CES Environmental (CEIEC)
Installation Wildland Fire Program Manager	354 CES Environmental (CEIEA)
Pest Manager	354 CES is responsible for control and management for pest management activities on Eielson AFB, with exception of pest issues within privatized housing units.
Range Operating Agency	353d Combat Training Squadron (RED FLAG-Alaska)
Conservation Law Enforcement Officer (CLEO)	354 CES is responsible for CLE
NEPA/Environmental Impact Analysis Process (EIAP) Manager	354 CES Environmental (CEIEC)
National Oceanic and Atmospheric Administration (NOAA)/ National Marine Fisheries Service (NMFS)	N/A
US Forest Service	N/A
US Fish and Wildlife Service	USFWS and ADF&G are signatory cooperators and partners in the implementation of this INRMP.
354th Fighter Wing	The 345th Fighter Wing is the host unit at EAFB which supports operations, maintenance, mission support and medical functions of the Pacific, and is host to six tenant units to include Alaska's Air National Guard 168th Wing.

Table 4.0. Roles and Responsibilities (Continued)

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
Vice Wing Commander	The Vice Wing Commander chairs the Bird Hazard Working Group (BHWG) as mandated by 354 FWI 91-202. The commander has authority to approve BHWG recommendations to minimize bird/wildlife hazards to aircraft.
354th Wing Safety/BASH Officer	The 354th Wing Safety and BASH Officer has primary responsibility to implement 354 FWI 91-212 BASH program.
354th Mission Support Group (354 MSG)	The 354 MSG provides most of the natural resources direction for Eielson AFB.

5.0 TRAINING

USAF installation NRMs/POCs and other natural resources support personnel require specific education, training and work experience to adequately perform their jobs. Section 107 of the Sikes Act requires that professionally trained personnel perform the tasks necessary to update and carry out certain actions required within this INRMP. Specific training and certification may be necessary to maintain a level of competence in relevant areas as installation needs change, or to fulfill a permitting requirement.

Installation Supplement – Training

Natural resources management training is provided to ensure that base personnel, contractors, and visitors are aware of their role in the program and the importance of their participation to its success. Training records are maintained IAW the Recordkeeping and Reporting section of this plan. Below are key NR management-related training requirements and programs:

- The NRM has completed the Civil Engineer Corps Officers School (CECO).
- The NRM has completed the Land Management Police Training course at the Federal Law Enforcement Training Center.

6.0 RECORDKEEPING AND REPORTING

6.1 Recordkeeping

The installation maintains required records in accordance with Air Force Manual 33-363, *Management of Records*, and disposes of records in accordance with the Air Force Records Management System (AFRIMS) records disposition schedule (RDS). Numerous types of records must be maintained to support implementation of the natural resources program. Specific records are identified in applicable sections of this plan, in the Natural Resources Playbook and in referenced documents.

Installation Supplement – Recordkeeping

All natural resources related documentation and GIS shape files are kept and maintained at the Eielson AFB Natural Resources Office.

6.2 Reporting

The installation NRM is responsible for responding to natural resources-related data calls and reporting requirements. The NRM and supporting AFCEC Media Manager and Subject Matter Specialists should refer to the Environmental Reporting Playbook for guidance on execution of data gathering, quality control/quality assurance, and report development.

Installation Supplement –Reporting

The NRM is responsible for all data calls and reporting requirements.

7.0 NATURAL RESOURCES PROGRAM MANAGEMENT

This section describes the current status of the installation's natural resources management program and program areas of interest. Current management practices, including common day-to-day management practices and ongoing special initiatives, are described for each applicable program area used to manage existing resources. Program elements in this outline that do not exist on the installation are identified as not applicable and include a justification, as necessary.

Installation Supplement –Natural Resources Program Management

The Eielson AFB INRMP will be implemented through operational component plans. The 354 MSG Commander is responsible for the following Management Plans unless otherwise specified. These plans identify the policies, goals, and projects to accomplish the objectives outlined under the management issues in Section 8. The accomplishment of projects identified by these 5-year component plans is subject to available manpower and funding.

7.1 Fish and Wildlife Management

Applicability Statement

The Sikes Act, as amended in 1997 (16 USC 67 a), requires each military agency to ensure that services are provided for managing natural resources, including fish and wildlife. The National Defense Authorization Act of 2009 added additional provisions to Section 103a (a) of the Sikes Act (16 USC 670c-1(a)).

Program Overview/Current Management Practices

Fish and Wildlife Management Plan

The primary objective of this operational component plan is to develop habitat conditions favorable to the production of native fish and wildlife species. The secondary objectives are to make available opportunities for recreational experiences, whether hunting, fishing, trapping, or non-consumptive use to all persons desiring to use Eielson AFB natural resources; reduce the possibility of bird/aircraft strike; resolve military mission/wildlife conflicts/problems; and conduct ecosystem monitoring to measure the quality of habitat.

The fish and wildlife habitat on Eielson AFB managed lands is not managed for individual species or specific population levels. Eielson AFB managers use ecosystem management to increase biological diversity rather than focusing on specific species needs.

The direct fish and wildlife habitat improvements for the next five years were prioritized as indicated in Section 8.4, Fish and Wildlife Management Projects.

- **High -** Critical to aircraft safety, protects real estate investments, enhances wetlands or floodplain management, or has a great effect on the biodiversity of Eielson AFB managed lands.
- **Medium -** Enhances or increases habitat or provides essential information that contributes to aircraft safety, protection of real estate investments, and increasing biodiversity.
- **Low -** Provides annual information on long-term trends but has little potential for increasing biodiversity.

Direct Wildlife Habitat Improvements Trapping Harvest Report

Trapping harvest reports have been collected since 1975 and should be continued. Each person assigned a trapping area will be required to file a harvest report following the trapping season. The results will provide an indication of the trends of the furbearer and small game populations and can be found in Appendix E, Trapping and Bow and Arrow Moose Hunting Harvest Reports.

Bow and Arrow Moose Harvest Report

Bow and arrow moose harvest reports have been collected since 1987 when the program began and should be continued. Each archer qualifying to hunt on base will be required to file a harvest report following the hunting season. Information will be gathered on moose killed, moose observed (paddle bulls, spike/fork bulls, and cows/calves) and daily hunter use by area. The results will provide an indication of moose population demographics and trends and can be found in Appendix E, Trapping and Bow and Arrow Moose Hunting Harvest Reports.

Direct Fish Habitat Improvements

Bear Lake (230 feet), Moose Lake/Polaris Lake (11,300 feet), and Mullins Pit (4,150 feet) Dikes

The necessary annual maintenance will be done to the Bear Lake, Moose Lake/Polaris Lake, and Mullins Pit dikes so French Creek does not overflow into the four lakes introducing unwanted fish species and providing possible escapement for fish in these lakes.

Develop Fish Habitat in Borrow Pits

The excavation of borrow pits will be done using the following recommendations. New shoreline of pits (lakes) will be irregular in configuration with points and coves. Peninsulas and islands should be created where feasible. The shoreline will have wide shallow water areas (littoral zones). The littoral zones will be a minimum of 20 feet wide. Their slope will not exceed a slope of 7 (horizontal) to 1 (vertical). A substantial proportion of the water volume will have a depth greater than 20 feet in an attempt to provide sufficient dissolved oxygen to winter a fish population in the gravel pits of interior Alaska. All basins will be connected with channels a minimum of 12 feet deep to allow fish passage between basins when the pit (lake) is ice covered. The lake bottom should be left rough with drop-offs, mounds, trenches, and ridges for structure. A 6-inch layer of overburden should be placed into the littoral zone (shelf) and over disturbed areas immediately adjacent to the pit to encourage re-vegetation. Continuous and complete coverage of the littoral zone with overburden and potential vegetation is not as desirable as intermittent patches of vegetated and non-vegetated areas. The shoreline should be an alternating mixture of strips

of trees/brush and openings of short length. The strips of trees/brush provide shade, food sources, and other riparian benefits. Openings facilitate user access.

Develop Mullins Pit Fish Habitat

Mullins Pit is an active borrow pit that will be developed following the recommendations in this section under Develop Fish Habitat in Borrow Pits.

Develop Cathers Lake Fish Habitat

Cathers Lake is an active borrow pit that will be developed following the recommendations in this section under Develop Fish Habitat in Borrow Pits.

Annual Dissolved Oxygen Inventory

All lakes on base will be checked annually for summer and winter dissolved oxygen content. This will provide a guideline for determining habitat condition and trends.

Creel Census

Whenever manpower is available, Natural Resources will conduct a creel census of the base lakes. It will provide information on fishing use of lakes (total fisherman and hours spent fishing per lake), fish size, and fishing success (fish caught and kept per man-hour fished). A creel census provides a barometer by which to evaluate fish stocking.

Habitat Protection - Mineral Licks (Three Areas)

The mineral licks on base will be protected from disturbance or destruction because relative to the total range of big game animals, mineral licks are relatively rare and site specific and elements commonly found in mineral licks are essential to the health of wild ungulates.

Ecosystem Monitoring

Monitor Fish Populations in Lakes

Objectives of the INRMP are to create fish habitat and provide recreational fishing. The degree of success can be monitored by winter dissolved oxygen inventory and population sampling (netting and shocking). Winter dissolved oxygen is a critical limiting factor for fish survival.

Annual monitoring documents ecosystem trends and the success of habitat development in borrow pits. Population sampling, which is done by the ADF&G, Sport Fish Division, measures the population of predatory and competing fish and game fish population numbers. High populations of predatory and competing fish can be a limiting factor for stocked game fish survival. Optimum game fish population numbers mean a high quality recreational fishing experience.

Monitor Fall Migrating Waterfowl and Sandhill Crane Numbers

Objectives of the INRMP are to remove waterfowl habitat from the Airfield Bird Exclusion Zone (BEZ), implement a grass height manipulation program for the BEZ. The degree of success can be measured by monitoring the number of migrating waterfowl and sandhill cranes using the BEZ and other areas of base each fall. The success of the grass manipulation program can be measured by recording the number of

birds in short, medium, and tall grass. Low bird numbers in the BEZ shows the programs are working and the risk of a bird/aircraft strike is reduced. Annual increases in local waterfowl and sandhill crane numbers in the BEZ may indicate the programs need for modification.

Monitor Arctic Grayling in Piledriver Slough

Since 1990, the ADF&G, Sport Fish Division has conducted population estimates of spawning arctic grayling in Piledriver Slough. Arctic grayling abundance in 1991 was 17,323 fish and in 1997 was 8,660 fish. Piledriver Slough is an important interior Alaska arctic grayling fishery that went from a daily bag limit of 10 to catch and release only. Coincident with the declining abundance estimates has been the steady encroachment of several new beaver dams. In 1998, about 52 percent of the habitat used by arctic grayling in 1991 was blocked by beaver dams. In the fall of 1998, the ADF&G and Eielson AFB began a cooperative effort to remove the beaver and dams. Annually Piledriver Slough is surveyed for the location of new beaver dams, Eielson's recreational trapping program is used to remove and control the beaver population, and after the beaver are harvested the dams are removed. The Alaska Sport Fish Division will continue to survey Piledriver Slough as needed to compare numbers, distribution, and composition (age and length) of arctic grayling and the slough habitat. The survey will monitor the program's success in restoring health to the Piledriver Slough ecosystem.

7.2 Outdoor Recreation and Public Access to Natural Resources

Applicability Statement

Outdoor recreation opportunities are important for the well-being and quality of life of base personnel and residents. Portions of Eielson AFB are also available to the general public for recreational activities keeping with the Sikes Act.

Program Overview/Current Management Practices

Eielson AFB, Birch Lake Recreation Area, and Chena River Annex offer a variety of outdoor recreational opportunities for military personnel and the general public. The Blair Lake AFR and AFTAC Remote Operating Facility are closed to the public for mission reasons.

Outdoor Recreation on Eielson AFB Managed Lands

The most important aspect of an outdoor recreation program is proper management. Without management, the recreational resources cannot be offered in a diversified manner to meet the needs and demands of the user, or be used in such a way that they are conserved for future generations. The recreation resources on Eielson AFB managed lands fall into three general classes. They are: Class I, General Outdoor Recreation Areas; Class II, Natural Environmental Areas; and Class III, Special Interest Areas.

- ***Class I, General Outdoor Recreation Areas***, can accommodate intensive recreational activities. Class I areas on Eielson AFB managed lands include the campgrounds, group and family picnic sites, ski/hiking cabin, shooting ranges, parcours trail, water sports site, cross-country ski trail, dog mushing trail, and winter sports area. If demand exceeds the carrying capacity of a general outdoor recreation area, the level of use will be regulated by user fees or reservations. When demand exceeds supply, additional areas will be developed to disperse the level of use so the environmental values of the Eielson AFB managed lands are not degraded.

- ***Class II, Natural Environmental Areas*** support dispersed types of recreation such as trail use, fishing, birdwatching, jogging, off-road vehicle use, hunting, trapping, and wildlife observation. These activities can be initiated by making trails, posting signs, establishing policy, or distributing maps. The better distributed the network of roads or trails, the better the level of use is dispersed. The control of off-road recreational vehicle use is critical to prevention of possible environmental damage. Four-wheeled vehicles will generally be restricted to main or secondary roads and gravel based trails. All-terrain vehicles, two-wheeled vehicles, and snowmobiles will be restricted to areas that will not conflict with other uses. Two-wheeled and all-terrain vehicle use will be prohibited during breakup until terrain conditions are drier. Snowmobile use will be prohibited until there is adequate snow cover to protect the underlying terrain from damage.
- ***Class III, Special Interest Areas***, have unique cultural, historical, scenic, or ecological features. In these areas, providing recreational opportunities must be consistent with protection of the features that make the area unique. The Class III areas on Eielson AFB managed lands are Lady of the Lake, the Eielson AFB self-guided nature trail, Chena River Campground Watchable Wildlife/Salmon Spawning area, mineral licks, and Heritage Park.

Class I, II, and III recreation areas are described below. Characteristics of Class I areas are summarized in the Table, Class I Outdoor Recreation Areas.

Class I Areas

Birch Lake Recreation Area—This 51-acre recreation area is located approximately 39 miles to the south of Eielson AFB just off the Richardson Highway on the east side of Birch Lake. The campground at this site has 23 cabins, 38 improved camper pads, and 7 primitive campsites. A water sports site offers rental opportunities of fishing boats, pontoon boats, and other equipment. Reservations for campsites and cabins are required.

FAMCAMP—The FAMCAMP, family campground, is located on Bear Lake. The entrance to this campground is on Transmitter Road. The campground has 41 improved camper pads and 10 tent sites. Electricity, water, sewage dump station, laundry facilities, canoe/boat rentals, and dumpster service are available. Reservations taken for PCS personnel in or out only.

Chena River Campground—This campground is located on the Chena River, 12 miles north of Eielson AFB at the end of Transmitter Road in the Chena River Annex. The campground offers 12 primitive campsites and access to good stream fishing. Campsites are available on a first-come/first-serve basis.

Boy Scout Campground—This undeveloped campground is located northwest of Scout Lake.

Group Picnic Sites—Three large capacity (100–300 users) picnic pavilions are located at Mullins Pit, Grayling Lake, and the Parcours trailhead. Reservations are required.

Family Picnic Sites—Eight family picnic sites are located on Eielson AFB, near base lakes and Piledriver Slough. The sites have picnic tables, fire pits, and trash barrels. The sites can also be used for camping. The family picnic sites are available on a first-come/first-serve basis.

Winter Sports Site—This recreational site is located on the south side of Quarry Hill on Eielson AFB. This site has a lodge, downhill skiing slopes, sledding slope, ice rink, and cross-country ski trails. The downhill ski slopes are serviced by a lift and are lighted to allow skiing in the long dark winter of Alaska.

Cross-Country Ski Trails—Eielson AFB has two cross-country ski trails of varying difficulty. The Parcours trail is a beginner's course. The Parcours is 1.5 miles long. The ski lodge system traverses

hilly terrain and has intermediate and advanced trail systems. The intermediate system is gently rolling with 1.55 and 3.1-mile trails. The advanced system offers the skier a choice of 1.55, 3.1, 4.65, and 6.2-mile trails.

***Parcours Trail*—**Eielson AFB has a 1.5-mile parcours trail that was paved in 1995. The parcours is a combination running, jogging, exercise, bicycle, and roller blade trail. In the winter, the parcours is used as a cross-country ski trail.

***Ski/Hiking Cabin*—**Eielson AFB has one public use cabin located on the advanced section of the ski lodge cross-country ski trails. The cabin is very rustic and sits upon a hillside overlooking the valley. The cabin is furnished with a wood stove, table and chairs, benches, and a loft for overnight sleeping. The cabin is available on a first-come/first-serve basis.

***Dog Mushing Trail*—**This 4.5-mile trail parallels Piledriver Slough along the southwest boundary of Eielson AFB. The trail is permitted to the Salcha Dog Mushers Association on an annual renewable permit.

***Archery Range*—**Near the ski lodge is a broadhead pit for sighting-in arrows for hunting.

***Skeet/Trap Range*—**The skeet and trap range is located near the ski lodge. The range is equipped with two complete skeet fields and 1-trap range. There are five positions for trap and eight positions for skeet. Twelve-gauge shotguns are available for rent (for range use only), and shotguns shells are available for purchase.

***Recreational Shooting at Base Firing Range*—**The base firing range is open to the public for recreational shooting, usually Saturday afternoon of each week. The program is operated by the 21 Mile Rifle and Pistol Shooting Club. The volunteer range monitor from the club must be present and in charge when the range is being used. Use of the range without a club range monitor present is prohibited. The range is not open for recreational shooting when the temperature is -20°F or colder.

Table 7.1. Class I Outdoor Recreation Areas

Type Development	Acres/Miles	Number of Units	Carrying Capacity	Degree of Public Access*
Birch Lake Recreation Area Campground	51.0 ac			
Cabins		23	107	E
Camp Pads		38	174	E
Tent Pads		7	104	E
Water Sports Sites				
Wading		1	30	E
Fishing Boats		16	96	E
Canoes		6	18	E
Pontoon Boats		2	11	E
Kayak		6	6	E
Chena River Campground	29.0 ac	12 primitive sites	72	A
Boy Scout Campground	5.0 ac	Undeveloped site	200	A
FAMCAMP	15.5 ac			

Camp Pads		41	240	E

Table 7.1. Class I Outdoor Recreation Areas (Continued)

Type Development	Acres/Miles	Number of Units	Carrying Capacity	Degree of Public Access*
Tent Pads		10	80	E
Group Picnic Sites				
Mullins Pit Pavilion	2.6 ac	1	300	E
Grayling Lake Pavilion	1.7 ac	1	300	E
Parcours Pavilion	2.0 ac	1	150	E
11 Family Picnic Sites				
Hidden Lake #1	0.1 ac	1	8	A
Hidden Lake #2	0.1 ac	1	8	A
Pike Lake	0.1 ac	1	8	A
Rainbow Lake	0.1 ac	1	8	A
Scout Lake #1	0.1 ac	1	8	A
Scout Lake #2	0.1 ac	1	8	A
Scout Lake #3	0.1 ac	1	8	A
28 Mile Pit #1	0.1 ac	1	8	A
28 Mile Pit #2	0.1 ac	1	8	A
Grayling Lake	0.1 ac	1	8	A
Polaris Lake	0.1 ac	1	8	A
Winter Sports Site				
Downhill Skiing	29.0 ac	1	400	E
Sledding	1.0 ac	1	40	E
Skating	0.7 ac	1	100	E
Boat Ramp-Mullins Pit	0.6 ac	1	25	A
Cross-Country Ski Trails				
Ski Lodge - Intermediate	3.1 mi	1	60/hr	A
Ski Lodge - Advanced	6.2 mi	1	60/hr	A
Parcours (in winter)	1.5 mi	1	60/hr	A
Parcours Trail	1.5 mi	1	30/hr	A
Ski/Hiking Cabin	0.1 ac	1	8	A
Dog Mushing Trail	4.5 mi	1	5	A
Shooting Ranges				
Base Firing Range (Recreation)	25.8 ac	1	30	E
Skeet/Trap Range	4.5 ac	1	5	A
Archery – Indoor	N/A	1	30	A
Field Archery	33.2 ac	1	80	A

* Class A - Generally open; controlled public areas within manageable quotas
Class E - Installation personnel, other military personnel, retired military personnel, DoD civilians and guest. Reservation priority follows the above listing.

Class II Areas

Class II areas are natural environmental areas for dispersed outdoor recreational activities not requiring developed facilities. The Class II areas on Eielson AFB, Chena River Annex, and Birch Lake Recreation

Area are open to the public. The Class II areas on Blair Lake AFR and AFTAC Remote Operating Facility are closed to the public for mission reasons.

***Hunting*—**Hunting is allowed on Eielson AFB for moose, by bow and arrow only, and for small game and fur animals with shotgun and bow and arrow. In the Chena River Annex big game, small game, and fur animal hunting is allowed with any weapon legal for hunting by state regulation. Safety restrictions apply. All hunting areas are open to the general public. A hunting permit is required and can be obtained from the Natural/Cultural Resources Office.

***Fishing*—**Fishing is allowed on Eielson AFB, Chena River Annex, and Birch Lake Recreation Area. Fishing at these sites is open to the general public with the exception of the Birch Lake Recreation Area, where fishermen must comply with the Services Programs and Use Eligibility requirements. A fishing permit is required for Eielson AFB and the Chena River Annex and can be obtained from the Natural/Cultural Resources Office.

***Trapping*—**Trapping is allowed in 29 established trapping areas on Eielson AFB and the Chena River Annex. Trapping is open to the general public. A trapping permit is required and can be obtained from the Natural/Cultural Resources Office.

***Nature Study*—**Opportunities for bird watching, wildlife photography, wildflower identification, and other forms of nature study abound on Eielson AFB managed lands. The general public can enjoy these activities on Eielson AFB, Chena River Annex, and Birch Lake Recreation Area. The base Natural/Cultural Resources Office maintains exhibits and distributes information on Alaska's fish and wildlife. The intent of these displays is public information/education, and to raise public awareness of the wildlife that exists in the natural environment of Eielson AFB managed lands.

***Walking/Hiking*—**Walking and hiking can be done in the natural environmental areas open to the general public on Eielson AFB, Chena River Annex, and Birch Lake Recreation Area.

***Off-Road Vehicle (ORV) Use*—**ORV use is allowed only on Eielson AFB and the Chena River Annex. Four-wheeled vehicles are restricted to designated trails. All-terrain vehicles, two-wheeled vehicles, and snowmobiles are restricted to designated use areas. Some ORVs require a base education course and operator's permit. The privilege of ORV use is granted to the general public subject to all restrictions and rules established by the base regulation EIELSONAFBI 32-7002, *Use and Control of Off-Road Vehicles (ORVS).*

***Cycling*—**Miles of roads, the ski lodge cross-country ski trails, and Parcours are open to the general public for bicycling on Eielson AFB, Chena River Annex, and Birch Lake Recreation Area.

Class III Areas

There are four sites on Eielson AFB that are considered Class III areas because of their historical or ecological significance.

***Lady of the Lake*—**Lady of the Lake, a B-29 WWII-era bomber, lies in a pond at 0.9 mile Transmitter Road. The history of the Lady is outlined on an interpretive display. User access is controlled by a viewer access point.

***Eielson AFB Self-Guided Nature Trail*—**The Eielson AFB self-guided nature trail is located next to the Natural/Cultural Resources Office. Guide booklets are located at the beginning of the trail, which has 28 information packed stations. Individuals can learn about local trees, shrubs, berry producing plants,

a few animals, and arctic environmental concepts. Inappropriate uses are discouraged so the next user can observe the specimens. Rules are outlined in the trail guide leaflet and on the sign at the beginning of the trail.

***Chena River Campground Watchable Wildlife/Salmon Spawning Area*—**King and chum salmon can be observed spawning from July through August at the Chena River Campground, located at the end of Transmitter Road. An interpretive display near the river at the campground has information on the salmon and their life cycle.

***Heritage Park*—**Heritage Park is a static display of various aircraft that have been assigned to the base. Both previously and currently assigned aircraft are displayed. The park contains a small memorial paying homage to the men and women of the 354 FW and 168 WG. There is a stone monument that commemorates Ben Eielson, the Alaskan bush pilot for whom the base was named. User access is controlled by a series of connecting sidewalks running through the park.

Public Use and Access

The outdoor recreation resources of Eielson AFB are open to the general public within the constraints of the military mission requirements for security, public health, and safety. There are some exceptions. Big game hunting is allowed on base for moose, by bow and arrow only for safety reasons. The FAMCAMP, group picnic pavilions, skeet/trap range, recreational shooting at the base firing range, and the ski slope are governed by AFI 34-110, *Air Force Outdoor Recreation Programs and Procedures,* and are restricted to military personnel, retired military personnel, DoD civilians, and their bonafide guests.

The Birch Lake Recreation Area is governed by AFI 34-110, *Air Force Outdoor Recreation Programs and Procedures,* and is restricted to military personnel, retired military personnel, DoD civilians, and their bonafide guests.

The AFTAC Remote Operating Facility portion of the Chena River Research Site is closed to the public for mission reasons. The Chena River Annex portion of the Chena River Research Site is open to the general public within the constraints of the military mission requirements for security, public health, and safety. The Blair Lake AFR is closed to the public for mission reasons.

Presently there is no degradation or impairment of the resource base associated with public access. If user demand exceeds a particular recreation resource supply, a permit, user fee, or reservation system will be established to control and disperse use over the resource base, or if available, additional resources will be developed to meet the demand.

Outdoor Recreation Plan

The purpose of this component plan is to conserve, use, enhance, and protect the outdoor recreation resources on Eielson AFB managed lands. One primary objective is to provide the maximum outdoor recreational benefits within the constraints of the military mission and the capability of the available resources. The other primary objective is to preserve the outdoor recreational resources on Eielson AFB managed lands for future generations.

The secondary objective is to provide fishing, hunting, camping, trapping, picnicking, skiing, hiking, off-road vehicle use, boating/canoeing, exercise trails, nature study, etc., to all persons desiring to use Eielson AFB managed recreational resources, except where circumstances dictate otherwise. The Birch Lake Recreation Area, FAMCAMP, group picnic pavilions, skeet/trap range, recreational shooting on base firing range, and the ski slope are restricted to military personnel, retired military, DoD civilians and their

bonafide guests. These facilities are governed by AFI 34-110, *Air Force Outdoor Recreation Programs and Procedures,* which limits their public use. The AFTAC Remote Operating Facility portion of the Chena River Research Site and the Blair Lake AFR are closed to the public for mission reasons.

Management Policy

The outdoor recreation program is coordinated with the mission and other natural resource uses. On land used primarily for mission purposes (airfield, rifle range and impact area, ammunition storage, etc.) outdoor recreation is prohibited for safety, public health and security reasons. On other lands the mission and outdoor recreation are compatible, however, in the event of a military exercise, outdoor recreation may be prohibited for a short time. If possible, prime outdoor recreation lands are not used for training exercises or new mission requirements. In areas used primarily for outdoor recreation (campgrounds, picnic sites, ski areas, parcours, nature trail, etc.), the use of other natural resources may be modified. Timber cutting may be prohibited. Cutting, if allowed, would be restricted to selective or sanitation cuts. Buffer zones would be required around any timber sale near a recreational area. In wildlife viewing areas, trapping and/or hunting might not be allowed. Some forms of recreation may be prohibited in wildlife management areas. Mission and other natural resources use should complement rather than be detrimental to the outdoor recreational program and vice versa.

Outdoor Recreation Management Projects

The following projects are planned for the next five years. They were prioritized as follows:

Maintain Existing Outdoor Recreation Facilities and Developed Trails

Annually, maintenance will be done to the existing outdoor recreation facilities and developed trails to include the painting and repair of wooden signs, off-road vehicle barricades, toilets, picnic tables, sign posts, informational displays, cabins, etc. Funding will come from non-appropriated, operations and maintenance, and conservation resource funds in accordance with USAF regulations.

Establish Canoe Route on French Creek

In July 1987, Natural/Cultural Resources floated French Creek to determine the feasibility of making a canoe route from Quarry Road to Transmitter Road. The survey found French Creek would make a good canoe run. The water depth is more than adequate. The creek provides opportunity for grayling fishing, especially in the upper half, and wildlife observation. French Creek has been known to support chum salmon as well as many species of resident fish.

Overhanging brush and logs in the stream bed serve as essential habitat for fish of all types and age classes. Care should be taken while removing obstructions from the stream and some of the dead and/or dying vegetation should be left in the stream for fish habitat. The main obstacle is the man hours required to clear the creek of obstructions (overhanging brush and logs across the creek). French Creek will be developed as a canoe run should man hours or funding become available. An estimated 2,000 man-hours costing $40,000 would be needed.

Regulations for Hunting, Fishing, and Trapping Programs

Fishing is allowed on Eielson AFB, Chena River Annex, and Birch Lake Recreation Area. Hunting is allowed on Eielson AFB for moose, by bow and arrow only, and for small game and fur animals with shotgun and bow and arrow. For safety reasons the shot discharged from shotguns on Eielson AFB must be BB steel shot or Number 2 lead birdshot or smaller. In the Chena River Annex big game, small game,

and fur animal hunting is allowed with any weapon legal for hunting by state regulation. Trapping is allowed on Eielson AFB and the Chena River Annex. The AFTAC Remote Operating Facility portion of the Chena River Research Site and the Blair Lake AFR are closed to the public and these activities for mission reasons.

354FWI 32-7001, *Conservation and Management of Natural Resources*, contains the rules governing hunting, fishing and trapping on Eielson AFB managed lands. 354FWI 32-7001 is updated as changes occur. Hunting, fishing, and trapping are allowed in accordance with federal and state hunting, fishing, and trapping regulations, seasons, and bag limits.

The privilege of hunting, fishing, and trapping is granted to the general public subject to requirements for safety, security of government property, and accomplishment of the military mission. A base permit for fishing, hunting, and trapping is required. No fee is charged for the permits because Eielson AFB has a HQ USAF waiver to the provisions of AFI 32-7064, *Integrated Natural Resources Management*; that requires collection of fees for hunting, fishing, and trapping. Fish stocking is provided free by the State of Alaska as long as reasonable access to base lakes is allowed to the general public. Eielson AFB annually issues about 1,500 fishing permits, 700 hunting permits, and 30 trapping permits.

7.3 Conservation Law Enforcement

Applicability Statement

The Sikes Act mandates that DoD installations employ adequate numbers of professionally trained natural resources personnel, including law enforcement personnel to implement the INRMP.

Program Overview/Current Management Practices

Eielson AFB presently has one Conservation Officer to enforce regulations. Security Forces and Natural Resources personnel currently assist the conservation officer on any reported fish and game violations. The Eielson AFB conservation officer will work with State Wildlife Troopers if the need arises.

7.4 Management of Threatened and Endangered Species, Species of Concern and Habitats

Applicability Statement

Currently, Eielson AFB has no T&E species or critical habitat.

Program Overview/Current Management Practices

Threatened and Endangered Species Management Plan

<u>Monitor for the Presence of Threatened and Endangered Species</u>

In FY93, Eielson AFB contracted a biological survey for all base managed lands. One objective of the survey was to inventory and map the occurrence of all federal and state listed and proposed endangered and threatened species and their habitats. A final report was published in August 1994 (EA 1994). No listed or proposed threatened and endangered species and critical habitats were found on Eielson AFB managed lands and is used as a base line for T&E species. As of March 2016, the USFWS has not listed any new federally listed species or critical habitat that may occur on Eielson AFB or its training lands. The state of Alaska has not listed any new threatened or endangered species that may occur on Eielson

AFB or its training lands. Should any threatened or endangered species become resident to Eielson AFB managed lands, consultation with the USFWS will be initiated (Gunderson 2016).

7.5 Water Resource Protection

Applicability Statement

Water quality monitoring and management are required to formulate options for managing those species particularly dependent upon high water quality. It is also imperative that land management activities use applicable best management practices to minimize non-point sources of water pollution. Water quality reflects environmental pollution, including erosion. Maintaining clean water is a critical part of ecosystem management.

Program Overview/Current Management Practices

Watersheds are topographically delineated land areas that define and control the pattern of local surface water runoff. In natural resources management, a watershed unit is often used as the smallest boundary for water, soils, vegetation, and wildlife conservation efforts since resources are closely interacting at this landscape scale. Watershed planning includes the assessment and monitoring of watershed conditions and the identification of priority watersheds on which to focus financial and other resources.

Eielson AFB operates under an APDES multi-sector storm water general permit (#AK060000). The base prepared a Storm Water Pollution Prevention Plan (SWPPP) which identifies existing and potential sources of storm water pollution at Eielson AFB and describes good management practices to reduce pollution and ensure compliance with permit requirements (Hoefler Consulting 2009).

7.6 Wetland Protection

Applicability Statement

Eielson AFB adheres to the Clean Water Act Section 404 for the management of its wetlands.

Program Overview/Current Management Practices

Wetlands and Floodplains Management Plan

Wetlands Management Policies

- Use uplands for base expansion whenever feasible.
- If wetlands must be used for base expansion build in low-value wetlands, not quality wetlands (lakes, ponds, potholes, marshes etc.).
- If wetlands must be used for base expansion, minimize the amount of wetlands affected.
- Protect and preserve quality wetlands. If base expansion must take place near a quality wetland, an undisturbed natural vegetated buffer around the wetland will be preserved.
- When wetlands have to be used in base expansion, Eielson AFB will comply with the mitigation required by the Section 404 permit.
- Use ongoing borrow pit activities to increase biodiversity and the functional value of base managed wetlands.

Wetlands Management Projects

The following projects are planned for the next five years. They were prioritized as follows:

- Maintain up-to-date wetlands maps annually, the Eielson AFB Natural/Cultural Resources Section will update the GIS wetlands maps for Eielson AFB managed lands.

Floodplains Management Policies

- Avoid expansion into floodplains whenever possible.
- When an action is proposed for a floodplain, consult the Floodplain Management Services Section of the US Army Corps of Engineers (USACE) and follow their recommendations.

Floodplains Management Projects

The following projects are planned for the next five years. They were prioritized as follows:

- Maintain up-to-date floodplain maps—The Eielson AFB Natural/Cultural Resources Section will update the GIS floodplains maps for Eielson AFB managed lands as needed.

7.7 Grounds Maintenance

Applicability Statement

In accordance with AFI 32-7064, *Integrated Natural Resources Management*; USAF land management activities must consider the protection and enhancement of desirable natural and man-made features in the landscape. It is federal policy that environmentally and economically beneficial landscaping practices be used, per EO 13148, *Greening the Government through Leadership in Environmental Management* and as outlined in a Presidential Memorandum (21 April 2000).

Program Overview/Current Management Practices

Grounds Management Plan

Soil Preparation

Lime should be added as needed if the pH of the soil is less than 5.6 as determined by a soil test. Since past soil tests have shown base soils in the developed areas have a pH greater than 5.6, adding lime to the soil on maintained grounds is not necessary. The natural fertility of all base soils is low.

Annually a complete fertilizer should be added as determined by a soil test or as recommended by this plan. Fertilizer should be applied in two applications. Half should be applied before growth begins in May and the other half in July.

Establishing Vegetation Grass

Grass can be planted between 15 May and 1 August. Planting between 1-15 August can only be justified if the seeded area is watered and the construction sites or disturbed areas needing revegetation were not available for planting before August. Although a light frost will not affect newly seeded grass, grass planted after 1 August can be damaged if prolonged hard freezing temperatures set in prior to 1 October.

August planting must be dictated by fall weather conditions. Winter dormant seeding, planting just before the ground freezes in the fall, is acceptable. The early May and winter dormant seeding takes advantage of the full growing season and soil moisture available from recently melted snow. Fertilizer applied to grass planted after 1 August should contain little or no nitrogen and a light application of phosphorus and potassium. High nitrogen levels in the spring encourage snow mold. The first mowing should be delayed until the grass is 3 to 4 inches tall. Mowing should maintain the grass height at about 2 to 3 inches.

Recommended Grass Species

For lawn and field areas:

Kentucky bluegrass (*Poa pratensis*) - 'Nugget' or 'Park' varieties are preferred, but 'Common' from a northern grown seed source is acceptable

Creeping red fescue (*Festuca rubra*) - 'Arctared' variety is preferred, but 'Pennlawn' or 'Common' are acceptable varieties.

For Airfield Bird/Aircraft Strike Hazard Zone:

Wainwright Germplasm slender wheatgrass (*Elymus trachycaulus*)

Creeping red fescue (*Festuca rubra*) - 'Arctared' variety is preferred, but 'Pennlawn' or 'Common" are acceptable varieties.

For hillsides with erosion problems:

Creeping red fescue (*Festuca rubra*) - 'Arctared' variety is preferred, but 'Pennlawn' or 'Common' are acceptable varieties

Bering hairgrass (*Deschampsia beringensis*) - 'Norcoast' variety.

For wet areas:

Blue-joint grass (*Calamagrostis canadensis*) (wet areas)
American sloughgrass (*Beckmannia syzignache*) - 'Egan' variety (very wet areas).

Seed Mixtures and Seeding Rate

Kentucky bluegrass/creeping red fescue (50/50 mix): 3.5 - 4.0 lbs/1,000 sq ft

Kentucky bluegrass: 2.5 - 3.0 lbs/1,000 sq ft (unshaded areas)

Creeping red fescue: 3.5 - 4.0 lbs/1,000 sq ft (shaded, acid, erosion, or drought areas)

Wainwright Germplasm slender wheatgrass /creeping red fescue (50/50 mix): 2.3 lbs/1000 sq ft, use .3 lbs of slender wheatgrass with 2.0 lbs of creeping red fescue (Bird/Aircraft Strike Hazard Zone)

Bering hairgrass: 0.4 lbs/1,000 sq ft (erosion areas) Blue-joint grass: 0.2 lbs/1,000 sq ft (wet areas)

American sloughgrass: 0.2 lbs/1,000 sq ft (very wet areas).

Nurse or Protective Crop - Perennial ryegrass (Lolium perenne) or annual ryegrass (Lolium multiflorum) may be used as a nurse or protective crop for the recommended grass species. Ryegrass shall be no more than 20 percent of the seed mixture.

Fertilizer

Formula: 20-20-10.
Rate: 300 pounds per acre or 3/4 pound per 100 square feet.
Time: Prior to seeding.
Method of Application: Hand (small areas) spreader (large areas).

Water

Newly seeded areas must be kept moist. Moist conditions are critical for proper germination. If precipitation does not occur frequently enough to keep the seedbed moist, water must be applied. Watering should stop when runoff begins.

Mowing

The first mowing should be delayed until the grass is 3 to 4 inches tall.

Length of Maintenance Period

Eight weeks for all types of grass.

Trees and Shrubs

Trees and shrubs will be transplanted from forested areas only when they are dormant. The preferred transplanting season is after a fall killing frost. Trees and shrubs can usually be transplanted from 15-20 September to freeze-up. Trees can also be transplanted in the spring (approximately 1–15 May) before the leaves are more than one-fourth open. The spring transplanting season is less desirable as the ground may be partially frozen, especially in heavily shaded or wooded areas. Balled and burlaped, containerized, and bare-root nursery stock can be planted when the ground is not frozen. Planting berry or fruit producing trees, shrubs, or hedges is prohibited.

Recommended Tree Species

White spruce	*Picea glauca*
Paper birch	*Betula papyrifera*
Quaking aspen	*Populus tremuloides*
Alaskan larch, Tamarack	*Larix laricina*
Lodgepole pine	Pinus contorta var. latifolia
Scotch pine	*Pinus sylvestris*

Recommended Shrub Species

Late lilac	*Syringa villosa*
Potentilla	*Potentilla fruticosa*

Common juniper	*Juniperus communis*
Creeping juniper	*Juniperus horizontalis*

Tree and shrub stock should be non berry producing locally grown, within about 100 miles of Fairbanks, or from local seed stock. In some cases material from the same latitude is acceptable if local material is not available. Stock from Delta Junction and Nenana are acceptable, but the photoperiod and winter temperatures south of these locations are different enough to cause concern. If local seed has been sent to nurseries outside of the local area the plant materials should still be locally adapted and could be acceptable. Any deviations must be approved by Natural/Cultural Resources in writing. All nursery stock shall be healthy and free from disease, insect pests, mold, and fungus. The minimum recommended sizes and planting distances for trees and shrubs are shown in the Tables Recurring Maintenance on Improved Grounds and Recurring Maintenance on Semi-improved Grounds.

Table 7.2. Minimum Ball Diameters

Height of Plant (feet)	Tree Diameter 1-Foot Above Ground (inches)	Diameter of Ball (inches)
Trees*		
0 - 4	1	24
5 - 8	1-2	30
8 - 12	2-3	36
Shrubs		
0 - 3	N/A	12
4 - 6	N/A	18
7 - 9	N/A	24
10 - 12	N/A	30

Note: * If tree height and stem diameter are in different ball size classes the larger root ball is required.

Table 7.3. Minimum Planting Distances for Trees and Shrubs

	Cantonment Area		Base Housing	
From	**Trees**	**Shrubs**	**Trees**	**Shrubs**
Other Trees/Other Shrubs	20	15	10	10
Clumps of Trees/Clumps of Shrubs	20	15	10	10
Buildings	10	6	8	6
Street	25	25	8	8
Sidewalk and Utilidors	6	6	6	6
Power Lines	20	15	8	8

Notes: 1. When group or clump planting, the minimum distance from other trees/shrubs does not apply.
2. Do not plant trees/shrubs where they will interfere with the line of sight at a street intersection or with snow removal.

Tree Trunk Protection

Trees are easily damaged or killed by lawn mowers or weed eaters. Trunk protectors will be installed on newly planted trees. Trunk protectors shall be ArborGard+ by Ben Meadows Company, Barkgard by Easy Gardener, or equivalent. Mulch around the base of the tree can be used in place of a trunk protector. The use of a 2-4 inch thick layer of wood chips, bark or other organic material extending out 24 inches from the base of the tree, has other advantages such as retaining soil moisture and can eventually improve soil structure and fertility.

Watering

Irrigate all trees three inches or less in diameter within prestige, improved, or semi-improved grounds, and irrigate all trees for the first two years after planting/transplanting regardless of size. Irrigation shall consist of application of water within the drip line to an amount equal to one inch of water per inch of tree diameter twice per week, unless one inch of rainfall has occurred during the previous week.

Guarantee (if required)

Growth will be guaranteed for one full year after the first two years of watering.

Maintaining Vegetation

Improved Grounds

Table 7.4. Recurring Maintenance on Improved Grounds

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fertilizing					X		X					
Reseeding						X	X	X				
Mowing					X	X	X	X	X			
Weed and Brush Control						X	X	X				
Insect Control					X	X	X	X				
Irrigation						X	X	X				
Aeration					X	X	X	X				
Pruning					X				X			
Transplanting Trees/Shrubs					X				X	X		
Planting Nursery Stock					X	X	X	X	X	X		

Fertilizer

Formula: 20-20-10
Rate of Application: 300 lbs/acre or 3/4 lb/100 sq ft
Time of Application: One-half in May and one-half in July

Mowing Schedule

Mowing will be done as needed from approximately 15 May to 15 September. Mulching blades should be used where rotary mowers are used for maintenance. The large field areas will be mowed to a height no less than three inches tall. Lawn areas immediately adjacent to buildings will be mowed to a minimum height of two inches. Mowing shorter than two inches tends to eliminate bluegrass, the dominant grass species on improved grounds, and encourages invasion by other plant species which could be less desirable. If mowed shorter, the lawn and field areas are more subject to the effects of drought. Little or no irrigation is needed for the field areas during a dry spell when the grass is mowed no shorter than three inches tall. Mowing will be discontinued in time for the lawn areas to attain a height of 2-3 inches by the time continued cold weather sets in. If mowed shorter than two inches, grass is subject to winterkill. If allowed to grow too tall the grass is more susceptible to disease such as snowmold. Improved grounds are shown on the Grounds Maintenance Map. Because of the map's large size, the map is located at the Base Civil Engineer GeoBase office. The map is updated annually by the Grounds Maintenance Monitor.

Weed and Brush Control

The recent introduction of bird vetch (*vicia cracca*), white sweet clover (*Melilotus alba*), and narrowleaf hawksbeard (*Crepis tectorum*) will need to be addressed to initiate a plan to eradicate or control these invasive noxious weed species. Pesticide use must be in accordance with the Base Pesticide Management Plan. All pesticides must be applied under the direction of the Pest Management Section at 377-1370. A broad-leaf herbicide, (2,4-D), is used to periodically control dandelion growth in the lawn areas. The 2,4-D is applied at a rate of 2/3-1 1/3 pints-per-acre. Oust, a total soil sterilant, or round-up, a non-selective herbicide, is used to eliminate fire hazards in Petroleum Oil Lubricant (POL) areas, transformer vaults, and along the railroad tracks. They are used in supply areas and along fences to lower maintenance costs. Oust is applied at a rate of 1-3 ounces-per-acre. Round-up is applied at a rate of 1.5 quarts-per-acre (1 percent application).

Insect Control

No serious insect problems have been encountered. Annually individual trees are infested by the birch aphid or leaf rollers. Occasionally individual trees are infested by the spear-marked black moth, mourning-cloak butterfly, or woolly aphid. In 2002, birch leaf miners were found in the Eielson AFB community forest. This was the first documented occurrence of birch leaf miners north of the Alaska Range. These infestations are not a problem unless they occur 2 or 3 years in a row to the same tree. If treatment is accomplished a Tempo application (55 grams per 100 gallons water) is used.

Irrigation

Irrigation is not required. Building occupants may water their area of responsibility during dry periods. Watering will be done during evening hours.

Aeration

The soil on base has a tendency to compact. Aeration treatment will be done annually in the spring prior to the growing season. Aeration will also be done prior to the establishment of vegetation.

Pruning & Tree Removal

The grounds maintenance contractor is responsible for all pruning on base outside of privatized housing as careless or untrained personnel can destroy years of skillful landscaping in a short time. The grounds maintenance contractor will do all pruning including the building occupant areas in May before the trees leaf out and in September after the first killing frost. Some light pruning or trimming of newly planted or damaged trees may be required at other times during the year. All pruning will be done to allow the shrubs and trees to assume their natural shape. Most pruning will be limited to removal of dead, broken, or diseased wood. All pruning will be done by hand.

No healthy trees will be removed unless potential damage to facilities or structures is imminent. The Natural Resources Office will make all final tree removal decisions.

Tree Care

From May through September during the first growing season, the Grounds Maintenance Contractor will water at the drip line each newly planted tree to maintain strong and healthy growth outside of privatized housing. On each tree 3 inches or less in diameter, as measured 12 inches above the soil line, the grounds

maintenance contractor shall install and maintain serviceable trunk protectors. The ground maintenance contractor shall be responsible for tree damage caused by contractor operated mowing devices.

Semi-improved Grounds

Table 7.4. Recurring Maintenance on Semi-improved Grounds

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fertilizing						X	X	X				
Reseeding Grass Areas						X	X	X				
Mowing					X	X	X	X	X			
Weed and Brush Control						X	X	X				
Aeration					X	X	X	X				

Fertilizer

Formula: 20-20-10
Rate of Application: 150 lbs/acre or 1/3 lb/100 sq ft
Time of Application: June and July

Mowing Schedule

Semi-improved grounds will be maintained to a height of 3 to 14 inches, with the following exceptions:

Airfield and Bird/Aircraft Strike Hazard Reduction Areas - The airfield and BASH reduction areas will be mowed annually prior to 1 June and after 10 September to allow the grass to attain a height of 14 inches or taller during fall waterfowl migration. These mowing dates may be adjusted at the discretion of Natural/Cultural Resources based on seasonal migration and weather variations. The only exceptions will be:

- The lawn areas at Buildings 1146, 1147, 1148, 1151, 1161, 1183, 1190, 1206, 1209, 1215, 1216, 1220, 1223, 3245, 4105, and the National Guard Area.
- The vegetation within 10 feet of airfield lighting, pavements, and navigational aids.
- Fifteen feet along each side of Central Avenue and Transmitter Road and on the west side of Flightline Avenue.
- The area west of the perimeter fence in the vicinity of the main gate will be mowed weekly to maintain a grass height of 2 to 4 inches.
- The vegetation inside the fence around Building 1300 and 50 feet from outside the fence will be maintained at a height of 8 inches or less.
- The vegetation inside the fences and to a point 30 feet outside the fences of Buildings 1303 and 1324 and inside the Pixie Pad fence, from the Pixie Pad access roads to the tree line, Pixie Pad fence to the tree line, and between the pond in front of Pixie Pad and Cargain Road will be mowed between 15-21 June and 1-7 August. The vegetation will be cut to a minimum height of 3 inches and a maximum height of 4 inches.
- All mowing changes to the airfield and BASH reduction areas will be approved by the base BASH Working Group.

Ammunition Storage Areas—All vegetation at Engineer Hill and Quarry Hill Ammunition Storage facilities in the non-forested areas inside the fence and to a point 30 feet outside the fence will be mowed

as required to maintain a height of 3 to 8 inches. The munitions bunkers, located within these two facilities, will be mowed three times annually in June, July, and August to maintain a height of 3 to 6 inches.

Ski Slope—The ski slope, Turner Trail, Terry Tunnel, sledding hill, and skating rink next to the Ski Lodge will be mowed once annually in late August. This is to allow for natural reseeding. The ski slope, Turner Trail, Terry Tunnel, sledding hill, and skating rink will be cut to a minimum height of 3 inches and a maximum height of 4 inches. Turner Trail and Terry Tunnel will mowed from tree line to tree line.

Ski Lodge Cross Country Ski Trails—The ski trails will be mowed once annually in late August to clear trails of vegetation for cross-country skiing. The ski trails will be cut to a minimum height of 1-inch and a maximum height of 3 inches from tree line to tree line.

Parcours—The parcours exercise and ski trail will be mowed twice annually in late June and late August. The parcours trail and exercise stations will be scalped from tree line to tree line.

Archery and Skeet/Trap Ranges—The practice archery range and skeet/trap range, located near the ski lodge, will be mowed the last week of June, July, and August. They will be cut to a minimum height of 2 inches and a maximum height of 4 inches.

Security Fence—The entire length of the security fence will be mowed once annually in late July. The perimeter fence will be mowed 10 feet on both sides of the fence to a minimum height of 3 inches and a maximum height of 4 inches.

Lake Accesses—The road shoulders and ditches along the lake accesses west of the Richardson Highway will be mowed once annually in late July. They will be cut to a minimum height of 3 inches and a maximum height of 4 inches from the road to tree line.

Bulk Fuel Storage Areas—The bulk fuel storage fenced and diked areas will be vegetation free. The vegetation inside the fence, to a point one to two feet outside the fence, will receive herbicide treatment as required followed by string trimmers to eliminate vegetation. The firebreak areas outside the fence will be mowed once annually between 10–20 July.

Garrison Slough—Mow on both banks of this ditch from behind Building 3224 to a point approximately 1,000 feet north of Building 2350 and 400 feet of similar ditch located south of Building 3228 to control woody vegetation. Management will consist of maintaining ample amount of vegetation cover on both banks to minimize any erosion into Garrison Slough. The upper bank is sloped away from the slough to minimize storm water into the slough reducing possible erosion.

Power Line Rights-of-Way—Power line rights-of-way (ROW) will be cut once per year. Cutting will include all vegetation to a point 20 feet outside the power lines. These areas are brush, trees, and tundra, may have standing water, and have been previously hydro-axed. Because portions may have standing water, cutting operations may begin as early as 15 April each year when the ground and standing water are still frozen.

Mullins Pit, Bear Lake, and Scout Lake Wildlife Management Areas—These wildlife management areas will be mowed once annually in late July to a height of 4-6 inches. Mullins Pit Road will be mowed once annually.

Railroad—The railroad will be mowed twice annually in late June and late August. All vegetation between the rails, and to a point 15 feet outside each side of the rails will be scalped. Herbicide may be

used to partially fulfill this requirement. If used, herbicide will be applied between the rails and to a point not to exceed five feet outside the rails.

Fuel Line Right of Way—The North Pole to Eielson AFB fuel line ROW will be mowed once annually to a height of 2-6 inches in August from tree line to tree line.

Weed and Brush Control

Weed and brush control on semi-improved lands will be accomplished using mechanical, chemical, or hand methods. The preferred method is rotary type brush mowers. Chemical methods are acceptable if used only on low-growing brush and weeds. The herbicides used are 2.4-D, Oust, and Round-up. A broad-leaf herbicide, (2.4-D), is applied at a rate of 2/3 to 1 1/3-pints-per-acre. Oust, a total soil sterilant, is applied as at a rate of 1 to 3 ounces per acre. Round-up, a non-selective herbicide, is applied as at a rate of 1.5-quarts-per-acre (1 percent application). Disking and dozing may be used on uplands, but are regulated activities on wetlands. Dozing on uplands is only permitted if: (1) the activity is approved by Natural/Cultural Resources, (2) no commercial timber is involved, (3) all debris is hauled away. Dozing and disking on wetlands can only be done if: (1) no other alternative is viable, (2) the action is approved by Natural/Cultural Resources, and (3) the necessary wetlands permits are obtained. Dozing is the least desirable method of weed and brush control.

Grounds Maintenance Responsibility Policing

The policing of grounds will be done by a base litter patrol (Neat Team), except for family housing occupant areas. The Privatized Housing (PH) partner will be responsible for the policing and appearance of the assigned units and housing grounds.

Grounds Maintenance (fertilizing, mowing, edging, trimming, etc.)

All grounds maintenance is done by the grounds maintenance contractor, except for areas maintained by the AF, and the PH partner. The 354 CES is responsible for the Chena River Campground and Blair Lake AFR. DET 460, AFTAC is responsible for the AFTAC Remote Operating Facility. The 354 FSS is responsible for five softball fields, a baseball field, a football field, and the Birch Lake Recreation Area. The Fairbanks North Star Schools are responsible for the land out-granted to them. A Grounds Maintenance Map showing the areas maintained by the grounds maintenance contractor is on file with 354 CES.

Table 7.5. Recurring Maintenance Operations Chart

Operation	Season	Frequency	Materials Used	Application
Improved Grounds				
Policing	January to December	Daily		
Fertilization	May and July	Twice Annually	20-20-10	150 pounds per acre each application
Reseeding	1 June to 15 August	As needed	50%-50% Kentucky bluegrass and creeping red fescue (varieties authorized by this plan)	3.5-4.0 pounds per 1,000 sq ft

Table 7.5. Recurring Maintenance Operations Chart (Continued)

Operation	Season	Frequency	Materials Used	Application
Improved Grounds				
Mowing	May to September	Weekly		
Weed and Brush Control	June to August	As needed	2, 4-D Oust Round-up	2/3 to 1 1/3 pints per acre 1 to 3 ounces per acre 1.5 quarts per acre
Insect Control	May to August	As needed	Tempo	55 grams per 100 gallons water
Irrigation (building occupants only)	June to August	As needed	Water	Wet soil to a depth of 1 inch
Aeration	May to August	All areas in May otherwise prior to revegetation		As required
Pruning	May, September, and October	As needed	Hand shears	Allow natural shape
Tree Planting	May, September, and October	Annually	Tree species authorized by this	Comply with base planting distances
Water Newly Planted Trees During First Growing Season	May to September	Weekly	Water	As required
Tree Protector	May to September	Weekly	Tree protector	One per each tree 0-3 inches in diameter
Semi-improved Grounds				
Policing	January to December	Weekly		
Fertilization	June and July	Once annually	10-20-20	150 pounds per acre
Reseeding	1 June to 15 August	As needed	Non-airfield/BASH zone: 50%-50%	3.5-4.0 pounds per 1,000 sq. ft.
Reseeding	1 June to 15 August	As needed	Airfield/BASH zone: 50%-50%	2.3 pounds per 1,000 sq. ft.
Mowing	May to September	To maintain vegetation at a		
Weed and Brush Control	June to August	As needed	Mechanical or hand methods	As necessary to comply with USAF standards
Insect Control	June to August	Only during epidemic	Depends on insect	Will comply with federal and state laws
Irrigation	N/A	N/A	N/A	N/A
Aeration	May to August	Prior to		As required
Pruning	N/A	N/A	N/A	N/A
Tree Planting	N/A	N/A	N/A	N/A

Table 7.5. Recurring Maintenance Operations Chart (Continued)

Operation	Season	Frequency	Materials Used	Application
Unimproved Grounds				
Policing	January to December	Monthly		
Fertilization	N/A	N/A	N/A	N/A
Reseeding	1 June to 15 August	Only if necessary	'Manchar' or 'Polar' smooth brome or 'Arctared,' 'Pennlawn,' or 'Common' creeping	0.6 lb per 1,000 sq. ft. 3.5-4.0 lb per 1,000 sq. ft.
Mowing	N/A	N/A	N/A	N/A
Weed and Brush Control	N/A	N/A	N/A	N/A
Insect Control	June to August	Only during epidemic	Depends on insect	Will comply with federal and state laws
Irrigation	N/A	N/A	N/A	N/A
Aeration	N/A	N/A	N/A	N/A
Pruning	N/A	N/A	N/A	N/A
Tree Planting	N/A	N/A	N/A	N/A

Grounds Management Projects

The following projects are planned for the next five years. They were prioritized as follows:

- Update Urban Forest Map - The urban forest has been put on GeoBase. Annually update the map.

7.8 Forest Management

Applicability Statement

Most of Eielson AFB is covered by forest. To maintain a healthy forest, the natural resources office has developed best management practices to keep not only sound forestry practices, but also in keeping with mission directives.

Program Overview/Current Management Practices

Forest Description and Inventory

General Description

Approximately 15,553 acres of base are forested. Approximately 6,013 acres or 38.7 percent of the forested land is commercial. The commercial species are white spruce (*Picea glauca*), paper birch (*Betula papyrifera*), balsam poplar (*Populus balsamifera*), quaking aspen (*Populus tremuloides*), black spruce *(Picea mariana*), and tamarack (*Larix laricina*). The commercial forest types found on base are:

Forest Type	Acres
White spruce	1,636
Paper birch	1,392
White Spruce-paper birch	1,653
Balsam poplar	893
White spruce-balsam poplar	281
Paper birch-black spruce	99
Black spruce	36
Tamarack	23

The older white spruce are about 105 to 115 years old and are in good condition. The older paper birch and balsam poplar are 85 to 105 years old and are deteriorating. Much of the balsam poplar in the white spruce-balsam poplar type is sparsely stocked and deteriorating. The younger stands are in good condition.

There is a market in the Fairbanks area for white spruce sawtimber, house logs, fuel wood, and paper birch fuel wood. There is not much of a demand for balsam poplar. About 7,789 acres of the 9,540 acres of non-commercial forest land are covered with black spruce and have the potential to support limited harvesting of Christmas trees.

Forest management consists of forest product sales, forest access road maintenance, and forest protection.

Forest Inventory

In 1979-80, the Eielson AFB Natural/Cultural Resources Section inventoried and cover type mapped the forest land on base. In 1994 and 2002, the Eielson AFB Natural/Cultural Resources Section updated the forest inventory and cover type map. A new forestry survey was conducted in FY14. The following data is from the 2014 forest inventory update conducted by the Eielson AFB Natural/Cultural Resources Section.

Table 7.6. Forest Land Acreage

	Commercial				Non-		
Compartment	**Regulated**	**Modified**	**Restricted**	**Total CFL***	**Commercial**	**Other**	**Total Forest**
1	1,012	27	89	1,128	2,044	131	3,303
2	217	512	784	1,513	3,364	141	5,018
3	323	165	5	493	3,511	3,138	7,142
4	1,076	144	0	1,220	480	20	1,720
5	1,165	338	156	1,659	141	15	1,815
Total	**3,793**	**1,186**	**1,034**	**6,013**	**9,540**	**3,445**	**18,998**

* CFL – Commercial Forest Land

Table 7.7. Commercial Forest Volume and Growth by Compartment[1]

Compartment	Volume		Volume/Acre		Annual Growth		Growth/Acre	
	MCF[2]	MBF[3]	Cu Fort	Bd Fort	MCF[2]	MBF[3]	Cu Fort	Bd Fort
1	595	1,178	688	1,363	20.5	18.5	23.7	21.4
2	1,661	1,126	1,338	907	30.4	18.7	24.5	15.1
3	64	220	517	1,762	2.4	6.1	19.6	49.4
4	932	2,945	1,138	3,595	18.6	43.9	22.7	53.6
5	1,007	2,975	847	2,502	27.7	82.1	23.3	69.1
Total	**4,259**	**8,444**	**1,005**	**1,992**	**99.6**	**169.3**	**23.5**	**40.0**

1. Poletimber and sawtimber stands only.
2. Thousand cubic feet.
3. Thousand board feet expressed in International 1/4-inch log rule.

Table 7.8. Forest Product Volume by Softwood and Hardwood[1]

Class	Product	Volume		Volume/Acre	
		MCF[2]	MBF[3]	Cu Fort	Bd Fort
Softwood (White and Black spruce)	Sawtimber	1,198	7,189	283	1,696
	Firewood	973		229	
Subtotal		*2,171*	*7,189*	*512*	*1,696*
Hardwood (Paper birch and Balsam poplar)	Sawtimber	209	1,255	49	296
	Firewood	1,879		443	
Subtotal		*2,088*	*1,255*	*492*	*296*
Total		**4,259**	**8,444**	**1,004**	**1,992**

1. Poletimber and sawtimber stands only.
2. Thousand cubic feet.
3. Thousand board feet expressed in International 1/4 inch log rule.

Table 7.9. White Spruce Forest Productive Capacity[1]

Site Index	Site Class[2]	Acres	Area Percent	Volume Factor Cu Fort/Acre[3]	Total Volume MCF[4]
50				1,580	
55	Poor	39	1.6	1,958	272
60		28	1.1	2,335	65
65	Fair			2,759	
70		2,164	87.4	3,183	6,888
75	Good	181	7.3	3,652	661
80		65	2.6	4,122	268
Total		**2,477**	**100%**	**19,589**	**8,154**

1. Poletimber and sawtimber stands only.
2. Term to express potential generally
3. Yield-table per-acre volume at rotation for species 4 Thousand cubic feet

Table 7.10. Paper Birch Forest Productive Capacity[1]

Site Index	Site Class[2]	Acres	Area Percent	Volume Factor Cu Fort/Acre[3]	Total Volume MCF[4]
35	Poor			282	
40		258	23.0	684	176
45	Fair	132	11.8	1,087	143
50		726	64.6	1,590	1,154
55	Good	7	.6	2,094	15
60					
Total		**1,123**	**100%**		**1,488**

1. Poletimber and sawtimber stands only
2. Term to express potential generally
3. Yield-table per-acre volume at rotation for species 4 Thousand cubic feet

Table 7.11. Balsam Poplar Forest Productive Capacity[1]

Site Index	Site Class[2]	Acres	Area Percent	Volume Factor Cu Fort/Acre[3]	Total Volume MCF[4]
35	Poor	15	2.9	30	0.4
40		35	6.8	721	25
45	Fair	52	10.0	1,412	73
50		399	77.2	2,068	825
55	Good	16	3.1	2,724	43
60				3,649	
Total		**517**	**100%**		**966.4**

1. Poletimber and sawtimber stands only
2. Term to express potential generally
3. Yield-table per-acre volume at rotation for species 4 Thousand cubic feet

Total Potential Volume = $\frac{\text{Total MCF Volume (Tables 7-9, 7-10, \& 7-11)}}{2} = \frac{10,608.4}{2}$ = 5,304 MCF

Present Volume = Total MCF Volume (Table 7-7) = 4,259 MCF

Comparison in Percent = $\frac{\text{Present Volume}}{\text{Total Potential Volume}} \times 100 = \frac{4,259 \text{ MCF}}{5,304 \text{ MCF}} \times 100 = 80.3\%$

History

Since November 1983, Eielson AFB forests have been managed under a forest management plan or INRMP. For the past 33 years cut your own Christmas tree permits have been available to base personnel. Christmas tree sales can decrease in years with extremely cold temperatures or lots of snow on the ground. In FY86, a personal use firewood program was established. The demand for firewood has been generally low through the years but has spiked since 2007 likely due to the increase in heating fuel costs and ease of access. The following table summarizes the forest activities during the past five years.

Table 7.12. Forestry Activities for the Past 5 Years

Fiscal Year	Firewood Harvested (Standard Cords)	Christmas Trees Harvested (No. of Trees)	Total Timber Sale Receipts	Total Program Costs
2011	195.5	14	$4,008	$0
2012	187.5	21	$3,897	$0
2013	169.75	17	$3,514	$0
2014	124	16	$2,560	$0
2015	187	32	$3,900	$0

Table 7.13. Five-Year Plan of Action

Fiscal Year	Estimated Program Costs	Estimated Timber Sales Receipts	Estimated Harvest	
			Standard Cords	Christmas Trees
2016	$0	$2,175	130	25
2017	$0	$2,175	130	25
2018	$0	$2,175	130	25
2019	$0	$2,175	130	25
2020	$0	$2,175	130	25

Forest Management

Philosophy

The forest land will be managed to supply Christmas trees for base personnel and firewood for a personal use firewood program. The sale of other products will be given little importance at this time. About 38.7 percent of the base has commercial potential. About 19.7 percent of the commercial forest land lies in recreation areas and 17.2 percent in special military use areas.

Aesthetic values are more important than forest products in recreation areas. Having an operational component plan for forest management provides the base the option to enter into the sale of forest products other than Christmas trees and personal use firewood.

The Alaska Division of Forestry uses the rotation age of 130 years for white spruce. The US Forest Service has found healthy white spruce stands up to 200 years old. Generally, the base will use the 130-year rotation, but may in certain instances delay harvest for up to 200 years. The Alaska Division of Forestry uses the rotation age of 70 years for hardwoods. The hardwoods on base show deterioration at 80 to 100 years. Delaying the harvest of hardwoods would not be sound management. The acreage of timber sales will be relatively small, 5 to 10 acres, because wildlife habitat is better enhanced by a forest interspersed with small regenerating areas.

Compartment/Stand Designation/Methodology

The USAF requires installations to divide their forest lands into compartments for orderly management and administration. Eielson AFB was divided into five compartments using permanent natural and man-made boundaries. Each compartment was further divided into timber stands. Each stand is an

aggregation of trees occupying a specific area and sufficiently uniform in species composition, age, arrangement, and condition as to distinguish it from adjoining areas. Initially, the minimum size for a timber stand was 5 acres. A few stands smaller than 5 acres were designated by the forest inventory or were created by compartment lines.

Management Strategy by Compartment

Compartment I

The black spruce stands will be used for harvesting Christmas trees. This compartment has a 124-acre stand of 119-year-old mature paper birch poletimber. This stand is past the 70-year rotation age and should be harvested. Access is through black spruce forested wetlands and over a couple of steep hills. Only winter access can be considered which could restrict harvest.

Compartment II

The black spruce stands will be used for harvesting Christmas trees. This compartment has three mature paper birch poletimber stands of 301 acres (age 130), 598 acres (age 123), and 133 acres (age 124). Approximately 95 percent of the total acreage of these mature birch stands is currently within recreation areas (ski trails, archery range, and ski slope), the Arctic Survival Field Training Area, and ammunition storage safety zone thus restricting timber harvest. The remaining acreage provides a limited opportunity for personal use firewood harvesting because of difficult terrain. The forest resources in the Arctic Survival Field Training Area are harvested by the instructors and students to support the field training portion of the week-long school.

Poles for shelter construction and firewood are an integral part of the training. A natural resources operating plan has been written for the Arctic Survival Field Training Area and can be found in Appendix F, Natural Resources Operating Plan for the Arctic Survival Field Training Area. The mature paper birch harvested for personal use firewood and Arctic Survival field training will be allowed to reforest by natural succession.

Compartment III

Sapling-sized white spruce located along Transmitter Road will be used for harvesting Christmas trees. During the next five years, Christmas tree harvest in the northern-most black spruce stands will probably not be allowed as they are adjacent to the cantonment area. The southern-most black spruce stands have poor access because of a perimeter fence along the Richardson Highway. Present demand does not require use of these black spruce stands. Should Christmas tree demand increase, the southern-most stands would be used first. The commercial forest land in this compartment is less than rotation age.

Compartment IV

This compartment has little potential for providing Christmas trees, but could be a possible alternate Christmas tree source should compartments I–III fail to meet the demand. This compartment has a 99-year-old mature balsam poplar poletimber stand, which is past rotation age. Access is poor and the demand for balsam poplar is questionable. The rest of the stands are below rotation age.

Compartment V

This compartment has little potential for providing Christmas trees, but could be a possible alternate Christmas tree source should compartments I-III fail to meet the demand. All stands are below rotation

age. This compartment has many lakes and picnic sites. Timber harvesting in these recreation areas is not desirable.

Forest Management Projects

The following projects are planned for the next five years. They were prioritized as follows.

Christmas Tree Sales

Christmas trees will be harvested from black spruce stands in Compartments I and II and sapling sized white spruce stands in Compartment III. Thinning cuts will be used. Sales receipts of $125 annually are anticipated.

Personal Use Firewood Sales

Eielson AFB will continue to offer a personal use firewood sales program. Firewood will be cut from mature paper birch stands and areas identified for future construction and other military activities. Priority will be given to areas identified for future development. The sales from mature paper birch stands will be made in Compartments I and II. Compartment I will be used only after completing the desired harvest in Compartment II. Clear cutting will be used. The acreage of the sales will be small, 5 to 10 acres. The areas clear-cut will be irregular in shape. This will provide the greatest edge effect for wildlife, be less degrading to the aesthetics, and provide the most biodiversity. The standard practice of using tree marking paint in spray form is authorized for marking trees in selective cut sales and delineating/marking the boundaries of firewood cutting areas. Each fiscal year about 130 standard cords will be sold generating estimated receipts of $2,600.

Insect and Disease Protection

No significant insect or disease problems have been encountered on Eielson AFB managed lands. The Natural/Cultural Resources Section is responsible for insect and disease protection and constantly monitors the forest lands.

Forest Road Construction and Maintenance

Eielson AFB has two gravel forest/recreation access roads totaling 1.6 miles in length. Roads periodically require the removal of brush interfering with vehicle passage. Because these roads also have non-forestry uses, other funding will be used when available to reduce the cost of road maintenance to the forestry program. In firewood cutting areas, hydro axing access trails may be required to facilitate tree removal.

Purchase Aerial Photography

Purchase recent aerial photographs of base to update Natural/Cultural Resources aerial photography file. Current photo coverage for the entire base is from 2005. In 2012, aerial imagery was taken but not of the entire installation. The next time some agency will photograph the entire base from the air is unknown. This photography will be purchased when the photos document changes in forest cover type. Funds can be saved by purchasing aerial photos from projects funded by other agencies.

Manage Arctic Survival Field Training Area

Annually ensure the Natural Resources Operating Plan for the Arctic Survival Field Training Area (Natural Resources Operating Plan for the Arctic Survival Field Training Area, Appendix F) maintains up-to-date guidelines for length of campsite use, use of wood resources, development of new trails, and use of wetlands. Annually monitor plan compliance.

7.9 Wildland Fire Management

Applicability Statement

Although wildfires are a concern at Eielson AFB, they are rarely a significant problem. The greatest threat of wildland fire comes from the Army Yukon Training Area that borders Eielson AFB property. This training area is used to conduct live fire training missions.

Program Overview/Current Management Practices

Eielson AFB currently does not have a Fire Management Plan but is working with the USAF Wildland Fire Center. The Center is in the process of creating a risk analysis for Eielson AFB. Once the Risk Analysis is completed, the information will be used to develop a Wild Land Fire Management Plan.

7.10 Integrated Pest Management Program

Applicability Statement

DoD requires all installations to provide a well-planned and implemented pest management program. A sound pest management program must be provided that maintains and safeguards the health, environmental quality, aesthetic values, and ecological balance of the military community by protecting real estate investments from depreciation by pests, while complying with environmental protection and improvement policies.

Integrated Pest Management at Eielson AFB is the responsibility of the 354 CES Pest Management Section. Their mission is to provide effective control of pest species (insects, arthropods, mammals (primarily rodents), birds, weeds, and other deleterious invasive species) to ensure that pests do not hinder completion of Eielson AFB mission. Personnel are responsible for dealing with small vertebrate and invertebrate pests in facilities and open areas within the cantonment area, especially the airfield infield, as well as weeds, invasive species, and insect control throughout Eielson AFB.

Program Overview/Current Management Practices

Resolve Wildlife Conflicts/Problems

Nuisance Beaver

Nuisance beaver can be a problem in the waterways draining the main base. Most problems occur in Garrison Slough and its tributaries. To a lesser extent, problems occur in French Creek, Knokanpeover Creek, and the cooling pond drainage ditch.

One contributing factor has been the closure of the base cantonment area to trapping for safety reasons. In 1985, the cantonment area was opened to beaver trapping on an as-necessary basis. The program has significantly reduced the number of nuisance beaver in this area and will continue to be used.

Eielson AFB can only manage the beaver population within its borders. Beaver from adjacent lands can migrate onto Eielson AFB and instantly become a problem. Nuisance beaver will never completely disappear. Nuisance beaver will be dealt with in the following manner.

- An annual beaver cache survey will be conducted to identify beaver colony locations.
- If the damage/flooding can be tolerated in the short term, removal will occur during the beaver trapping season.
- If the damage/flooding cannot be tolerated and beaver trapping season is closed, a nuisance beaver removal permit will be obtained from the ADF&G.

7.11 Bird/Wildlife Aircraft Strike Hazard (BASH)

Applicability Statement

EIELSONAFBI 91-212, *Eielson Air Force Base Bird and Wildlife Hazard (BASH) Program*; covers the Eielson AFB BASH program. This instruction implements AFPD 91-2, *Safety Programs*, and is used in conjunction with AFIs 91-202, *The US Air Force Mishap Prevention Program*, 91-204, *Safety Investigations and Reports*, and AFPAM 91–212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Techniques*. This instruction provides a base program to minimize aircraft exposure to potentially hazardous bird/wildlife strikes and applies to all host, associate, and temporary duty (TDY) organizations on Eielson AFB, including the Air National Guard and USAF Reserve members and units.

Program Overview/Current Management Practices

Borrow Pit Development

To minimize the threat to flight safety, no special habitat development will be done to encourage bird use in borrow pits. Borrow pits will be developed as outlined under Section 7.1, Develop Fish Habitat in Borrow Pits, to provide fish habitat, and recreation user safety and access. Eielson AFB recognizes that borrow pits developed for fish habitat, user safety, and access will attract birds. The base will monitor bird numbers, assess the potential threat, and make management adjustments as necessary.

Bird Harassment/Depredation Program

Annually, Eielson AFB conducts a bird harassment/depredation program. The harassment program is conducted in the bird exclusion zone (BEZ) and waterfowl exclusion zone (WEZ). The harassment program consists of sound cannons, pyrotechnics, mylar tape, and bird detection and dispersal teams. The depredation program is conducted within the confines of the BEZ and WEZ, but only after obtaining the required federal and state permits. This program is a necessary part of the bird/aircraft strike hazard reduction program.

Waterfowl Habitat Removal in the Airfield Bird Exclusion Zone

The airfield, which comprises most of the bird exclusion zone, has always had numerous man-made ponds and a swamp attractive to waterfowl and shorebirds. Waterfowl and shorebirds on the airfield are a possible threat to aircraft. In the 1980's and 1990's, the base obtained the necessary wetlands and solid waste permits to implement a continuing program to eliminate this highly attractive habitat by filling the ponds and swamp. Currently, about 8 surface acres of man-made ponds remain. Once filled, the ponds are capped with soil, planted with a tall growing species of grass, and managed under the airfield

bird/aircraft strike hazard reduction mowing plan. This bird exclusion zone program must be continued until all waterfowl habitat that is a potential bird/aircraft strike hazard is removed.

Grass Height Manipulation Program

Eielson AFB has over 600 acres of mowed grass that is attractive to local resident and migrating geese. Any geese choosing to loaf or feed near the airfield are a possible threat to aircraft.

Geese have been known to venture onto the runway and taxiways and deposit their droppings, which is considered foreign objects debris (FOD) and requires immediate cleanup.

Geese prefer mowed areas over un-mowed, as they can more easily watch for predators and feed on the shorter succulent grasses. Fall goose surveys on Eielson AFB from 1985-2008 indicated geese do have a preference for short grass (Records of these surveys may be viewed at the Natural Resources Office). The birds use the airfield for about a 10-day period in the spring and a 6-week period in the fall. The fall migration has posed the most problems due in part to the increase in number of young-of-year birds migrating south with adults.

Airfield Grounds shall be mowed twice per year beginning on or about 15 June; second mowing beginning 1 September, to a height 10 inches. Cutting of grass on airfield grounds shall be accomplished only after Airfield Management has approved scheduled times.

The 1986-1994 Summer Airfield Passerine Surveys indicated the tall grass policy does not attract passerine populations to the airfield that exceed expected levels (Von Rueden 1986 - 94).

7.12 Cultural Resources Protection

Applicability Statement

The Integrated Cultural Resources Management Plan (ICRMP) provides guidance for the effective and efficient management of cultural resources as an integral part of the Eielson AFB IDP, as required by AFI 32-7065, *Cultural Resources Management*. This plan includes a summary of the history and prehistory of the base and reviews past architectural and archeological survey efforts. It outlines and assigns responsibilities for the management of cultural resources and discusses standard operating procedures (SOPs) for Eielson AFB. The plan also addresses guidance and procedures regarding consultation and the care and management of cultural resources of Eielson AFB within the context of the base mission. This document was prepared as a reference guide for any base employee involved in installation planning activities on Eielson AFB.

Program Overview/Current Management Practices

Cultural resources management at Eielson AFB is provided in accordance with Section 106 and Section 110 of the *National Historic Preservation Act* (16 USC Section 470, as amended), the *Archeological Resources Protection Act* (16 USC Section 470aa-47011), the *American Indian Religious Freedom Act* (42 USC 1996), the *Native American Graves Protection and Repatriation Act* (25 USC Section 3001 *et seq*.), *Protection and Enhancement of Cultural Environment* (EO 11593), and AFI 32-7064, *Integrated Natural Resources Management*. Means to achieve compliance with these laws and policies are outlined in the *Integrated Cultural Resources Management Plan, 2013–2018*.

The Cultural Resources Manager (CRM) is responsible for the management of cultural resources on a day-to-day basis. At Eielson AFB, cultural resources management is a collateral duty and the

responsibility of the NRM assigned to the CES Installation Management Environmental Assets (CEIEA) element. The CES is responsible for reviewing proposed projects for their potential impact as part of the NEPA environmental review process. In the event that there are potential impacts to cultural resources, the CRM is responsible for ensuring that the impacts are assessed and that National Historic Preservation Act (NHPA) in Section 106 consultation is initiated early in the planning process and complete in advance of the project execution timelines.

7.13 Public Outreach

Applicability Statement

An installation outreach program is another component of an integrated natural resources management program. Each natural resource program area will conduct outreach activities, and the natural resources program management function integrates these efforts through a conservation web page, displays, and participation in other outreach events.

Program Overview/Current Management Practices

Construct Mullins Pit Habitat Development Display

Construct an interpretive display for the Mullins Pit habitat development project. One panel of the display would tell the pit's history. A second panel would list the development guidelines. A third panel would be a map showing how the pit will be developed. The display will educate the public about how wise planning can provide useful man-made habitat.

Watchable Wildlife Program

King and chum salmon can be observed spawning from July through August at the Chena River Annex campground located at the end of Transmitter Road. An interpretive display near the river describes the life cycle of the salmon.

The areas on base closed to hunting for public safety reasons allow for wildlife viewing by providing an area where wildlife is subjected to little disturbance and where it is highly visible to the public. Most of the closed areas are near where base personnel work and live, thus providing an excellent opportunity for wildlife observation and photography.

The base Natural/Cultural Resources Office is the logical beginning point for incoming personnel seeking information on Alaska's fish and wildlife. The office maintains exhibits of game and nongame birds, animals, and fish common to the area. The intent of these displays are for public information/education and to make people aware of the wildlife that exists on Eielson AFB managed lands. Natural/Cultural Resources assists students preparing fish and wildlife papers, speeches, and presentations. The office is a source of information for airmen seeking to further their education in the fish and wildlife field.

7.14 Geographic Information Systems (GIS)

Applicability Statement

A GIS database is a vital tool for assisting land managers with decision-making and monitoring results of management and mission activities. GIS is critical in planning actions for current and future years and maps out useful information for everyday work plans.

Program Overview/Current Management Practices

Eielson AFB maintains a GIS system that includes all maps contained in the INRMP to include wetlands, soil types, surface water, vegetation types, wildlife habitat types, forestry types, forest compartments, and land management units. GIS programs are accessible to the Natural Resources personnel to update layers pertaining to natural resources management as needed.

Wetland and vegetation surveys are needed to update base GIS layers to assist in future project planning and land management. Current aerial photography of Eielson AFB ranges are needed to update GIS range layers.

8.0 MANAGEMENT GOALS AND OBJECTIVES

The installation establishes long term, expansive goals and supporting objectives to manage and protect natural resources while supporting the military mission. Goals express a vision for a desired condition for the installation's natural resources and are the primary focal points for INRMP implementation. Objectives indicate a management initiative or strategy for specific long or medium range outcomes and are supported by projects. Projects are specific actions that can be accomplished within a single year. Also, in cases where off-installation land uses may jeopardize USAF missions, this section may list specific goals and objectives aimed at eliminating, reducing or mitigating the effects of encroachment on military missions. These natural resources management goals for the future have been formulated by the preparers of the INRMP from an assessment of the natural resources, current condition of those resources, mission requirements, and management issues previously identified. Below are the integrated goals for the entire natural resources program.

The installation goals and objectives are displayed in the 'Installation Supplement' section below in a format that facilitates an integrated approach to natural resource management. By using this approach, measurable objectives can be used to assess the attainment of goals. Individual work tasks support INRMP objectives. The projects are key elements of the annual work plans and are programmed into the conservation budget, as applicable.

Installation Supplement—Management Goals and Objectives

Identifying issues and concerns is the first step in developing a sound management strategy for Eielson AFB managed lands. Developing goals for each issue and concern provides the general direction that management should follow. The goals are intended to drive the integrated ecosystem management effort for the next five years. Management objectives are more specific measures designed to help achieve the management goals. The following nine issues and concerns with goals and objectives were identified for Eielson AFB managed lands.

8.1 Natural Resource Constraints to Installation Planning and Missions
8.2 Wetlands and Floodplains
8.3 Lake and Watershed Protection
8.4 Fish and Wildlife Management
8.5 Threatened and Endangered Species and Critical Habitats
8.6 Forest Management
8.7 Grounds Maintenance
8.8 Outdoor Recreation and Public Access
8.9 Geographic Information System (GIS)

Goal 8.1 Support and enhance the USAF mission and readiness by considering and minimizing natural resource constraints in installation planning while providing natural environments for training and mission requirements.

- Objective 8.1.1—Provide base planners with up-to-date Eielson AFB IDP, INRMP, and GeoBase so they can comply with natural resources constraints.

    - Project 8.1.2—Annually evaluate and update the INRMP as needed based on extent of changes to natural resources. Provide the updated information to the base planners so they can update the Eielson AFB IDP and use the information when developing installation plans and missions.

Goal 8.2 Protect wetlands and floodplains from loss or degradation to the maximum extent possible outside the airfield vicinity to ensure compliance with the Clean Water Act.

- Objective 8.2.1—Use uplands or low quality wetlands for base expansion whenever feasible minimizing wetland loss.

    - Project 8.2.1.1—Conduct a wetland survey of Eielson AFB and the Chena Annex by October 2020.
    - Project 8.2.1.2—Conduct wetland delineations in the early stage of projects to allow for practical alternatives. If there are no practical alternatives, apply for Section 404 permits and comply with mitigation requirements.
    - Project 8.2.1.3—For proposed actions in a floodplain, consult the Floodplain Management Services Section of the USACE and follow their recommendations.
    - Project 8.2.1.4—When base expansion must take place in floodplains, the development is flood proofed using diking or back filling to an elevation above the 100-year floodplain.
    - Project 8.2.1.4—Supply base planners with up to date wetland and floodplain maps as needed.

Goal 8.3 Minimize the impacts of erosion, sedimentation, and point and nonpoint water pollution to watersheds and bodies of water to ensure compliance with the Multi-Sector General Permit (#AK060000) for Storm Water Discharges.

- Objectives 8.3.1—The SWPPP implements best management practices that limit or reduce the amount of contaminants exposed to storm water.

    - Project 8.3.1.1—Annually review SWPPP and implement the best management practices outlined in the plan.

Goal 8.4 Manage game and nongame fish and wildlife species for long-term sustainability, diversity, and productivity of the ecosystem considering the needs of other natural resources while creating habitats that will decrease BASH issues around the airfield.

- Objective 8.4.1—Develop and improve fish habitat on base lakes and streams to provide recreational and aesthetic opportunities.

    - Project 8.4.1.1—Develop fish habitat in Mullins Pit and Cathers Lake gravel pits as they are expanded during gravel mining operations.
    - Project 8.4.1.2—Annually inventory winter dissolved oxygen in base lakes.
    - Project 8.4.1.3—Conduct a beaver dam survey on Piledriver Slough to assess impact on grayling habitat.

- Project 8.4.1.4—Construct a habitat development/watchable wildlife interpretive display at Mullins Pit Wildlife Management Area.

- Objective 8.4.2—Continue the BASH program along with removing and modifying waterfowl and shorebird habitat from the airfield bird exclusion zone under Section 404 of the Clean Water Act.

  - Project 8.4.2.1—Fill 4 acres of the South Loop water bodies.

- Objective 8.4.3—Implement conservation law enforcement on Eielson AFB.

  - Project 8.4.3.1—Acquire conservation law enforcement vehicle and equipment to monitor and enforce federal and state fish and game rules and regulations.

Goal 8.5 Conserve threatened and endangered species and critical habitats.

- Objective 8.5.1—Monitor for the presence of listed or proposed threatened and endangered species and critical habitats on Eielson AFB managed lands. Should any threatened or endangered species become resident to Eielson AFB managed lands, consultation with the USFWS will have to be initiated.

  - Project 8.5.1.1—Annually contact USFWS for updated Endangered Species Act lists.

Goal 8.6 Manage forest resources and timber production for long-term sustainability, diversity and productivity of the ecosystem considering the needs of the USAF mission and other natural resources.

- Objective 8.6.1—Establish a 70-year rotation age for hardwoods and a 130-year rotation age for softwoods; however, in specific instances, softwood harvest can be delayed until the trees are 200 years old.

  - Project 8.6.1.1—Maintain up-to-date aerial photos and maps of forest resources as needed.

- Objective 8.6.2—Remove forested areas within the airfield height restrictions.

  - Project 8.6.2.1—Annually administer personal use firewood and cut-your-own Christmas tree sale programs for thinning stands.

Goal 8.7 Manage grounds to maintain, protect, and conserve existing ecosystems, contribute to biodiversity, minimize maintenance costs, protect real estate investments, and decrease BASH issues.

- Objective 8.7.1—Establish land maintenance procedures and guidelines for establishing and controlling vegetation consistent with USAF needs.

  - Project 8.7.1.1—Conduct an exotic invasive vegetation survey in cantonment and surrounding areas by October 2018.
  - Project 8.7.1.2—Develop and implement a management plan for the eradication or control of invasive plant species by May 2019.

- Objective 8.7.2—Manage and improve urban forest program.
    - Project 8.7.2.1—Annually plant up to 20 native tree species by end of August in open spaces to reduce maintenance costs and deter use by migrating geese.

Goal 8.8 Manage outdoor recreation resources for long-term sustainability, diversity, productivity of the ecosystem, considering the needs of other natural resources and compatibility with the USAF mission.

- Objective 8.8.1—Improve and develop new primitive campsites in unimproved areas.
    - Project 8.8.1.1—Construct four new campsites at the Chena Annex Campground with picnic tables and fire rings by September 2018.
    - Project 8.8.1.2—Repair picnic tables at campsites west of the Richardson Highway and Chena Annex by September 2017.
    - Project 8.8.1.4—Install informational signs at recreational entrances by June 2018.
- Objective 8.8.2—Improve 20 km of hiking/skiing trails located south of ski lodge.
    - Project 8.8.1.3—Remove 4 km of encroaching brush, trees, and woody vegetation from cross country ski trails per year.

Goal 8.9 Maintain natural resources maps on the Eielson AFB GeoBase to assist in the environmental management decision-making process and ongoing implementation of the INRMP.

- Objective 8.9.1—Make natural resources maps on the GeoBase available to civil engineer personnel for evaluating management practices and potential impacts of proposed development projects.
    - Project 8.9.1.1—Annually update the natural resources layers on the Eielson AFB GeoBase as needed.

9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.1 Natural Resources Management Staffing and Implementation

The CES Environmental Element at Eielson AFB is the primary executor of this INRMP, though many other staff members have a role. The NRM must coordinate and communicate within the internal command structure and with external stakeholders to convey the requirements of the INRMP and to develop integrative and cooperative approaches to natural resources management (see responsibilities outlined in Section 7.0). NRM's are encouraged to attend relevant conferences and seek training.

This INRMP provides guidance on how to manage natural resources at Eielson AFB in compliance with federal, state, and local regulations as well as in support of environmental stewardship. The plan is dynamic in that goals and objectives are to be monitored on a continuous basis and management strategies updated whenever there are changes in the mission requirements, adverse effects observed in the management of the natural resources, or changes in regulations governing management of natural resources. Goals and objectives must be considered early in the planning process as they will not be fully realized without requested appropriations. Resources required to implement this plan will be included in the Future Year Defense Program. The projects presented in this INRMP have been prioritized in

consideration of the fact that the funding received is often less than requested and necessary for implementation of all projects. Work plans that provide time frames for project implementation are provided in Section 8.0. This plan also provides information for preparation and review of facility projects or Air Force Form 813, *Request for Environmental Impact Analysis*, that affect natural resources management.

Ecosystem management is the tool that the USAF uses to protect and enhance biodiversity, the variety of life and its processes, and achieves sustainable land use. This approach considers natural resources at an ecosystem level, rather than at the single species level. The quality, integrity, and connectivity of the ecosystem are the overall goal of this approach, and it is assumed that, within this broader scheme, individual species will prosper. Rare species are important components of ecosystems and biodiversity. In addition, rare species are often provided legal protection; therefore, they must be considered during project planning in relation to natural resources management. The INRMP implements ecosystem management on USAF installations by setting goals for attaining a desired land condition, based on ecosystem management principles and guidelines in DoDI 4715.3, *Natural Resources Conservation Program*.

Eielson AFB's INRMP was developed by identifying and integrating mission requirements with all aspects of natural resources management, including:

- BASH–minimization
- Stream, floodplain, and wetlands hydrological processes–maintenance or restoration when feasible
- Sensitive Species–conservation
- Biodiversity–conservation
- Exotic/Invasive Species–control
- Recreation–provision
- Regulatory requirements–compliance
- Base development–compliance
- Landscaping and grounds maintenance–provision

The INRMP integrates these requirements into an overall plan so the different aspects of natural resources management complement each other and contribute to the overall goal of a healthy diverse ecosystem capable of supporting the military mission into the foreseeable future.

9.2 Monitoring INRMP Implementation

This plan is written by the Eielson AFB Natural/Cultural Resources Section. The Eielson AFB Environmental Protection Committee (EPC) and PACAF/A7AV reviewed the plan. The public was provided an opportunity to comment through the Environmental Impact Analysis Process (EIAP January 2003) conducted by the Eielson AFB Environmental Planner. The plan has been coordinated with the USFWS and ADF&G. The USFWS and ADF&G are signatories to the plan. The 354th Fighter Wing Commander is the approving official.

Revision of this plan will be accomplished as major programs are initiated, redirected, or discontinued, but in no case will the period between revisions exceed five years. The Natural/Cultural Resources Section will annually review the plan for revision. The Natural/Cultural Resources Section must approve changes to the plan. If the Natural/Cultural Resources Section cannot resolve a conflict, the EPC makes the decision. Notification of the plans revision will be posted in the Fairbanks newspaper and the public will have a review period of 30 days.

9.3 Annual INRMP Review and Update Requirements

The Sikes Act requires that the INRMP be reviewed as to operation and effect by the parties thereto on a regular basis, but not less often than every five years. Implementation of this INRMP by the Installation Environmental Element will include annual reviews to evaluate the effectiveness of management approaches and to propose modifications as necessary in support of adaptive management. These reviews should be undertaken with representation by the USFWS and ADF&G.

As the foundation for adaptive management on-base, these annual reviews will help keep the INRMP current and relevant with the incorporation of new projects, additional data, new understanding of natural processes and species, knowledge of other base operations impacting natural resources, and lessons learned from completed and ongoing projects.

10.0 ANNUAL WORK PLANS

The INRMP Annual Work Plans are included in this section. These projects are listed by fiscal year, including the current year and four succeeding years. For each project and activity, a specific timeframe for implementation is provided (as applicable), as well as the appropriate funding source, and priority for implementation. The work plans provide all the necessary information for building a budget within the USAF framework. Priorities are defined as follows:

High: The INRMP signatories assert that if the project is not funded the INRMP is not being implemented and the USAF is non-compliant with the Sikes Act; or that it is specifically tied to an INRMP goal and objective and is part of a "Benefit of the Species" determination necessary for ESA Sec 4(a)(3)(B)(i) critical habitat exemption.

Medium: Project supports a specific INRMP goal and objective, and is deemed by INRMP signatories to be important for preventing non-compliance with a specific requirement within a natural resources law or by EO 13112 on Invasive Species. However, the INRMP signatories would not contend that the INRMP is not be implemented if not accomplished within programmed year due to other priorities.

Low: Project supports a specific INRMP goal and objective, enhances conservation resources or the integrity of the installation mission, and/or support long-term compliance with specific requirements within natural resources law; but is not directly tied to specific compliance within the proposed year of execution.

Table 10.1. Fish and Wildlife Management Projects

Project	Priority	Land Use Type	Land Management Unit	Required Agency Coordination	Source of Funds	Estimated Cost
Maintain Moose Lake/Polaris Lake, Bear Lake, and Mullins Pit dikes	High	Multiple	Multiple		Operations and Maintenance	Variable
Develop Mullins Pit fish habitat	High	Borrow Pits	Mullins Pit borrow pit	USACE, ADF&G, and USFWS	Conservation Resources and construction projects	$55,000 annually
Develop Cathers Lake fish habitat	High	Borrow Pits	Cather Lake borrow pit	USACE, ADF&G, and USFWS	Conservation Resources and construction projects	$50,000 annually
Conduct annual winter/summer dissolved oxygen inventory	Medium	Fish and Wildlife/ Open Space/ Borrow Pits	Multiple	ADF&G	Conservation Resources	Accomplish with section salaries and $100
Conduct creel census	Low	Open Space and Fish and Wildlife	Lakes and streams		Conservation Resources	Accomplish with Section Salaries
Collect trapping harvest data	Low	Multiple	Multiple	ADF&G	Conservation Resources	Accomplish with section salaries
Collect bow and arrow moose harvest data	Low	Multiple	Multiple		Conservation Resources	Accomplish with section salaries
Construct Mullins Pit habitat development interpretive display	Low	Fish and Wildlife and Borrow Pits	Mullins Pit Wildlife Management Area and borrow pit		Conservation Resources	$5,000
Protect mineral licks	Low	Fish and Wildlife	Mineral licks		Conservation Resources	Accomplish with section salaries
Bird Harassment Depredation program	High	Multiple	Multiple	USFWS and ADF&G	Conservation Resources	Accomplished through USDA Contract
Waterfowl habitat removal in airfield Bird Exclusion Zone	High	Airfield	Airfield	USFWS and USACE	Conservation Resources and construction projects	$50,000 Annually
Grass height manipulation	High	Multiple	Airfield and other turf		Operations and Maintenance	
Resolve nuisance beaver problems	High	Multiple	Multiple	ADF&G	Conservation Resources	Accomplish with section salaries
Conduct ecosystem monitoring to measure the quality of habitat	Medium	Multiple	Multiple	ADF&G	Conservation Resources	Accomplish with section salaries

Table 10.2. Forest Management Projects

Project	Priority	Land Use Type	Land Management Unit	Estimated Sales Receipts	Source of Funds	Estimated Cost
Christmas Tree Sales	Low	Open space	Forest Compartments and Stands	$125 annually	Conservation Resources	Accomplish with section salaries
Personal Use Firewood Sales	Medium	Open space	Forest Compartments and Stands	$2,000 annually	Conservation Resources	Accomplish with section salaries
Fire Protection	High	Multiple	Multiple		Operations and Maintenance	Depends on number and size of fires
Insect and Disease Protection	Medium	Multiple	Multiple		Operations and Maintenance	Depends on size of infestation
Forest Road Construction and Maintenance	Low	Multiple	Multiple		Reimbursable Forestry Budget	$3,000 every third year
Purchase Aerial Photography	Medium	Multiple	Multiple		Reimbursable Forestry Budget	$1,000 every three years
Manage Arctic Survival Field Training Area	Medium	Training Areas	Arctic Survival Field Training Area		Conservation Resources	Accomplish with section salaries

11.0 REFERENCES

11.1 Standard References *(Applicable to all USAF installations)*

- AFI 32-7064, *Integrated Natural Resources Management*
- Sikes Act
- eDASH Natural Resources Program Page
- Natural Resources Playbook –an Internal USAF reference available at https://cs1.eis.af.mil/sites/ceportal/CEPlaybooks/NRM2/Pages/

11.2 Installation References

- Battelle Pacific Northwest Laboratories (PNL). 1994. *Eielson Air Force Base, Operable Unit 1 Record of Decision, Decision Summary*. Battelle PNL, Richland, Washington.
- Brown, J. And R.A. Kreig. 1983. *Guidebook to Permafrost and Related Features along the Elliott and Dalton Highways, Fox to Prudhoe Bay, Alaska: 4th International Conference on Permafrost, 18-22 July 1983, University of Alaska Fairbanks*. Guidebook 4. Division of Geological and Geophysical Surveys, Alaska Department of Natural Resources, Fairbanks, Alaska.
- Connor, C. And D. O'Haire. 1988. *Roadside Geology of Alaska*. Mountain Press Publishing Co., Missoula, Montana.
- EA Engineering, Science, and Technology. 1994. *Biological Surveys Final Report*. Eielson AFB. US AF, Eielson AFB, Alaska.

- EA Engineering, Science, and Technology. 1995. *Sitewide Monitoring Program Report*. Eielson AFB. US AF, Eielson AFB Alaska.
- Eielson AFB. 2001. *Air Installation Compatible Use Zone (AICUZ) Study*. Eielson AFB, Alaska.
- ENSR Corporation. 1997. *Title V Air Operating Permit Application Eielson Air Force Base*. ENSR Corporation, Redmond, Washington.
- Fairbanks North Star Borough. 2002. *Community Research Quarterly, Vol. XXV, No. 3*. Community Research Center.
- Fairbanks North Star Borough. 2005. Ordinance No. 2005-56
- Fairbanks North Star Borough. 2009. *Community Research Quarterly, Vol. XXXII, No. 3*. Community Research Center.
- Foote, M.J. 1983. *Classification and Description, and Dynamics of Plant Communities After Fire in the Taiga of Interior Alaska*. Res. Pap. PNW-307. Portland, OR. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. 108p.
- Gunderson, R. 2010. Electronic communication between Ronald Gunderson, Chief/Natural/Cultural Resources Eielson AFB and Sarah Conn USFWS, concerning Endangered/Threatened species of interior Alaska. 17 March.
- Gunderson, R. 2010. Electronic communication between Ronald Gunderson, Chief/Natural/Cultural Resources Eielson AFB and Sadie Wright ADF&G, concerning Endangered/Threatened species of interior Alaska. 22 March.
- Hulten, E. 1968. *Flora of Alaska and Neighboring Territories*. Stanford University Press, Stanford, California.
- Parsons Engineering Science. 1994. *Air Emissions Survey Report*. Eielson AFB.
- US AF, Eielson AFB, Alaska.
- Hoefler Consulting. 2009. *Storm Water Pollution Prevention Plan*. Eielson AFB. US AF, Eielson AFB, Alaska.
- Parsons Engineering Science. 2002. *Storm Water Pollution Prevention Plan*. Eielson AFB. US AF, Eielson AFB, Alaska.
- Pewe, T.L. and R.D. Reger. 1983. *Richardson and Glenn Highways, Alaska: Guidebook to Permafrost and Quaternary Geology*. Guidebook 1. Division of Geological and Geophysical Surveys, Alaska Department of Natural Resources, Fairbanks, Alaska.
- USA.F. 1994. *Integrated Natural Resources Management*. USAF Instruction 32-7064. 8 March.
- USA.F. 2004. *Integrated Natural Resources Management*. USAF Instruction 32-7064. 17 September.
- USA.F. 1996. Prepared by Pacific Northwest National Laboratory. *Sitewide Record of Decision Eielson Air Force Base, Alaska FINAL*. USA.F, Eielson AFB, Alaska.
- US Army. 1994. *Proposed Resource Management Plan, Final Environmental Impact Statement, Fort Wainwright Yukon Maneuver Area*. US Army 6th Infantry Division and US Department of the Interior Bureau of Land Management Steese/White Mountains District Office, Fairbanks, Alaska.
- USDA Natural Resources Conservation Service. 1990. *Soil and Vegetation Inventory*. Eielson AFB, Alaska. USDA NRCS, Anchorage, Alaska.
- USDA Natural Resources Conservation Service. 1998. *Soil Survey of Eielson Air Force Base, Alaska (An Interim Report)*. Eielson AFB, Alaska. USDA NRCS, Anchorage, Alaska.
- Van Cleve, K. and V. Alexander. 1981. N*itrogen cycling in tundra and boreal ecosystems*. Ecological Bulletin 33:375-404.
- Van Cleve, K., L.A. Viereck, and G.M. Marion. 1993. *Introduction and overview of a study dealing with the role of salt-affected soils in primary succession on the Tanana River floodplain, interior Alaska*. Canadian Journal of Forest Resources 23:879-888.

- Viereck, L.A. 1973. *Wildfire in the taiga of Alaska*. Quaternary Research, 3:465-495 Viereck, L.A. and C.T. Dyrness. 1980. *A preliminary classification system for vegetation of Alaska*. USDA Forest Service General Technical Report INT-257, pp. 197-203.
- Viereck, L.A., C.T. Dyrness, A.R. Batten, and K.J. Wenslick. 1992. *The Alaska Vegetation Classification*. General Technical Report PNW-GTR-286. Portland, OR. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. 278pp.
- Viereck, L.A., C.T. Dyrness, and M.J. Foote. 1993. *An overview of the vegetation and soils of the floodplain ecosystems of the Tanana River, interior Alaska*. Canadian Journal of Forest Resources 23:889-898.
- Youngblood, A. 1993. *Community Type classification of Forest Vegetation in Young, Mixed Stands, Interior Alaska*. Res. Pap. PNW-RP-485. Portland, OR. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. 42 p.

12.0 ACRONYMS

12.1 Standard Acronyms (Applicable to all USAF installations)

- eDASH Acronym Library
- Natural Resources Playbook – Acronym Section
- USEPA Terms & Acronyms

12.2 Installation Acronyms

- **168 WG—**168th Wing
- **ADEC—** Alaska Department of Environmental Conservation
- **ADF&G—**Alaska Department of Fish and Game
- **AFB—**Air Force Base
- **AFI—**Air Force Instruction
- **AFTAC—**Air Force Technical Applications Center
- **APDES—**Alaska Pollution Discharge Elimination System
- **BASH—**Bird Aircraft Strike Hazard
- **BEZ—**Bird Exclusion Zone
- **CFL—**Commercial Forest Land
- **CH&PP—**Central Heat and Power Plant
- **CFCs—**chlorofluorocarbons
- **CRM—**Cultural Resources Manager
- **DET—**Detachment
- **DoD—**Department of Defense
- **EMP—**Environmental Management Plan
- **ERP—**Environmental Restoration Program
- **FAMCAMP** – Family Campground
- **FGS—**Final Governing Standards
- **GIS—**Geographic Information System
- **HAPS—**hazardous air pollutants
- **HCFCs—**hydro chlorofluorocarbons
- **IAW—**In accordance with
- **ICRMP—**Integrated Cultural Resources Management Plan
- **IDP—**Installation Development Plan
- **ISTs—**Installation Support Teams

- **INRMP—**Integrated Natural Resources Management Plan
- **MACT—**maximum achievable control technology
- **MILCON—**Military Construction
- **NEPA—**National Environmental Protection Act
- **NRM—**Natural Resources Manager
- **OG—**Operations Group
- **ODCs—**ozone depleting substances
- **PCB—**Polychlorinated biphenyl
- **SOP—**Standard Operating Procedure
- **SWPPP—**Storm Water Pollution Prevention Plan
- **T&E—**Threatened and Endangered Species
- **USEPA—**United States Environmental Protection Agency
- **USFWS—**United States Fish and Wildlife Service
- **VOCs—**volatile organic compounds
- **WEZ—**Waterfowl Exclusion Zone

13.0 DEFINITIONS

13.1 Standard Definitions *(Applicable to all USAF installations)*

- Natural Resources Playbook – Definitions Section

13.2 Installation Definitions

- Add unique state, local and installation-specific definitions

14.0 APPENDICES

Appendix A. Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP

Federal Public Laws and Executive Orders	
National Defense Authorization Act of 1989, Public Law (P.L.) 101-189; Volunteer Partnership Cost-Share Program	Amends two Acts and establishes volunteer and partnership programs for natural and cultural resources management on DoD lands.
Defense Appropriations Act of 1991, P.L. 101-511; Legacy Resource Management Program	Establishes the "Legacy Resource Management Program" for natural and cultural resources. Program emphasis is on inventory and stewardship responsibilities of biological, geophysical, cultural, and historic resources on DoD lands, including restoration of degraded or altered habitats.
EO 11514, Protection and Enhancement of Environmental Quality	Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. They shall monitor, evaluate, and control agency activities to protect and enhance the quality of the environment.
EO 11593, Protection and Enhancement of the Cultural Environment	All Federal agencies are required to locate, identify, and record all cultural resources. Cultural resources include sites of archaeological, historical, or architectural significance.
EO 11987, Exotic Organisms	Agencies shall restrict the introduction of exotic species into the natural ecosystems on lands and waters which they administer.
EO 11988, Floodplain Management	Provides direction regarding actions of Federal agencies in floodplains, and requires permits from state, territory and Federal review agencies for any construction within a 100-year floodplain and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for acquiring, managing and disposing of Federal lands and facilities.
EO 11989, Off-Road Vehicles on Public Lands	Installations permitting off-road vehicles to designate and mark specific areas/trails to minimize damage and conflicts, publish information including maps, and monitor the effects of their use. Installations may close areas if adverse effects on natural, cultural, or historic resources are observed.
EO 11990, Protection of Wetlands	Requires Federal agencies to avoid undertaking or providing assistance for new construction in wetlands unless there is no practicable alternative, and all practicable measures to minimize harm to wetlands have been implemented and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; and (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Federal Public Laws and Executive Orders	
EO 12088, Federal Compliance With Pollution Control Standards	This EO delegates responsibility to the head of each executive agency for ensuring all necessary actions are taken for the prevention, control, and abatement of environmental pollution. This order gives the USEPA authority to conduct reviews and inspections to monitor Federal facility compliance with pollution control standards.
EO 12898, Environmental Justice	This EO requires certain federal agencies, including the DoD, to the greatest extent practicable permitted by law, to make environmental justice part of their missions by identifying and addressing disproportionately high and adverse health or environmental effects on minority and low-income populations.
EO 13112, Exotic and Invasive Species	To prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	The USFWS has the responsibility to administer, oversee, and enforce the conservation provisions of the Migratory Bird Treaty Act, which includes responsibility for population management (e.g., monitoring), habitat protection (e.g., acquisition, enhancement, and modification), international coordination, and regulations development and enforcement.
United States Code	
Animal Damage Control Act (7 USC § 426-426b, 47 Stat. 1468)	Provides authority to the Secretary of Agriculture for investigation and control of mammalian predators, rodents, and birds. DoD installations may enter into cooperative agreements to conduct animal control projects.
Bald and Golden Eagle Protection Act of 1940, as amended; 16 USC 668-668c	This law provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act.
Clean Air Act, (42 USC § 7401– 7671q, 14 July 1955, as amended)	This Act, as amended, is known as the Clean Air Act of 1970. The amendments made in 1970 established the core of the clean air program. The primary objective is to establish Federal standards for air pollutants. It is designed to improve air quality in areas of the country which do not meet Federal standards and to prevent significant deterioration in areas where air quality exceeds those standards.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (Superfund) (26 USC § 4611–4682, P.L. 96-510, 94 Stat. 2797), as amended	Authorizes and administers a program to assess damage, respond to releases of hazardous substances, fund cleanup, establish clean-up standards, assign liability, and other efforts to address environmental contaminants. IRP guides cleanups at DoD installations.

United States Code	
Endangered Species Act (ESA) of 1973, as amended; P.L. 93-205, 16 USC § 1531 et seq.	Protects threatened, endangered, and candidate species of fish, wildlife, and plants and their designated critical habitats. Under this law, no Federal action is allowed to jeopardize the continued existence of an endangered or threatened species. The ESA requires consultation with the USFWS and the NOAA Fisheries (National Marine Fisheries Service) and the preparation of a biological evaluation or a biological assessment may be required when such species are present in an area affected by government activities.
Federal Aid in Wildlife Restoration Act of 1937 (16 USC § 669–669i; 50 Stat. 917) (Pittman-Robertson Act)	Provides Federal aid to states and territories for management and restoration of wildlife. Fund derives from sports tax on arms and ammunition. Projects include acquisition of wildlife habitat, wildlife research surveys, development of access facilities, and hunter education.
Federal Public Laws and Executive Orders	
Federal Environmental Pesticide Act of 1972	Requires installations to ensure pesticides are used only in accordance with their label registrations and restricted-use pesticides are applied only by certified applicators.
Federal Land Use Policy and Management Act, 43 USC § 1701–1782	Requires management of public lands to protect the quality of scientific, scenic, historical, ecological, environmental, and archaeological resources and values; as well as to preserve and protect certain lands in their natural condition for fish and wildlife habitat. This Act also requires consideration of commodity production such as timbering.
Federal Noxious Weed Act of 1974, 7 USC § 2801–2814	The Act provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the
Federal Water Pollution Control Act (Clean Water Act [CWA]), 33 USC §1251–1387	The CWA is a comprehensive statute aimed at restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. Primary authority for the implementation and enforcement rests with the USEPA.
Fish and Wildlife Conservation Act (16 USC § 2901–2911; 94 Stat. 1322, PL 96-366)	Installations encouraged to use their authority to conserve and promote conservation of nongame fish and wildlife in their habitats.
Fish and Wildlife Coordination Act (16 USC § 661 et seq.)	Directs installations to consult with the USFWS, or state or territorial agencies to ascertain means to protect fish and wildlife resources related to actions resulting in the control or structural modification of any natural stream or body of water. Includes provisions for mitigation and reporting.
Lacey Act of 1900 (16 USC § 701, 702, 32 Stat. 187, 32 Stat. 285)	Prohibits the importation of wild animals or birds or parts thereof, taken, possessed, or exported in violation of the laws of the country or territory of origin. Provides enforcement and penalties for violation of wildlife related Acts or regulations.
Leases: Non-excess Property of Military Departments, 10 USC § 2667, as amended	Authorizes DoD to lease to commercial enterprises Federal land not currently needed for public use. Covers agricultural outleasing program.

Federal Public Laws and Executive Orders	
Migratory Bird Treaty Act 16 USC § 703–712	The Act implements various treaties for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful without a valid permit.
National Environmental Policy Act of 1969 (NEPA), as amended; P.L. 91-190, 42 USC § 4321 et seq.	Requires Federal agencies to utilize a systematic approach when assessing environmental impacts of government activities. Establishes the use of environmental impact statements. NEPA proposes an interdisciplinary approach in a decision-making process designed to identify unacceptable or unnecessary impacts on the environment. The Council of Environmental Quality (CEQ) created Regulations for Implementing the National Environmental Policy Act (40 CFR Parts 1500–1508), which provide regulations applicable to and binding on all Federal agencies for implementing the procedural provisions of NEPA, as amended.
National Historic Preservation Act, 16 USC § 470 et seq.	Requires Federal agencies to take account of the effect of any federally assisted undertaking or licensing on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). Provides for the nomination, identification (through listing on the NRHP), and protection of historical and cultural properties of significance.
National Trails Systems Act (16 USC § 1241–1249)	Provides for the establishment of recreation and scenic trails.
National Wildlife Refuge Acts	Provides for establishment of National Wildlife Refuges through purchase, land transfer, donation, cooperative agreements, and other means.
National Wildlife Refuge System Administration Act of 1966 (16 USC § 668dd–668ee)	Provides guidelines and instructions for the administration of Wildlife Refuges and other conservation areas.
Native American Graves Protection and Repatriation Act of 1990 (25 USC § 3001–13; 104 Stat. 3042), as amended	Established requirements for the treatment of Native American human remains and sacred or cultural objects found on Federal lands. Includes requirements on inventory, and notification.
Rivers and Harbors Act of 1899 (33 USC § 401 et seq.)	Makes it unlawful for the USAF to conduct any work or activity in navigable waters of the United States without a Federal Permit. Installations should coordinate with the USACE to obtain permits for the discharge of refuse affecting navigable waters under APDES and should coordinate with the USFWS to review effects on fish and wildlife of work and activities to be undertaken as permitted by the USACE.
Sale of certain interests in land, 10 USC § 2665	Authorizes sale of forest products and reimbursement of the costs of management of forest resources.

Federal Public Laws and Executive Orders	
Soil and Water Conservation Act (16 USC § 2001, P.L. 95-193)	Installations shall coordinate with the Secretary of Agriculture to appraise, on a continual basis, soil/water-related resources. Installations will develop and update a program for furthering the conservation, protection, and enhancement of these resources consistent with other Federal and local programs.
Sikes Act (16 USC. § 670a - 6701, 74 Stat. 1052), as amended	Provides for the cooperation of DoD, the Departments of the Interior (USFWS), and the State Fish and Game Department in planning, developing, and maintaining fish and wildlife resources on a military installation. Requires development of an INRMP and public access to natural resources, and allows collection of nominal hunting and fishing fees. NOTE: AFI 32-7064 sec 3.9. Staffing. as defined in DoDI 4715.03, use professionally trained natural resources management personnel with a degree in the natural sciences to develop and implement the installation INRMP. (T-0). 3.9.1. Outsourcing Natural Resources Management. As stipulated in the Sikes Act, 16 USC § 670 et. seq., the Office of Management and Budget Circular No. A-76, Performance of Commercial Activities, 4 August 1983 (Revised 29 May 2003) does not apply to the development, implementation and enforcement of INRMPs. Activities that require the exercise of discretion in making decisions regarding the management and disposition of government owned natural resources are inherently governmental. When it is not practicable to utilize DoD personnel to perform inherently governmental natural resources management duties, obtain these services from federal agencies having responsibilities for the conservation and management of natural resources.
DoD Policy, Directives, and Instructions	
DoD Instruction 4150.07 DoD Pest Management Program dated 29 May 2008	Implements policy, assigns responsibilities, and prescribes procedures for the DoD Integrated Pest Management Program.
DoD Instruction 4715.1, Environmental Security	Establishes policy for protecting, preserving, and (when required) restoring and enhancing the quality of the environment. This instruction also ensures environmental factors are integrated into DoD decision-making processes that could impact the environment, and are given appropriate consideration along with
DoD Instruction (DODI) 4715.03, Natural Resources Conservation Program	Implements policy, assigns responsibility, and prescribes procedures under DoDI 4715.1 for the integrated management of natural and cultural resources on property under DoD control.

DoD Policy, Directives, and Instructions	
OSD Policy Memorandum – 17 May 2005 – Implementation of Sikes Act Improvement Amendments: Supplemental Guidance Concerning Leased Lands	Provides supplemental guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD. The guidance covers lands occupied by tenants or lessees or being used by others pursuant to a permit, license, right of way, or any other form of permission. INRMPs must address the resource management on all lands for which the subject installation has real property accountability, including leased lands. Installation commanders may require tenants to accept responsibility for performing appropriate natural resource management actions as a condition of their occupancy or use, but this does not preclude the requirement to address the natural resource management needs of these lands in the installation
OSD Policy Memorandum – 1 November 2004 – Implementation of Sikes Act Improvement Act Amendments: Supplemental Guidance Concerning INRMP Reviews	Emphasizes implementing and improving the overall INRMP coordination process. Provides policy on scope of INRMP review, and public comment on INRMP review.
OSD Policy Memorandum – 10 October 2002 – Implementation of Sikes Act Improvement Act: Updated Guidance	Provides guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD and replaces the 21 September 1998 guidance Implementation of the Sikes Act Improvement Amendments. Emphasizes implementing and improving the overall INRMP coordination process and focuses on coordinating with stakeholders, reporting requirements and
Federal Public Laws and Executive Orders	
	INRMP projects, using the INRMP as a substitute for critical habitat designation, supporting military training and testing needs, and facilitating the INRMP review process.
USAF Instructions and Directives	
32 CFR Part 989, as amended, and AFI 32-7061, Environmental Impact Analysis Process	Provides guidance and responsibilities in the EIAP for implementing INRMPs. Implementation of an INRMP constitutes a major federal action and therefore is subject to evaluation through an Environmental Assessment or an Environmental Impact Statement.
AFI 32-7062, Air Force Comprehensive Planning	Provides guidance and responsibilities related to the USAF comprehensive planning process on all USAF-controlled
AFI 32-7064, Integrated Natural Resources Management	Implements AFPD 32-70, Environmental Quality; DODI 4715.03, Natural Resources Conservation Program; and DODI 7310.5, Accounting for Sale of Forest Products. It explains how to manage natural resources on USAF property in compliance with Federal, state, territorial, and local standards.
AFI 32-7065, Cultural Resources Management	This instruction implements AFPD 32-70 and DoDI 4710.1, Archaeological and Historic Resources Management. It explains how to manage cultural resources on USAF property in compliance with Federal, state, territorial, and local standards.

USAF Instructions and Directives	
AFPD 32-70, Environmental Quality	Outlines the USAF mission to achieve and maintain environmental quality on all USAF lands by cleaning up environmental damage resulting from past activities, meeting all environmental standards applicable to present operations, planning its future activities to minimize environmental impacts, managing responsibly the irreplaceable natural and cultural resources it holds in public trust and eliminating pollution from its activities wherever possible. AFPD 32-70 also establishes policies to carry out these objectives.
Policy Memo for Implementation of Sikes Act Improvement Amendments, HQ USAF Environmental Office (USAF/ILEV) on 29 January 1999	Outlines the USAF interpretation and explanation of the Sikes Act and Improvement Act of 1997.

Appendix B. Acreage of Lands Managed by the Base Civil Engineer at Eielson AFB

Appendix C. Plant Species List

Appendix D. Fish and Wildlife Species List

Appendix E. Trapping and Bow and Arrow Moose Hunting Harvest Reports

Appendix F. Natural Resources Operating Plan for the Arctic Survival Field Training Area

Appendix G. Off-Road Vehicle Use Plan

Appendix H. Maps

Appendix I. Eielson Air Force Base, Alaska List of Site Installations

Appendix J. Environmental Assessment

Appendix K. Taxonomic Classes and General Characteristics of Soils Found at Eielson AFB

15.0 ASSOCIATED PLANS

Tab 1 – Wildland Fire Management Plan

Tab 2 – Bird/Wildlife Aircraft Strike Hazard (BASH) Plan

Tab 3 – Integrated Cultural Resources Management Plan (ICRMP)

Tab 4 – Integrated Pest Management Plan (IPMP)

APPENDIX B

Acreage of Lands Managed by the Base Civil Engineer at Eielson AFB

Table B-1. Acreages of Lands Managed by the Base Civil Engineer on Eielson AFB.

Land	Total	Improved	Semi-Improved	Unimproved	Under Facilities
Eielson AFB	19,789	598	1,364	16,676	1,152
C Battery	18		2.6	7.7	7.7
Chena River Research Site					
Chena River Annex	690		6	677	7
Access Road (Transmitter Road)	106		27	52	27
AFTAC Remote Operating Facility	2,995		38	2,954	3
Blair Lake Air Force Range	33,964		1,248	32,655	61
Birch Lake Recreation Area	51		11.3	35.5	4.2
TOTAL	**57,507**	**598**	**2,696.9**	**53,057.2**	**1,261.9**

Acres (Estimated)

NOTE: Blair Lake Air Force Range and AFTAC, Remote Operating Facility are restricted areas closed to the public.

APPENDIX C

Plant Species List

Table C-1. Plant Species Found on Unimproved Grounds on Eielson Managed Lands.

Common Name	Scientific Name	Status
Trees		
balsam poplar	*Populus balsamifera*	w
black spruce	*Picea mariana*	n
paper birch	*Betula papyrifera*	n
quaking aspen	*Populus tremuloides*	w
tamarack	*Larix Laricina*	n
white spruce	*Picea glauca*	n
American red currant	*Ribes triste*	n
ican red raspberry	*Rubus idaeus*	w
bearberry	*Arctostaphylos uva-ursi*	n
beauverd spirea	*Spiraea beauverdiana*	n
Bedd willow	*Salix bebbiana*	n
black crowberry	*Empetrum nigrum*	n
bog blueberry	*Vaccinium uliginosum*	n
bog rosemary	*Andromeda polifolia*	n
cloudberry	*Rubus chamaemorus*	n
diamondleaf willow	*Salix planifolia*	n
dwarf arctic birch	*Betula nana*	n
feltleaf willow	*Salix alaxensis*	n
grayleaf willow	*Salix glauca*	n
green alder	*Alrus crispa*	n
highbush cranberry	*Viburnum edule*	n
Labrador tea	*Ledum groenlandicum*	n
leatherleaf	*Chamaedaphne calyculata*	n
littletree willow	*Salix arbusculoides*	n
low blueberry willow	*Salix myrtillitolia*	n
lowbush cranberry	*Vaccinium vitis-idaea*	n
narrowleaf Labrador tea	*Ledum palustre subsp.decumbens*	n
prickly rose	*Rosa Acicularis*	n
resin birch	*Betula glandulosa*	n
russet buffalo berry	*Shepherdia canadensis*	n
shrubby cinquefoil	*Potentilla fruticosa*	n
sweet gale	*Myrica gale*	n
thinleaf alder	*Alnus tenuifolia*	w
willow	*Salix spp.*	w

Status: n = native species, w = native species that tends to invade or otherwise increase in abundance
on disturbed sites, i = introduced species.

Table C-1. Plant Species Found on Unimproved Grounds on Eielson Managed Lands.

Common Name	Scientific Name	Status
Forbs and Horsetails		
Alaska wild rhubarb	*Polygonum alaskanum*	n
alpine arnica	*Arnica alpina*	n
alpine bistort	*Polygonum viviparum*	n
alpine milkvetch	*Astragalus alpinus*	w
alpine sweet-vetch	*Hedysarum alpinum*	w
American twin-flower	*Linnaea borealis*	n
arctic startflower	*Trientalis europaea*	n
bunchberry dogwood	*Cornus canadensis*	n
clubmoss	*Lycopodium spp.*	n
common cattail	*Typha latifolia*	n
common dandelion	*Taraxacum officinale*	i
common fireweed	*Epilobium angustifolium*	n
common plantain	*Plantago major*	i
dwarf scouring-rush	*Equisetum scirpoides*	n
elegant groundsel	*Senecio indecorus*	w
fireweed	*Epilobium angustifolium*	n
garden dock	*Rumex longifolius*	i
geocaulon	*Geocaulon lividum*	n
horsetail	*Equisetum arvense, E. scirpoides*	w
Mackenzie water hemlock	*Cicuta mackenzieana*	n
marsh cinquefoil	*Potentilla palustris*	n
marsh marigold	*Caltha spp.*	n
monkshood	*Aconitum delphinifolium*	n
nagoonberry	*Rubus arcticus*	n
narrow-leaved saussurea	*Saussurea angustifolia*	n
northern bedstraw	*Galium boreale*	w
northern comandra	*Comandra umbellata*	n
northern grass-of-parnassus	*Parnassia palustris*	n
northern startflower	*Trientalis borealise*	n
pineapple weed	*Matricaria maricarioides*	w
pondweed	*Potamogeton spp.*	n
swamp cranberry	*Oxycoccus microcarpus*	n
sweet coltsfoot	*Petasites hyperboreus*	n
tall bluebell	*Mertensia paniculata*	n
varied-leaved cinquefoil	*Potentilla diversifolia*	n
Watson's epilobium	*Epilobium watsonii*	n
white sweet clover	*Melilotus alba*	i
wild iris	*Iris setosa subsp. setosa*	n
wintergreen	*Pyrola spp.*	n
woodland horsetail	*Equisetum sylvaticum*	w
yarrow	*Achillea millefolium*	i
yellowcress	*Rorippa hispida*	w

Status: n = native species, w = native species that tends to invade or otherwise increase in abundance
on disturbed sites, i = introduced species.

Table C-1. Plant Species Found on Unimproved Grounds on Eielson Managed Lands.

Grasses, Sedges, and Rushes		
beaked sedge	*Carex rhynchophysa*	n
bluegrass	*Poa spp.*	w
bluejoint reedgrass	*Calamagrostis canadensis*	w
cotton grass	*Eriophorum vaginatum*	n
foxtail barley	*Hordeum jubatum*	w
great bulrush	*Scirpus validus*	w
Oeder sedge	*Carex oederi*	n
sedge	*Carex spp.*	n
spikerush	*Eleocharis uniglumis*	n
ticklegrass	*Agrostis scabra*	w
water sedge	*Carex aquatilis*	n

Sources: USDA NRCS 1990, Eielson Natural/Cultural Resources Office

Status: n = native species, w = native species that tends to invade or otherwise increase in abundance
on disturbed sites, i = introduced species.

Table C-2. Plant Species Found on Improved and Semi-improved Grounds at Eielson AFB.

Common Name	Scientific Name	Found on Improved (I) or Semi-improved (S) Grounds	Status	Abundance on Semi-improved Grounds
Trees				
Amur choke cherry	*Prunus maackii*	I	i	
balsam poplar	*Polpulus balsamifera*	I, S	w	2
black spruce	*Picea mariana*	I, S	n	1
Canada Red choke cherry	*Prunus virginiana 'Canada Red'*	I	i	
choke cherry	*Prunus virginiana*	I	i	
Dolgo crabapple	*Molus sp. 'Dolgo'*	I	i	
European bird cherry (Mayday tree)	*Prunus padus*	I	i	
lodgepole pine	*Pinus contorta var. latifolia*	I	i	
paper birch	*Betula papyrifera*	I, S	n	2
quaking aspen	*Populus tremuloides*	I, S	w	2
scotch pine	*Pinus sylvestris*	I	i	
Shubert choke cherry	*Prunus Virginiana 'Shubert'*	I	i	
Siberian larch	*Larix sibirica*	I	i	
Siberian crabapple	*Malus baccata*	I	i	
tamarack	*Larix laricina*	I, S	n	1
white spruce	*Picea glauca*	I, S	n	1
Shrubs				
American red raspberry	*Rubus idaeus*	S	w	2
bearberry	*Arctospahylos uva-ursi*	S	n	2
Bebb willow	*Salix bebbiana*	S	n	2
Black currant	*Ribes nigrum*	I	i	
bog blueberry	*Vaccinium uliginosum*	I, S	n	2
creeping juniper	*Juniperus horizontalis*	I	i	
false spirea	*Sorbaria sorbifolia*	I	i	
feltleaf willow	*Salix alaxensis*	S	n	2
Labrador-tea ledum	*Ledum groenlandicum*	S	n	2
late lilac	*Syringa villosa*	I	i	
littletree willow	*Salix arbusculoides*	S	n	1
low blueberry willow	*Salix myrtillifolia*	S	n	1
mugo pine	*Pinus mugo*	I	i	
Peking cotoneaster	*Cotoneaster acutifolia*	I	i	
prickly rose	*Rosa acicularis*	S	n	2

Status: n = native species, w = native species that tends to invade or otherwise increase in abundance on disturbed sites, i = introduced species

Abundance: 3 = species that is common in most areas of semi-improved ground; 2 = species that is uncommon in most areas or common locally; and 1 = species that is found only occasionally.

Table B-2. Plant Species Found on Improved and Semi-improved Grounds at Eielson AFB.

Common Name	Scientific Name	Found on Improved (I) or Semi-improved (S) Grounds	Status	Abundance on Semi-improved Grounds
Shrubs				
red currant	*Ribes triste*	I	i	
red osier dogwood	*Cornus (suida) stolonifera*	I	i	
rugosa rose	*Rosa rugosa*	I	i	
russet buffalo berry	*Shepherdia canadensis*	S	n	1
shrubby cinquefoil	*Potentilla fruticosa*	I, S	n, i	1
Siberian peashrub	*Caragana arborescens*	I	i	
sweet gale	*Myrica gale*	S	n	1
Tatarian honeysuckle	*Lonicera tatarica*	I	i	
thinleaf alder	*Alnus tenuifolia*	I, S	w	2
willow	*Salix spp.*	I, S	w	2
alpine arnica	*Artnica alpina*	S	n	1
alpine bistort	*Polygonum viviparum*	S	n	1
alpine milkvetch	*Astragalus alpinus*	I, S	w	2
alpine sweet-wetch	*Hedysarum alpinum*	S	w	3
alsike clover	*Trifolium hybridum*	I, S	i	3
arctic dock	*Rumex arcticus*	S	n	1
arctic eyebright	*Euphrasia mollis*	I, S	w	2
bitter fleabane	*Erigeron acris*	I, S	w	2
blunt-leaved sandwort	*Moehringia lateriflora*	I, S	w	1
bristly buttercup	*Ranunculus pennsylvanicus*	I, S	w	2
bunchberry dogwood	*Cornus canadensis*	S	n	2
Canada goldenrod	*Solidago canadensis*	S	w	3
common dandelion	*Taraxacum officinale*	I, S	i	3
common pepperweed	*Lepidium denisflorum*	I, S	w	1
common plantain	*Plantago major*	I, S	i	2
common yarrow	*Achillea millefolium*	I, S	w	3
continental ladies-tresses	*Spiranthes romanzoffiana*	S	n	1
deflexed oxytrope	*Oxytropis deflexa*	S	n	1
dwarf firewood	*Epilobium latifolium*	S	w	1
dwarf scouring-rush	*Equisetum scirpoides*	S	n	1
elegant groundsel	*Senecio indecorus*	S	w	2
elegant milkvetch	*Astragalus eucosmus*	S	n	1

Status: n = native species, w = native species that tends to invade or otherwise increase in abundance on disturbed sites, i = introduced species

Abundance: 3 = species that is common in most areas of semi-improved ground; 2 = species that is uncommon in most areas or common locally; and 1 = species that is found only occasionally.

Table C-2. Plant Species Found on Improved and Semi-improved Grounds at Eielson AFB.

Common Name	Scientific Name	Found on Improved (I) or Semi-improved (S) Grounds	Status	Abundance on Semi-improved Grounds
Forbs and Horsetails				
field oxytrope	*Oxytropis campestris*	S	w	2
hawkweed	*Hieracium scabriusculum*	S	n	2
knotweed	*Polygonum aviculare*	I, S	w	2
lamb's quarters	*Chenopodium album*	I, S	i	2
large leaf avens	*Geum macrophyllum*	I, S	w	1
lugen groundsel	*Senecio lugens*	S	n	1
marsh arrowgrass	*Triglochin palustre*	S	n	1
marsh cinquefoil	*Potentilla palustris*	S	n	1
marsh fleabane	*Senecio congestus*	S	n	1
meadow horsetail	*Equisetum pratense*	I, S	w	2
nagoonberry	*Rubus arcticus*	I, S	n	2
narrow-leaved saussurea	*Saussurea angustifolia*	S	n	1
northern bedstraw	*Galium boreale*	I, S	w	2
northern bog-orchid	*Platanthera hyperborea*	S	n	1
northern grass-of-parnassus	*Parnassia palustris*	S	n	2
northern tansymustard	*Descurainia sophioides*	I, S	w	1
northern willow-herb	*Epilobium adenocaulon*	I, S	w	3
Norwegian cinquefoil	*Potentilla norvegica*	I, S	w	3
ox-eye daisy	*Chrysanthemum leucanthemum*	I, S	i	1
pale indian paintbrush	*Castilleja caudata*	S	n	1
pineapple weed	*Matricaria maticarioides*	I, S	w	2
pussytoes	*Antennaria umbrinella*	I, S	w	1
rape mustard	*Brassica rapa*	I, S	i	1
rattlebox	*Rhinanthus crista-galli*	I, S	w	2
shepherd's purse	*Capsella bursa-pastoris*	I, S	i	1
showy pussytoes	*Antennaria pulcherrima*	S	n	1
Siberian aster	*Aster sibiricus*	I, S	n	2
Siberian yarrow	*Achillea sibirica*	S	n	3
small aster	*Aster commutatus*	S	n	2
spearleaf fleabane	*Erigeron lonchophyllus*	I, S	w	2
strawberry spinach	*Chenopodium capitatum*	I, S	w	1
variegated scouring-rush	*Equisetum variegatum*	S	n	1
white sweet clover	*Melilotus alba*	S	i	1
wild iris	*Iris setosa*	I, S	n	1

Status: n = native species, w = native species that tends to invade or otherwise increase in abundance on disturbed sites, i = introduced species

Abundance: 3 = species that is common in most areas of semi-improved ground; 2 = species that is uncommon in most areas or common locally; and 1 = species that is found only occasionally.

Table C-2. Plant Species Found on Improved and Semi-improved Grounds at Eielson AFB.

Common Name	Scientific Name	Found on Improved (I) or Semi-improved (S) Grounds	Status	Abundance on Semi-improved Grounds
Forbs and Horsetails				
wild strawberry	*Fragaria virginiana*	I, S	n	2
willow weed	*Polygonum lapathifolium*	S	i?	1
yellowcress	*Rorippa hispida*	I, S	w	2
alpine rush	*Juncus alpinus*	S	w	1
American mannagrass	*Glyceria maxima*	S	n	1
American sloughgrass	*Beckmannia erucaeformis*	S	i	1
bluejoint reedgrass	*Calamagrostis canadensis*	S	w	3
brownish sedge	*Carex brunnescens*	S	n	1
chestnut rush	*Juncus castaneus*	S	n	1
Crawford sedge	*Carex crawfordii*	S	w?	2
crested wheatgrass	*Agropyron cristatum*	S	i	1
foxtail barley	*Hordeum jubatum*	I, S	w	3
Kentucky bluegrass	*Poa pratensis*	I, S	i	3
northern reedgrass	*Calamagrostis inexpansa*	S	n	1
polargrass	*Arctagrostis latifolia*	S	n	1
quackgrass	*Agropyron repens*	S	i	1
red fescue	*Festuca rubra*	I, S	i?	2
sedge	*Carex spp.*	S	n	2
slender wheatgrass	*Agropyron caninum*	S	n	1
smooth brome	*Bromus inermis*	I, S	i	3
tickle grass	*Agrostis scabra*	I, S	w	3
toad rush	*Juncus bufonius*	I, S	w	2
tufted hairgrass	*Deschampsia cespitosa*	S	n	1
vanilla grass	*Heirochloe odorata*	S	n	1
weeping alkaligrass	*Puccinellia distans*	I, S	w	1
western wheatgrass	*Agropyron smithii*	S	i?	1

Status: n = native species, w = native species that tends to invade or otherwise increase in abundance on disturbed sites, i = introduced species

Abundance: 3 = species that is common in most areas of semi-improved ground; 2 = species that is uncommon in most areas or common locally; and 1 = species that is found only occasionally.

Source: USDA NRCS 1990, Eielson Natural/Cultural Resources Office

APPENDIX D

Fish and Wildlife Species List

Table D-1. Fish and Wildlife Species Occurring on Lands Managed by Eielson AFB.

Common Name	Scientific Name
Amphibians	
Family Ranidae - true frogs	
woodfrog	*Rana sylvatica*
Birds	
Family Gaviidae (loons)	
common loon	*Gavia immer*
Pacific loon	*Gavia pacifica*
red-throated loon	*Gavia stellata*
red-necked grebe	*Podiceps grisegena*
Barrow's goldeneye	*Bucephala islandica*
blue-winged teal	*Anas discors*
bufflehead	*Bucephala albeola*
Canada goose	*Branta canadensis*
canvasback	*Aythya valisineria*
common goldeneye	*Bucephala clangula*
gadwall	*Anas strepera*
greater white-fronted goose	*Anser abifrons*
greater scaup	*Aythya marila*
green-winged teal	*Anas crecca*
harlequin duck	*Histrionicus histrionicus*
lesser scaup	*Aythya affinis*
mallard	*Anas platyrhynchos*
northern pintail	*Anas acuta*
northern shoveler	*Anas clypeata*
long-tailed duck	*Clangula hyemalis*
red-breasted merganser	*Mergus serrator*
redhead	*Aythya americana*
ring-necked duck	*Aythya collaris*
surf scoter	*Melanitta perspicillata*
trumpeter swan	*Cygnus buccinator*
tundra swan	*Cygnus columbianus*
white-winged scoter	*Melanitta fusca*
golden eagle	*Aquila chrysaetos*
Harlan's hawk	*Buteo harlani*

Table D-1. Fish and Wildlife Species Occurring on Lands Managed by Eielson AFB.

Common Name	Scientific Name
Family Accipitridae (kites, hawks, eagles)	
northern harrier	*Circus cyaneus*
northern goshawk *	*Accipiter gentilis*
osprey	*Pandion haliaetus*
red-tailed hawk	*Buteo jamaicensis*
rough-legged hawk	*Buteo lagopus*
sharp-shinned hawk	*Accipiter striatus*
Swainson's hawk	*Buteo swainsoni*
gyrfalcon	*Falco rusticolus*
merlin	*Falco columbarius*
lesser golden-plover	*Pluvialis dominica*
semipalmated plover	*Charadrius semipalmatus*
dunlin	*Calidris alpina*
greater yellowlegs	*Tringa melanoleuca*
least sandpiper	*Calidris minutilla*
lesser yellowlegs	*Tringa flavipes*
long-billed dowitcher	*Limnodromus scolopaceus*
pectoral sandpiper	*Calidris melanotos*
red-necked phalarope	*Phalaropus lobatus*
sanderling	*Calidris alba*
semipalmated sandpiper	*Calidris pusilla*
solitary sandpiper	*Tringa solitaria*
spotted sandpiper	*Actitis macularia*
surfbird	*Aphriza virgata*
upland sandpiper	*Bartramia longicauda*
wandering tattler	*Heteroscelus incanus*
western sandpiper	*Calidris mauri*
whimbrel	*Numenius phaeopus*
ruffed grouse	*Bonasa umbellus*
sharp-tailed grouse	*Tympanuchus phasianellus*
spruce grouse	*Dendragapus candensis*
willow ptarmigan	*Lagopus lagopus*

* Boreal Partners in Flight Landbird Conservation Plan: Central Alaska Priority Species

Table D-1. Fish and Wildlife Species Occurring on Lands Managed by Eielson AFB.

Common Name	Scientific Name
Family Laridae (jaegers, gulls, terns)	
Arctic tern *	*Sterna paradisaea*
Bonaparte's gull	*Larus philadelphia*
herring gull	*Larus argentatus*
long-tailed jaeger	*Stercorarius longicaudus*
mew gull	*Larus canus*
great horned owl	*Bubo virginianus*
great gray owl *	*Strix nebulosa*
northern hawk-owl *	*Surnia ulula*
short-eared owl *	*Asio flammeus*
snowy owl	*Nyctea scandiaca*
downy woodpecker	*Picoides pubescens*
hairy woodpecker	*Picoides villosus*
northern flicker	*Colaptes auratus*
three-toed woodpecker	*Picoides tridactylus*
Hammond's flycatcher *	*Empidonax hammondii*
olive-sided flycatcher *	*Contopus borealis*
Say's phoebe	*Sayornis saya*
western wood-pewee	*Contopus sordidulus*
cliff swallow	*Hirundo pyrrhonota*
tree swallow	*Tachycineta bicolor*
violet-green swallow	*Tachycineta thalassina*

* Boreal Partners in Flight Landbird Conservation Plan: Central Alaska Priority Species

Table D-1. Fish and Wildlife Species Occurring on Lands Managed by Eielson AFB.

Common Name	Scientific Name
Family Corvidae (jays and crows)	
black-billed magpie	*Pica pica*
common raven	*Corvus corax*
gray jay	*Perisoreus canadensis*
boreal chickadee	*Parus hudsonicus*
gray-cheeked thrush *	*Catharus minimus*
hermit thrush	*Catharus guttatus*
northern wheatear	*Oenanthe oenanthe*
ruby-crowned kinglet	*Regulus calendula*
Swainson's thrush	*Catharus ustulatus*
varied thrush	*Ixoreus naevius*
blackpoll warbler *	*Dendroica striata*
dark-eyed junco	*Junco hyemalis*
fox sparrow	*Passerella iliaca*
golden-crowned sparrow *	*Zonotrichia atricapilla*
Lapland longspur	*Calcarius lapponicus*
Lincoln's sparrow	*Melospiza lincolnii*
northern waterthrush	*Seiurus noveboracensis*
orange-crowned warbler	*Vermivora celata*
rusty blackbird *	*Euphagus carolinus*
Savannah sparrow	*Passerculus sandwichensis*
snow bunting	*Plectrophenax nivalis*
white-crowned sparrow	*Zonotrichia leucophrys*
Wilson's warbler	*Wilsonia pusilla*

* Boreal Partners in Flight Landbird Conservation Plan: Central Alaska Priority Species

Table D-1. Fish and Wildlife Species Occurring on Lands Managed by Eielson AFB.

Common Name	Scientific Name
Family Emberizidae (warblers and sparrows)	
yellow warbler	*Dendroica petechia*
yellow-rumped warbler	*Dendroica coronata*
pine grosbeak	*Pinicola enucleator*
pine siskin	*Carduelis pinus*
rosy finch	*Leucosticte arctoa*
white-winged crossbill	*Loxia leucoptera*
Mammals	
Family Soricidae (shrews)	
arctic shrew	*Sorex articus*
dusky shrew	*Sorex obscurus*
masked shrew	*Sorex cinereus*
pygmy shrew	*Microsorex hoyi*
brown/grizzly bear	*Ursus arctos*
hoary marmot	*Marmota caligata*
northern flying squirrel	*Glaucomys sabrinus*
red squirrel	*Tamiasciurus hudsonicus*
woodchuck	*Marmota monax*
meadow vole	*Microtus pennsylvanicus*
muskrat	*Ondatra zibethicus*
northern bog lemming	*Synaptomys borealis*
tundra red-backed vole	*Clethrionomys rutilus*
tundra vole	*Microtus oeccnomus*

Table D-1. Fish and Wildlife Species Occurring on Lands Managed by Eielson AFB.

Common Name	Scientific Name
coyote	*Canis latrans*
wolf	*Canis lupus*
red fox	*Vulpes vulpes*
longtail weasel	*Mustella frenata*
marten	*Martes americana*
mink	*Mustella vison*
river otter	*Lutra canadensis*
shorttail weasel	*Mustela erminea*
wolverine	*Gulo luscus*
Fish	
Family Petromyzontidae (lampreys)	
arctic lamprey	*Lampetra japonica*
arctic grayling	*Thymallus arcticus*
chum salmon	*Oncorhynchus keta*
coho salmon	*Oncorhynchus kisutch*
humpbacked whitefish	*Coregonus oidschian*
king salmon	*Oncorhynchus tshawytscha*
least cisco	*Coregonus sardinella*
rainbow trout	*Oncorhynchus mykiss*
round whitefish	*Prosopium cyindraceum*
sheefish	*Stenodus leucichthys*

APPENDIX E

Trapping and Bow and Arrow Moose Hunting Harvest Reports

Table E-1. Trapping Harvest Report (2001-2011) for Eielson AFB and Chena River Annex. (Information taken from annual Eielson AFB trapping harvest reports)

TOTAL FURBEARER HARVEST										
Species	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11
Coyote	2	2	2	1	0	2	1	0	3	2
Lynx	23	9	0	1	0	3	3	13	13	22
RedFox	24	15	13	13	17	4	3	6	8	5
Red	19	13	9	7	12	3	2	3	2	3
Cross	5	2	4	5	6	1	1	2	4	1
Silver	0	0	0	1	1	0	0	3	2	1
Marten	0	0	3	6	6	1	2	5	1	0
Muskrat	2	10	14	10	3	1	0	1	2	2
Mink	2	6	4	6	20	6	1	8	2	10
Beaver	26	22	10	11	12	11	5	8	5	9
Otter	0	0	0	0	1	0	0	0	0	0
Weasel	2	4	5	3	6	0	0	4	0	4
Wolf	0	0	0	0	0	0	0	1	1	0
Wolverine	0	0	0	0	0	0	0	0	0	0

Table E-2. Eielson AFB Bow and Arrow Moose Hunting Harvest Report (1988-2010).
(Information taken from annual Eielson AFB bow and arrow moose harvest reports)

Year	Number of Archers Qualifying for Hunt	Number of Archers That Hunted	Moose Harvested	Paddle Bulls Observed During Season	Spike/Fork Bulls Observed During Season	Cows/Calves Observed During Season
1988	6	4	0	17	15	178
1989	24	18	1	8	17	200
1990	39	32	3	26	7	249
1991	68	43	1	7	14	686
1992	33	26	0	2	7	211
1993	55	32	2	10	12	294
1994	43	32	1	0	11	409
1995	54	40	3	14	44	339
1996	44	29	1	11	38	438
1997	56	27	2	6	19	183
1998	36	26	3	9	24	165
1999	36	28	5	7	25	131
2000	64	35	3	3	36	449
2001	68	41	6	9	27	207
2002	46	33	4	9	23	359
2003	54	36	2	20	16	231
2004	38	26	3	32	48	215
2005	70	38	3	7	18	172
2006	56	30	2	32	13	165
2007	68	30	2	5	8	192
2008	54	25	2	7	13	278
2009	37	21	6	10	14	174
2010	49	31	2	4	14	225

APPENDIX F

Natural Resources Operating Plan
for
The Arctic Survival Field Training Area

NATURAL RESOURCES OPERATING PLAN

FOR

THE ARCTIC SURVIVAL FIELD TRAINING AREA

PURPOSE/TERM:

This plan establishes guidelines for length of campsite use, use of wood resources, development of new trails, and use of wetlands in the Arctic Survival Field Training Area, on Eielson AFB. Arctic Survival began using the present field training area in 1979. The goal of this plan is to extend the life of the training area indefinitely. The use of wetlands will comply with the National Wetlands Policy. This operating plan will take effect on 1 October 1994 and shall remain valid indefinitely. The plan should be rewritten if significant shortfalls are noted.

LENGTH OF CAMP SITE USE:

Camp sites will be moved when it becomes apparent that the harvesting of existing ground wood, the cutting of trees (standing dead or girdled live), or the destruction of ground vegetation/die off of trees in camp sites from excessive use (e.g., soil compaction, erosion, etc.) will deteriorate the environmental qualities of the present location.

USE OF WOOD RESOURCES:

1. A forest inventory conducted in 1980 of the land that encompasses the Arctic Survival Field Training Area found 48.5 percent of the merchantable timber was Paper Birch, 40.1 percent was White Spruce, and 11.4 percent was Quaking Aspen and Balsam Poplar. A large percentage of the Paper Birch, Quaking Aspen, and Balsam Poplar are overmature and should be considered for harvest. The white spruce is not mature and will be partially saved as a seed source for regeneration. Emphasis will be placed on the harvest of Paper Birch, Quaking Aspen, and Balsam Poplar. At a minimum these species should comprise one-half of the firewood harvested in any year. **The Arctic Survival Training School can use any and all dead and downed trees in the training area. The percentages established below are for the harvest of live standing trees and do not pertain to the use of dead and downed trees.** The Arctic Survival Training School will try to use all ground wood and dead standing wood resources prior to rotting. All stumps of cut trees shall be 6 inches or less in height.

2. Live standing trees can be selectively thinned, removing no more than 50 percent of the trees. Selective thinning will approximate the following ratio: 15 percent Quaking Aspen/Balsam Poplar, 55 percent Paper Birch, and 30 percent White Spruce. When selectively thinning, remove the overmature and deformed trees first.

3. Small 1-acre or less irregular clear cuts in the Paper Birch, Quaking Aspen, and Balsam Poplar are permissable. Such cuts can regenerate from suckering and stump sprouting providing grouse, hare, and moose habitat. Clear cutting should be accomplished during the winter months

as winter cutting produces the better suckering and stump sprouting. The Arctic Survival School will provide information on these irregular cuts upon request from Natural/Cultural Resources.

4. Girdling of standing live White Spruce for use with student training is permissable. Paper Birch, Quaking Aspen, and Balsam Poplar identified for harvest will not be girdled. These species will be cut down in preparation for processing into student firewood.

5. Arctic Survival, may at any time, consult Natural/Cultural Resources for firewood cutting guidance.

DEVELOPMENT OF NEW TRAILS:

No new vehicle trails shall be cut or constructed without prior approval from Natural/Cultural Resources and Environmental Planning.

USE OF WETLANDS:

The wetlands in the Arctic Survival Field Training area are shown on the attached map. The wetlands shall not be dozed, excavated, or filled. A US Army Corps of Engineers permit is required prior to vegetation (other than grasses) being dislodged or run down with a vehicle. Permit requests shall be made through Natural/Cultural Resources. Activities not requiring a permit (e.g., removing vegetation with a chainsaw or hand-held tool, operating motorized vehicles on existing trails in the wetlands, walking, trapping, etc.) can be conducted.

POLICY:

1. Winter Assistance Visit. Annually while training is being conducted, Natural/Cultural Resources, Environmental Planning, and Arctic Survival will conduct an assistance visit. Items to be discussed will include, but not be limited to how well the different woods burn and provide heat, efficient use of the resources, and so on.

2. Annual Review. Annually after firewood is harvested for the upcoming field training season the aforementioned agencies shall conduct a review of the Arctic Survival Field Training area activities to ensure compliance with this plan. Changes to this plan will be formalized during this review. The reviews will be documented in the Annual Review section at the end of this plan.

APPROVED:

Date:_____ _____
Arctic Survival

Date:_____ _____
Environmental Planning

Date:_____ _____
Natural/Cultural Resources

ATTACHMENT: Training Area Map

APPENDIX G

Off-Road Vehicle Use Plan

OFF-ROAD VEHICLE (ORV) USE PLAN

Forward

The purpose of this plan is to provide general guidelines from which a base off-road vehicle regulation will be developed. This plan will adequately outline the management goals, but be general enough not to require constant revision. Day-to-day policy changes will be handled in the regulation 354FWI32-7002.

ORV Classes

Four-Wheeled Vehicles – Passenger cars, trucks, buses, jeeps, vans, and recreational campers, etc.

Two-Wheeled Vehicles - Motorcycles, motor scooters, motor bikes, trail bikes, mini bikes, dirt bikes, and three-wheeled vehicles not defined as an ATV.

All Terrain Vehicle (ATV) - Tracked vehicles; low-pressure, flotation-type tired vehicles; amphibious machines including airboats; and air cushion vehicles primarily designed for recreational purposes.

Snowmobiles - Any vehicle propelled by mechanical power, steered by using skis, and designed to travel over ice and snow.

Responsibilities

The Base Civil Engineer will be responsible for prescribing operating conditions, designating use areas, and monitoring effects. The Security Forces will be responsible for enforcement of ORV regulations and registering all privately-owned ORVs that are not registered as street vehicles under a separate local system. Wing Safety will be responsible for prescribing safety and accident requirements, monitoring an ORV safety education program, and issuing base operator licenses.

Licensing, Registration and Age Requirements

All ORVs requiring Alaskan registration will be registered with any state prior to operation on base. All privately owned ORVs that are not registered as street vehicles by the base will be registered with Security Forces under a separate local system prior to operation on base. The base will require a state operators license for an ORV if the state of Alaska requires it. Base operator licenses and ORV safety education courses will be required as determined by Air Force safety regulations. Minimum age for operating any ORV on base will be 6. The base will increase the minimum age limit for certain ORVs if it is felt such action is in the best interest of the base resources and protection of the operator. Persons under 16 years of age will be required to be under the direct supervision of their parent or legal guardian, when operating a two-wheeled vehicle except motor scooter, snowmobile, and ATV on base. Persons under 14 years of age will be required to be under the direct supervision of their parent or legal guardian, when

operating a motor scooter on base. A motor scooter is any two-wheeled motorized vehicle under five-brake horsepower (151 cubic centimeters of displacement or less) meeting the requirements for on-street operation.

Equipment and Safety Requirements

Off-road vehicles will have the necessary equipment to conform to federal and state laws concerning exhaust emissions and noise. Vehicular and operator safety equipment will be required as necessary to protect the public health, safety, and welfare of base personnel and resources.

Environmental Considerations

Off-road vehicles use will be prohibited or modified when environmental damage can occur. Crossing streams with ORVs where no bridge, culvert, or designated ford exists will be prohibited, except when the ground and streams are frozen and snow covered. Off-road vehicle use will be restricted to maintained roads during break-up until the terrain assumes a dry condition. Snowmobile use will be prohibited unless there is adequate snow cover to protect the underlying terrain from damage. Four-wheeled ORVs will be restricted to maintained roads, gravel accesses to lakes and designated trails. Uncontrolled four-wheeled ORV use has the potential to cause extensive environmental damage. Use areas will be designated for other ORVs as their potential to cause environmental damage is significantly less. Off-road vehicle use will be prohibited on grass and lawn areas, unless there is adequate snow cover to protect these areas from damage.

Designated Areas

Off-road vehicles use will be prohibited in all off-limit or restricted areas for security or safety reasons, mission use areas if it will conflict with the accomplishment of the mission, areas where it will conflict with other recreation uses, areas of significant environmental quality, or areas very susceptible to ORV damage. Four-wheeled vehicles will be restricted to designated trails. About 30 miles of trails will be available for four-wheeled vehicle use. Other ORVs will be restricted to use areas. About 13,000 to 14,000 acres will be available for other ORV use. The amount available will fluctuate within these perimeters as land uses occasionally change. Maps showing the ORV trails and use areas will be part of the regulation and handouts available for ORV operators. The maps will be updated as changes occur. The base cantonment area will be designated as a transient area to designated use areas. This will prohibit all unnecessary use within the cantonment area minimizing disturbance to housing and dormitory occupants.

Access

The privilege of ORV use on base shall be granted to the general public subject to requirements for safety, security of government property, accomplishment of the military mission, and all restrictions and rules established by the base ORV regulations.

Violations

Violators of the base ORV regulation may lose their base ORV privileges, be assessed traffic points, or in the case of active duty military personnel, be punished by UCMJ action as appropriate.

APPENDIX H

Forest Inventory Maps

APPENDIX I

EIELSON AIR FORCE BASE, ALASKA
LIST OF SITE INSTALLATIONS

Eielson Properties

FTQW - Eielson (Main Base)

BRAQ - Birch Lake Recreation Site

DMSZ - Chena River Research Site

Leased Properties

AQYX - Attu Research Site

BBYY - Beaver Creek Research Site

BTSG - Blair Lakes Air Force Range

CUYS - Burnt Mountain Research Site

FTQA - Eielson Alaska Long Period Array (ALPHA) Site 1-1-G

FTQC - Eielson Alaska Long Period Array (ALPHA) Site 2-2-B

FTQD - Eielson Alaska Long Period Array (ALPHA) Site 2-3-A

FTQE - Eielson Alaska Long Period Array (ALPHA) Site 2-4-F

FTQL - Eielson Alaska Long Period Array (ALPHA) Site 3-3-D

FTQS - Eielson Alaska zLong Period Array (ALPHA) Site 3-23-C

FTQT - Eielson Alaska Long Period Array (ALPHA) Site 3-34-E

LKRE - Indian Mountain Research Site

ZQUN - Yukon Weapons Range

APPENDIX J

Environmental Assessment

ENVIRONMENTAL ASSESSMENT

FOR THE IMPLEMENTATION OF EIELSON AIR FORCE BASE'S INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

354 Fighter Wing
Eielson Air Force Base, Alaska
January 2003

Finding of No Significant Impact (FONSI)
For the
Implementation of Eielson Air Force Base's (Eielson AFB)
Integrated Natural Resource Management Plan

Introduction

As mandated by the Sikes Act (16 U.S.C. 670a et seq.) as amended, the Secretary of Defense is authorized to carry out a program of planning for, and the development, maintenance, and coordination of, wildlife, fish, and game conservation and rehabilitation on each military reservation. This would be accomplished in accordance with a cooperative plan agreed upon by the Secretary of Defense, the Secretary of the Interior, and the appropriate state agency for the state in which the reservation is located. Each cooperative plan shall provide for fish and wildlife habitat improvements or modifications; range rehabilitation where necessary to support wildlife; control of off-road vehicle traffic; specific habitat improvement projects and related activities and adequate protection for species of fish, wildlife and plants considered threatened or endangered. As a general rule, once a cooperative plan is agreed to, no sale or lease of land on a military reservation, or sale of forest products from the land, may be undertaken unless the effects of the sale or leasing are compatible with the purposes of the plan. Cooperative plans are to be reviewed at least every five years. The current plan expires on 31 August 2016.

Proposed Action

Under the Proposed Action, the USAF proposes to implement the INRMP at a level that strives for a healthy balance between natural resource enhancement and stewardship, complimenting the military mission, and availability of resources required to accomplish the stated management goals and objectives. The Proposed Action is similar to the level of implementation under the existing INRMP. The Proposed Action would implement 100 percent of the goals identified as high priority, 75 percent of medium priority goals, and 36 percent of low priority goals.

Alternatives to the Proposed Action

In addition to the Proposed Action, this EA considers two other action alternatives, as well as, the No Action Alternative. Alternative 1 would implement 100 percent of high, medium, and low priority goals identified in the INRMP and would result in a more comprehensive management approach of natural resources on Eielson AFB lands. Selection of this alternative would require additional personnel and fiscal resources over current operating levels in order to be implemented. Alternative 2 would implement portions of the INRMP with emphasis being placed only on those actions required for compliance of federal and state regulations and mandated Air Force initiatives. Selection of this alternative would result in a less proactive approach to resource management as opposed to the Proposed Action or Alternative 1.

No Action Alternative

Under the No Action Alternative no INRMP would be implemented. All programs included in the management plan would be discontinued, causing Eielson AFB to be out of compliance with several federal, state, and Air Force regulations.

Anticipated Environmental Effects

Most, if not all actions proposed under the INRMP would have some benefit on the natural and human environment of Eielson AFB. These benefits would occur because the INRMP emphasizes an ecosystem management approach whereby planning decisions consider the interrelationships of the natural resources of Eielson AFB and the surrounding lands, and the relationship between the natural resources and the military mission. The goal of this plan is to integrate all management activities in a way that sustains and restores the health and integrity of ecosystems on Eielson AFB lands. This overall goal would be implemented to varying degrees depending on whether the Proposed Action or Alternatives 1 or 2 were selected. The highest level of implementation would occur under Alternative 1, with the least under Alternative 2. The Proposed Action implements the INRMP to the greatest extent possible within the constraints provided by the level of funds and manpower available at the present time. Under the Proposed Action, 100 per cent of all goals identified as high priority would be implemented.

Findings

Talcing into consideration the benefits that will result from implementation of the INRMP at the level the Proposed Action will provide for Eielson AFB managed lands, I feel that selection of this alternative will give the highest possible level of resource management within the constraints of currently available manpower and funding. Inaddition, the environmental impacts resulting from the implementation of the Proposed Action are beneficial and that a FONSI is warranted and it is unnecessary to prepare an Environmental Impact Statement for this action.

TIMOTHY B. VIGIL
Colonel, USAF
Vice Commander

Date

Table of Contents

ENVIRONMENTAL ASSESSMENT
FOR IMPLEMENTATION OF
Integrated Natural Resources Management Plan
Eielson Air Force Base, Alaska

1.1 Purpose and Need for Action

Section 1.0 provides a description of the purpose and need for the proposed action.

1.2 Background and Objectives for the Proposed Action

1.2.1 As mandated by the Sikes Act (16 U.S.C. 670a et seq.) as amended, the Secretary of Defense is authorized to carry out a program of planning for, and the development, maintenance, and coordination of, wildlife, fish, and game conservation and rehabilitation on each military reservation. This would be accomplished in accordance with a cooperative plan agreed upon by the Secretary of Defense, the Secretary of the Interior, and the appropriate state agency for the state in which the reservation is located. Each cooperative plan shall provide for fish and wildlife habitat improvements or modifications; range rehabilitation where necessary to support wildlife; control of off-road vehicle traffic; specific habitat improvement projects and related activities and adequate protection for species of fish, wildlife and plants considered threatened or endangered. As a general rule, once a cooperative plan is agreed to, no sale or lease of land on a military reservation, or sale of forest products from the land, may be undertaken unless the effects of the sale or leasing are compatible with the purposes of the plan. Cooperative plans are to be reviewed at least every five years.

1.2.2 The Secretary of each military department (Army, Navy, Air Force) shall manage the natural resources of each military reservation under the Secretary's jurisdiction, to the extent not inconsistent with the military mission of the reservation, so as to provide for sustained multipurpose uses of those resources and to provide the public access necessary or appropriate for those uses. To the extent feasible, the services necessary for developing, implementing and enforcing fish and wildlife management on military reservations are to be provided by Department of Defense personnel with professional training in those services. The proposed implementation of the Eielson Air Force Base Integrated Natural Resource Management Plan would fulfill the stated requirements under the Sikes Act.

1.2.3 The United States Air Force (USAF) is committed to the wise use and prudent stewardship of lands entrusted to them. These lands are critical to fulfilling the USAF's military mission and the environmental health of the region. The USAF is proposing to implement the Eielson Air Force Base's Integrated Natural Resource Management Plan (INRMP) for a five-year period from 2011 through 2016. The INRMP provides the

necessary framework and general guidance for management activities and long-range planning on Eielson Air Force Base (Eielson AFB) managed lands. The proposed INRMP emphasizes an ecosystem management approach whereby planning decisions consider the interrelationships of the natural resources of Eielson AFB and the surrounding lands, and the relationship between the natural resources and the military mission. The goal of this plan is to integrate all management activities in a way that sustains and restores the health and integrity of ecosystems on Eielson AFB lands.

1.2.4 Under this management plan, resource management goals and objectives are prioritized taking into consideration factors such as federal and state regulatory requirements and Air Force initiatives, impact to natural resources and ecosystems, military mission, and availability of funding and personnel. The Proposed Action and Alternatives 1 and 2 would result in varying levels of implementation of the stated resource management goals described in the plan.

1.2 Location of the Proposed Action

The plan addresses natural resource management on Eielson AFB, C-Battery, Chena River Research Site, Blair Lakes Bombing Range, and Birch Lake Recreation Area (**Figure 1**).

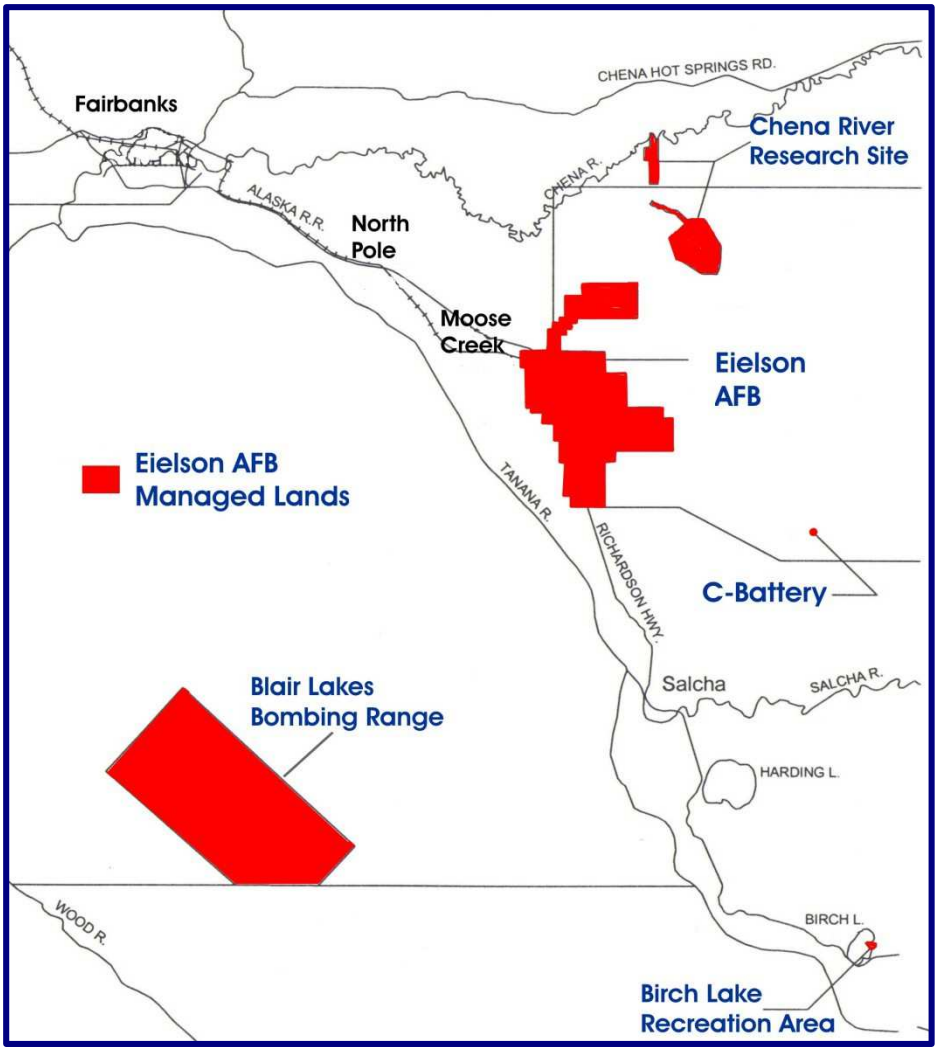


Figure 1 – Eielson AFB Managed Lands

Eielson AFB is located in the interior of Alaska within the Fairbanks North Star Borough. The base lies approximately 120 miles south of the Arctic Circle, 23 miles southeast of Fairbanks, and 9 miles southeast of the city of North Pole. C-Battery is located within the Fort Wainwright Yukon Training Area approximately 12 miles southeast of the Eielson AFB. The Chena River Research Site is comprised of the Chena River Annex, the Air Force Technical Applications Center (AFTAC) Remote Operating Facility, and the access road to these sites (Transmitter Road). This site is located approximately 10 miles northeast of the main base within the Fort Wainwright Yukon Training Area. The Blair Lake Air Force Bombing Range is located approximately 17 air miles southwest of Eielson AFB in the Fort Wainwright Tanana Flats Training Area.

1.3 Proposed Action – Substantial Implementation of the INRMP

1.3.1 Under this alternative, the USAF proposes to implement the INRMP at a level that strives for a healthy balance between natural resource enhancement and stewardship, complimenting the military mission, and availability of resources required to accomplish

the stated management goals and objectives. The Proposed Action is similar to the level of implementation under the existing INRMP. The Proposed Action would implement 100 percent of the goals identified as high priority, 75 percent of medium priority goals, and 36 percent of low priority goals.

1.3.2 This plan serves as the primary guidance document for management of natural resources at Eielson AFB. The plan provides base personnel a management tool to use when making decisions about natural resources, activities and development at Eielson AFB. The plan also provides mitigation for environmental effects from actions in support of the military mission. The INRMP would be in effect for a five-year period from 2011 through 2016.

1.4 Alternatives to the Proposed Action

In addition to the Proposed Action, the following alternatives, including the No Action Alternative, are considered for analysis in this Environmental Assessment (EA).

1.4.1 Alternative 1 – Full Implementation of the Integrated Natural Resource Management Plan

This alternative would implement 100 percent of high, medium, and low priority goals identified in the INMRP and would result in a more comprehensive management approach of natural resources on Eielson AFB lands. Selection of this alternative would require additional personnel and fiscal resources over current operating levels in order to be implemented.

1.4.2 Alternative 2 – Minimal Implementation of the Integrated Natural Resource Management Plan

This alternative would implement portions of the INRMP with emphasis being placed only on those actions required for compliance of federal and state regulations and mandated Air Force initiatives. Selection of this alternative would result in a less proactive approach to resource management as opposed to the Proposed Action or Alternative 1.

1.4.3 No Action Alternative

This alternative would result in no implementation of any aspect of the INRMP for Eielson AFB lands. A wide variety of laws and executive orders addressing issues such as environmental quality, federal land management, wildlife, wetlands, floodplains, as well as, Department of Defense and USAF policies and initiatives would not be complied with if the INRMP is not implemented.

1.5 Decision to be Made

1.5.1 In order to comply with environmental laws, manage natural resources, and support the military mission, the USAF is required to implement an INRMP. A decision must be made which supports this action.

1.5.2 As required by Air Force Instruction 32-7061, an *Environmental Impact Analysis Process* (EIAP) must be completed to evaluate potential environmental consequences of the proposed implementation of the INRMP. The completion of this EA is intended to satisfy these requirements. The Proposed Action and alternatives listed in Section 1.3 are addressed in detail in Chapter 2.0 of this document. A description of the resources is described in Chapter 3.0 and the impacts that could result from each alternative are discussed in Chapter 4.0.

1.5.3 Based on the information presented in this analysis, a decision must be made by the Eielson Air Force Base Commander (354 FW/CC) whether or not to implement the Proposed Action or one of the listed alternatives. A Finding of No Significant Impact (FONSI) will be published if it is determined that no significant environmental impacts will result from the selected course of action. If it is determined that the selected alternative will have significant environmental impacts, another alternative will be chosen for which impacts will not reach the threshold of significance.

1.6 Project Scoping

The Environmental Impact Analysis Process involved the review of resource management data collected by USAF, federal, state, and local government agencies, and private organizations. The process included interviews with USAF personnel involved with natural resource management, environmental planning, and the Installation Restoration Program. Interviews were also conducted with personnel from outside agencies with interests, responsibilities, and/or expertise regarding natural resource management of Eielson AFB lands. The USAF, U.S. Fish and Wildlife Service, and Alaska Department of Fish and Game are signatory partners in implementation of the INRMP. Chapter 5.0 lists all agencies contacted as part of the assessment.

1.7 Federal and State Permits or Licenses Needed to Implement the Project

The INRMP addresses and incorporates numerous federal and state laws, regulations, Executive Orders, Department of Defense Directives, and USAF policies in the formulation of the natural resource management plan. However, no federal and state permits or licenses are needed to implement the INRMP.

2.1 Description of the Proposed Action and Alternatives

Section 2.0 provides a description of alternatives considered to achieve the purpose and need described in Section 1.0. The Proposed Action, Alternative 1, Alternative 2, and the No Action Alternative will be addressed.

2.2 Proposed Action – Substantial Implementation of the INRMP

2.2.1 Under this alternative, the USAF proposes to implement the INRMP at a level that strives for a healthy balance between natural resource enhancement and stewardship, complimenting the military mission, and availability of resources required to accomplish the stated management goals and objectives. The Proposed Action is similar to the level of implementation under the existing INRMP. The Proposed Action would implement 100 percent of the goals identified as high priority, 75 percent of medium priority goals, and 36 percent of low priority goals.

2.2.2 This plan serves as the primary guidance document for management of natural resources at Eielson AFB. The plan provides base personnel a management tool to use when making decisions about natural resources, activities and development at Eielson AFB. The plan also provides mitigation for environmental effects from actions in support of the military mission. The INRMP would be in effect for a five-year period from 2011 through 2016.

2.2.3 The INRMP is a proactive management plan that emphasizes an interdisciplinary approach to ecosystem management. This approach is a process that considers the environment as a complex system functioning as a whole unit. The overall goal of this plan is to bring together and integrate all management activities in a way that sustains and restores the health and integrity of ecosystems on Eielson managed lands. The USAF seeks the effective partnership of private, local, state, and federal interests to accomplish this goal.

2.2.4 The INRMP describes the general physical and biotic environments to include the following: climate, landforms, water resources, geology, soils, vegetation, wetlands, floodplains, fish and wildlife species and their habitat requirements, threatened and endangered species, outdoor recreation, and public land resources. Operational component plans focusing on specific management units and inventory of resources are also included.

2.2.5 The primary issues and concerns facing natural resources management at Eielson AFB were identified during the development of this plan. For each issue and concern, specific goals and objectives were developed to guide the direction of management over the next 5 years. All goals are intended to contribute to promoting ecosystem health,

while still meeting the military mission of the base. The issues and concerns, goals, and objectives form the foundation of the INRMP. The issues and concerns are divided into nine major categories for management purposes as follows:

- Natural Resource Constraints to Installation Planning and Missions
- Wetlands and Floodplains
- Lake and Watershed Protections
- Fish and Wildlife Management
- Threatened and Endangered Species and Critical Habitats
- Forest Management
- Grounds Maintenance
- Outdoor Recreation and Public Access
- Geographic Information System (GIS)

2.2.6 The issues, concerns, and goals are prioritized taking into consideration factors such as laws and regulations, directives, military mission, and funding. The specific objectives developed to implement and achieve each goal are listed in Section 8 of the INRMP. **Table 2.3** summarizes the goals and priority for each management category and the actions that would be taken under this alternative.

2.2 Alternative 1 – Full Implementation of the Integrated Natural Resource Management Plan

This alternative would implement 100 percent of high, medium, and low priority goals identified in the INMRP and would result in a more comprehensive management approach of natural resources on Eielson AFB lands. Selection of this alternative would result in an increase of resource management actions over current levels under the existing INRMP and would require additional personnel and fiscal resources in order to be implemented. **Table 2.3** summarizes the goals and priority for each management category and the actions that would be taken under this alternative.

2.3 Alternative 2 – Minimal Implementation of the Integrated Natural Resource Management Plan

This alternative would implement portions of the INRMP with emphasis being placed only on those actions required for compliance of federal and state regulations and mandated Air Force initiatives. This alternative would result in a decrease of resource management actions over existing levels and would take a less proactive approach to resource management as opposed to the Proposed Action or Alternative 1. Selection of this alternative would implement 44 percent of goals identified as high priority, 1 percent of medium priority goals, and 0 percent of low priority goals. **Table 2.3** summarizes the goals and priority for each management category and the actions that would be taken under this alternative.

Table 2.1 Summary of INRMP Management Goals and Priority for Proposed Action and Alternatives

Management Category	Goals	Priority	Proposed Action	Alter-native 1	Alter-native 2
Natural Resource Constraints to Installation Planning and Missions	Provide base planners with up-to-date tools necessary to comply with natural resource constraints	High	**X**	**X**	**X**
Wetlands and Floodplains	Maintain up-to-date wetlands maps	High	**X**	**X**	**X**
	Maintain up-to-date floodplain maps	High	**X**	**X**	**X**
Lake and Watershed Protections	Minimize the impacts to erosion, sedimentation, and point and nonpoint water pollution to watersheds and water bodies	High	**X**	**X**	**X**
Fish and Wildlife Management	Maintain Moose Lake/Polaris Lake, Bear Lake, and Mullins Pit dikes	High	**X**	**X**	
	Develop fish habitat in new gravel borrow pits	High	**X**	**X**	
	Develop Mullins Pit fish habitat	High	**X**	**X**	
	Develop Cathers Lake fish habitat	High	**X**	**X**	
	Bird harassment/Dep-redation program	High	**X**	**X**	**X**

Management Category	Goals	Priority	Proposed Action	Alter-native 1	Alter-native 2
	Waterfowl habitat removal in airfield Bird Exclusion Zone	High	**X**	**X**	**X**
Fish and Wildlife Management	Grass height manipulation	High	**X**	**X**	**X**
	Resolve nuisance beaver problems	High	**X**	**X**	
	Conduct annual winter/summer dissolved oxygen inventory	Medium	**X**	**X**	
	Conduct ecosystem monitoring to measure the quality of habitat	Medium	**X**	**X**	
	Collect trapping harvest data	Low	X	**X**	
	Collect bow and arrow moose harvest data	Low	**X**	**X**	
	Construct Mullins Pit habitat development/ watch able wildlife display	Low		**X**	

Management Category	Goals	Priority	Proposed Action	Alter-native 1	Alter-native 2
Fish and Wildlife Management	Conduct creel census	Low		X	
Threatened and Endangered Species and Critical Habitats	Monitor for presence of T&E Species	Medium	X	X	**X**
Forest Management	Fire Protection	High	X	X	
	Personal Use Firewood Sales	Medium	X	X	
	Insect and Disease Protection	Medium	X	X	
	Purchase Aerial Photography	Medium	X	X	
	Manage Arctic Survival Field Training Area	Medium	X	X	
Forest Management	Christmas Tree Sales	Low	**X**	X	
	Forest Road Construction and Maintenance	Low	**X**	**X**	
Grounds Maintenance	Update urban forest map	Medium	**X**	**X**	
Outdoor Recreation and Public Access	Annually Maintain Outdoor Recreation Facilities and Trails	High	**X**	X	
Outdoor Recreation and Public Access	Establish Canoe Route on French Creek	Low		**X**	
	Establish Canoe Route on Piledriver Slough	Low		**X**	

Management Category	Goals	Priority	Proposed Action	Alter-native 1	Alter-native 2
Geographic Information System (GIS)	Maintain natural/cultural resources maps on the Eielson GeoBase to assist in the environmental management decision-making process and ongoing implementation of the INRMP.	Medium	X	X	

2.4 No Action Alternative

The No Action Alternative would result in no INRMP being implemented for Eielson AFB. A wide variety of laws and executive orders addressing issues such as environmental quality, federal land management, wildlife, wetlands, floodplains, etc., as well as Department of Defense and USAF policies and initiatives require the management of natural resources and implementation of an INRMP.

2.4 Other Alternatives Considered

The options available for management of individual natural resources (i.e. forestry, fish and wildlife, wetlands, etc.) are numerous resulting in various combinations each of which could be presented as possible alternatives. Development of the Eielson AFB INRMP however, is based on an interdisciplinary approach to natural resource management that considers the environment as a complex system functioning as a whole, not a sum of the individual components. Professional resource managers concur that this is the most comprehensive approach to natural resource management.

3.1 Affected Environment

Chapter 3 describes the existing environment and resource components that would be impacted by the proposed action and the alternatives. The resources discussed in this section are presented as a baseline for comparisons of environmental consequences. Resource descriptions provided in Chapter 3 are given in a regional context, as well as specific descriptions that characterize Eielson AFB as a subset of the interior Alaska region that it resides. For additional detail of the environment affected by this plan, please refer to resource descriptions provided in the INRMP for Eielson AFB. Resources discussed in the section are as follows:

- Physical resources, which include general site location, topography, geology, soils and permafrost, climate and air quality, noise, ground and surface water, floodplains, and wetlands.
- Biological resources, which include vegetation, wildlife, fish, and threatened or endangered species.
- Cultural resources including Archeological or Historical Resources.
- Recreational Resources

3.2 Regional Resources

3.2.1 Physical Resources

3.2.1.1 General Site Location

3.2.1.1.1 Eielson AFB is located in the interior of Alaska, north of the Alaska Range in the Tanana Valley Basin. The base lies within the Fairbanks North Star Borough approximately 120 miles south of the Arctic Circle, 23 miles southeast of Fairbanks, and 9 miles southeast of the city of North Pole.

3.2.1.1.2 The main base encompasses approximately 19,920 acres. The base manages an additional 37,824 acres at four other locations as follows:

- C Battery (18 acres) is located on a ridgeline within the Ft Wainwright Yukon Training Area approximately 12 air miles east-southeast of the base.
- The Chena River Research Site is comprised of the Chena River Annex (690 acres), the Air Force Technical Applications Center (AFTAC) Remote Operating Facility (2,995 acres), and the access road to these sites (106 acres). This site is located approximately 10 miles northeast of the main base within the Ft Wainwright Yukon Training Area.
- The Blair Lake Air Force Range (33,964 acres) is located approximately 17 air miles southwest of Eielson AFB in the Ft Wainwright Tanana Flats Training Area.

- The Birch Lake Recreation Area (51 acres) is located on the western shore of Birch Lake approximately 35 miles southeast of the main base along Highway 2.

Table 3.1 summarizes the state of development of the various land management areas.

Table 3.1 Acreages of Lands Managed by Eielson AFB (Acres Estimated)

Land	Total	Improved	Semi-Improved	Unimproved	Under Facilities
Eielson AFB	19,920	598	1,364	16,676	1,152
C Battery	18		2.6	7.7	7.7
Chena River Research Site					
Chena River Annex	690		6	677	7
Access Road (Transmitter Road)	106		27	52	27
AFTAC Remote Operating Facility	2,995		38	2,954	3
Blair Lake Air Force Range	33,964		1,248	32,655	61
Birch Lake Recreation Area	51		11.3	35.5	4.2
TOTAL	**57,744**	**598**	**2,696.9**	**53,057.2**	**1,261.9**

3.1.1.2 Regional Topography

3.1.2.1 The project area is within the Yukon–Tanana Upland of the Northern Plateau physiographic province. Eielson AFB managed lands are located in Interior Alaska, which is comprised of a vast plateau that stretches from the Brooks Range in the north to the Alaska Range in the south. The principal river systems draining the interior are the Yukon and Tanana Rivers. The Yukon River, located approximately 120 miles northeast of Eielson AFB, dominates the landscape of interior Alaska, flowing some 2,000 miles from the Canadian Yukon to the Bering Sea. The Yukon River and its tributaries, of which the Tanana River is one, form the largest river system in Alaska.

3.1.2.2 The Eielson AFB managed lands lie more specifically in the Tanana River Valley. The Tanana River Valley is very broad with relatively flat or gently sloped terrain. In a 50-mile radius to the west and south of Eielson, the valley floor ranges in elevation from 400 to 1,000 feet above sea level. Hills rise sharply to the east to form the valley edge. Here the slopes become quite steep and elevations rise to peaks and ridge tops over 3,000 feet. These hills are dissected by the Chena and Salcha Rivers and their numerous tributaries, which flow in an east-west direction. The Eielson AFB managed lands are situated primarily in the valley floor, with some portions extending into the adjacent foothills.

3.1.1.3 Regional Geology, Soils, and Permafrost

3.1.1.3.1 Most of the subsurface geologic formations of the central plateau of Alaska date primarily from the Permian and Devonian periods of the Paleozoic era (Hulten 1968). The oldest rock known to occur in interior Alaska is a formation known as the Yukon-Tanana Terrane that comprises most of the Tanana Valley area from just west of Fairbanks east to the Yukon Territory of Canada. The formation dates back to the Precambrian Period of the Paleozoic era, and consists of metamorphic rocks including muscovite-quartz schist, micaceous quartzite, and graphitic schist (Connor and O'Haire 1988). Overlying this bedrock formation are deep deposits of fluvial and glaciofluvial sediments originating primarily from the Alaska Range. Windblown and glaciofluvial deposits are up to 750 feet thick in an area south of Fairbanks (Pewe and Reger 1983).

3.1.1.3.2 Soils in the Tanana River Valley consist of unconsolidated silty sands and gravels, organic silts, sandy silts, and clays. Floodplain soils nearest the active channel are sandy with a thin silt loam layer on the surface. On higher terraces the soils are predominately silt belonging to the Salchaket series (Van Cleve *et al*. 1993). On older river terraces, silt loam soils of the Goldstream series dominate and often have a significant organic component (Van Cleve *et al*. 1993). These soils tend to be cold and wet and are generally underlain by permafrost. Clays, sandy silts, and sandy gravelly loams may be found in upland areas of the Tanana River Valley.

3.1.1.3.3 In Interior Alaska, the areas that are generally underlain by permafrost in the Yukon-Tanana uplands include north aspects, valley floors, and poorly drained lower slopes (Van Cleve *et al*. 1993). Well-drained south aspects and sediments adjacent to and beneath active river channels are typically permafrost free.

3.1.1.4 Regional Water Resources

Wetlands and low gradient alluvial streams comprise most of the surface water resources within the area. Wetland areas dominate the flat, low-lying areas within and surrounding Eielson AFB. The largest river system to the base is the Tanana River drainage. The major tributaries are the Salcha, Chena, and Wood Rivers. Surface drainage is generally north-northwest. There are three large, natural lakes (Harding, Birch, and Blair) located within 35 miles of the base. The general area has numerous natural and constructed lakes and ponds.

3.1.1.5 Regional Climate and Air Quality

3.1.1.5.1 The Yukon-Tanana subregion has the northern continental climate of Interior Alaska, which is characterized by short, moderate summers, long cold winters, and low precipitation and humidity. The mean annual temperature is 26° F. The average annual precipitation at Eielson AFB is 13.0 inches, with approximately 60 percent of the annual precipitation occurring during the warmer months of June through September. The average annual snowfall is 73.4 inches.

3.1.1.5.2 Eielson AFB is considered a major facility because the base has the potential to emit more than 100 tons per year of criteria air pollutants. Due to the bases potential to emit, a Title V air operating permit application was prepared and submitted to the Alaska Department of Environmental Conservation in December 1997. The permit application outlines emission sources subject to Title V, a summary of facility wide potential and actual emissions, hazardous air pollutants (HAPS) status, and requirements for an Accidental Release Prevention Program (ENSR 1997). To support the permit application, an air emissions inventory was completed.

3.1.1.5.3 The Central Heat and Power Plant (CH&PP) is the primary source of electrical power and heat for all base facilities. The CH&PP has six coal-fired boilers, which are the largest air emission sources. Other emission sources include emergency fire pumps, backup generators, compressor engines, painting and fueling operations, aircraft engine testing, and incinerator emissions. The most significant HAPs emissions are hydrochloric acid and hydrofluoric acid from the coal fired boilers.

3.1.1.5.4 Ozone depleting substances (ODCs) are used on a limited basis at Eielson and include chlorofluorocarbons (CFCs) and hydro chlorofluorocarbons (HCFCs). CFCs and HCFCs are contained in some of the chemicals and products used in recharging air conditioning and compressor equipment, solvents used in cleaning parts and precision instruments, and sterilization equipment at the hospital.

3.1.1.6 Noise

The most recent calculations of noise contours for Eielson AFB were completed during the 2001 US Air Force Air Installation Compatible Use Zone (AICUZ) Study. Air Force land use recommendations suggest residential areas be located outside of the 65 decibels (dB) contour. All of Eielson's accompanied housing areas fall outside of the 65 dB areas. There are no residential areas located off the installation that fall into the 70 dB contour. Moose Creek, which has low-density housing, is within the 65 dB contour off the north end of the runway. The highest Day-Night Average Weighted Sound Levels occur on the runway and taxiways and were measured at 85 decibels (dB).

3.2 Eielson AFB Physical Resources

3.2.1 Eielson AFB Topography

Eielson AFB (19,920 acres) is located along the eastern edge of the Tanana River Valley. The eastern portions of the base extend into the foothills along the eastern edge of the valley. About 89 percent of the base is flat alluvial floodplain with elevations ranging from 520 to 550 feet. The remaining 11 percent of the base occurs in the hills. The highest point at 1,125 feet occurs on Quarry Hill in the southeast corner.

3.2.1.1 Eielson AFB Geology, Soils, and Permafrost

3.1.7.2.1 The geology of the area consists of Precambrian and Paleozoic-age metamorphic rocks of the Yukon-Tanana crystalline complex, formally known as Birch Creek Shist. The rocks have been intruded by igneous rocks consisting of granodiorite and quartz monzanite of Mesozoic and Cenozoic age and have been overlain by younger sedimentary Pleistocene and Holocene fluvial gravel and loess deposits. Unconsolidated sediments are approximately 200 feet to 300 feet thick beneath Eielson AFB. Glacial outwash plains at the base of the Alaska Range provided wind-blown silts that have been transported northward and deposited as loess mantles along the crystalline uplands. Silt has also accumulated at lower elevations in organic muck deposits in combination with plant debris (EA 1995).

3.1.7.2.2 In 1998, the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) completed a soils survey of Eielson AFB. Soils and miscellaneous land types were mapped and are described in INRMP.

3.1.7.2.3 Discontinuous permafrost can be found throughout Eielson AFB, and is typically found in low-lying areas and north aspects of slopes.

Photo 1 – Mullins Pit

3.2.1.2 Eielson AFB Water Resources

3.1.7.3.1 Eielson AFB was constructed within the floodplain of the Tanana River. Surface drainage at Eielson AFB is generally north-northwest, parallel to the Tanana River. Surface water resources include numerous creeks, sloughs, lakes, and ponds. Man-made lakes and ponds were created during the excavation of gravel deposits for use as fill material for construction projects on base. Lake development, through gravel extraction, is still occurring at Mullins Pit (**Photo 1**), and Cathers Lake. A summary of water resources is shown in **Table 3.2.**

3.1.7.3.2 The low-lying, developed portions of Eielson AFB are underlain by a shallow, unconfined aquifer comprised of 200 to 300 feet of loose alluvial sands and gravel overlying bedrock of relatively low permeability (Battelle PNL 1994). The groundwater table is typically less than 10 feet below the ground surface, but it can rise with seasonal variations to as shallow as 1.5 feet below grade. The direction of groundwater flow is generally north-northwest. Water supply for Eielson AFB is drawn from five wells capable of producing a total of 3,200,000 gallons per day.

Table 3.2 Eielson AFB Water Resources

Eielson AFB Water Resources		
Lakes/Ponds (Total Number)	**Total Acres**	**Description**
104	602	Lily Lake – naturally occurring lake 12 man-made lakes 14 naturally occurring ponds 77 man-made ponds
Streams (Total Number)	**Total Length (Miles)**	**Description**
5	29.1	Piledriver Slough (12.6 Miles)
Streams (Total Number)	**Total Length (Miles)**	**Description**
		Garrison Slough (4.5) Moose Creek (1.3 Miles) French Creek (8.1 Miles) Knokanpeover Creek (2.4 Miles)
Floodplains	**Total Acres**	**Description**
	6,444	100-year floodplains located throughout base area

3.2.2 Physical Resources of Eielson AFB Managed Lands

At the beginning of this Chapter it was stated that Eielson AFB has 19,920 acres that is part of its base lands. In addition to this acreage, the base also manages another 37,824 acres of land that it is permitted to use by the U.S. Army. These lands are part of the U.S. Army's military withdrawal lands that belong to the Bureau of Land Management. These lands include C Battery (18-acres), Chena River Research Site (3,791-acres), Blair Lake Air Force Range (33, 964-acres), and the Birch Lake Recreation Area (51-acres). The following is a brief description of their physical resources.

3.2.2.1 C Battery

3.2.2.1.1 C Battery Topography

C Battery is a small, 18-acre site located on a ridge top to the east of the main base at an elevation of about 2,100 feet. The site is relatively flat with the ground to the north and south dropping sharply down the slopes of the ridge.

3.2.2.1.2 C Battery Geology, Soils, and Permafrost

The geology in the general vicinity of C Battery is described in Section 3.1.1.3. The soils at the site have not been inventoried, but general information is known for the area. Ridge topsoils are typically shallow gravelly silt (US Army 1994).

3.2.2.1.3 C Battery Water Resources

C Battery is located on a ridgeline with surface water from the site draining into two distinct drainage systems, the French Creek drainage to the north and the Little Salcha River drainage to the south. There are no wetlands, streams, ponds, or floodplains on the site. Currently there is no information available on groundwater resources at C Battery.

3.2.2.2 Chena River Research Site

3.2.2.2.1 Chena River Research Site Topography

The Chena River Research Site consists of two separate parcels, the Chena River Annex (690 acres) and the Air Force Technical Applications Center (AFTAC) Remote Operating Facility (2,995 acres). In addition, there are 106 acres of access roads into these two areas. The Chena River Annex is essentially flat, occurring within the floodplain and on old terraces of the Chena River at an elevation of roughly 600 feet. The AFTAC Remote Operating Facility lies to the south of the Chena River Annex in the foothills along the east edge of the Tanana Valley, and varies in topography with elevations ranging from 750 feet to 1,900 feet above sea level.

3.2.2.2.2 Chena River Research Site Geology, Soils, and Permafrost

The geology of the general vicinity of Chena River Research Site is described in Section 3.1.1.3. A soils survey of the Chena River Annex was completed in 1998 by the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Soil description and classification for Chena River Annex is described in INRMP. Soils in the AFTAC Remote Operating Facility have not been surveyed, however, a generalized soil survey for nearby Army lands provides information that can be applied to this site. The soils are generally silt loams. South slopes vary from shallow, gravelly silt near ridge tops to deep, moist silt loams on the lower slopes. North slopes have shallow, gravelly silt loams with thick vegetative cover. Drainage bottoms and depressions have shallow, gravelly silt loam overlain with a thick layer of peat and underlain with permafrost. Soils on the south-facing slopes are generally well drained and free of permafrost. The soils on the north slopes are usually underlain by permafrost and are poorly drained (US Army 1994).

3.2.2.2.3 Chena River Research Site Water Resources

3.2.2.2.3.1 The Chena River Annex lies within the floodplain of the Chena River, which forms the northern boundary of the site. There are no lakes, ponds, or perennial streams within the Annex. The portion of the parcel that lies within the 100-year floodplain of the Chena River is approximately 304 acres. Currently, there is no information available on groundwater resources within the site.

3.2.2.2.3.2 The AFTAC Remote Operating Facility lies to the south of the Chena River Annex in the foothills along the east edge of the Tanana Valley. Surface water drainage is split into two distinct drainage systems, both of which are tributaries to the Chena River. The eastern corner of the site drains into an unnamed tributary of Horner Creek. The remaining area drains into two

branches of an unnamed watercourse. Approximately 2.7 miles of stream occur on this site. No lakes, ponds, and floodplains occur on the Remote Operating Facility. Currently, there is no information available on groundwater resources at the site. A summary of water resources is shown in **Table 3.3.**

Table 3.3 Chena River Water Resources

Chena River Water Resources		
Lakes/Ponds (Total Number)	**Total Acres**	**Description**
NA	NA	
Streams (Total Number)	**Total Length (Miles)**	**Description**
NA	2.7	Streams are located in AFTAC Remote Operating Facility area within the Chena River drainage.
Floodplains	**Total Acres**	**Description**
	304	100-year floodplains are located in Chena River Annex

3.2.2.2.4 Blair Lake Air Force Range

3.2.2.2.4.1 Blair Lake Air Force Range Topography

The Blair Lake Range lies on the floor of the Tanana River Valley in a very flat, low-lying area called the Tanana Flats. The site totals approximately 33,964 acres in size. The land has a very gradual slope to the northwest with elevations ranging from 600 feet to 900 feet above sea level.

3.2.2.2.4.2 Blair Lake Air Force Range Geology, Soils, and Permafrost

The geology of the area consists of very thick layers of river sediments and fluvioglacial drift deposits of unconsolidated silts, sands, and gravels. The primary sources of the sediments in the Blair Lakes region are the Totatlanika Schist and the Birch Creek Schist of the Alaska Range. The soils of the Blair Lake Range have not been inventoried, but exploratory borings show profiles consist of unconsolidated silty sands and gravels, organic silts, sandy silts, and clays (EA 1995).

3.2.2.2.4.3 Blair Lake Air Force Range Water Resources

3.2.2.2.4.3.1 Surface water within the Blair Lake Range is comprised of small creeks and several man-made ponds. Surface drainage is generally north-northwest and is dominated by 3 general drainage systems, each comprised of numerous perennial watercourses. Clear Creek, a tributary of Salchaket Slough, drains the eastern one third of the range. A series of unnamed, poorly defined, tributaries to the Tanana River drain the central portion of the range. Willow Creek, also a tributary to the Tanana River, drains the western-most corner of the range. A summary of water resources is shown in **Table 3.4.**

3.2.2.2.4.3.2 Groundwater at the Blair Lake Range is encountered above the permafrost in a shallow, unconfined aquifer of alluvial deposits, and again below the permafrost in highly transmissive, alluvial sand and gravel deposits. The depth to the shallow groundwater generally ranges between 6 and 10 feet below the surface and varies with the depth to permafrost. Groundwater movement is generally north to northwest. Water is supplied to the facilities at the range from a well drilled into the deeper aquifer. The well operates on a demand basis, and is estimated to pump at approximately 24 gallons/minute, for a total of between 500 and 1,350 gallons/day (EA 1995).

Table 3.4 Blair Lake Water Resources

Blair Lake Water Resources		
Lakes/Ponds (Total Number)	**Total Acres**	**Description**
3	6.7	Three (3) man-made ponds Numerous pockets of surface water due to permafrost
Blair Lake Water Resources		
Streams (Total Number)	**Total Length (Miles)**	**Description**
NA	111.1	Numerous unnamed tributaries for Clear Creek, Willow Creek, and Tanana River drainages
Floodplains	**Total Acres**	**Description**
	1,486	100-year floodplains located throughout the area

3.2.2.2.5 Birch Lake Recreation Area

3.2.2.2.5.1 Birch Lake Recreation Area Topography

The Birch Lake Recreation Area (51 acres) lies on the east side of Birch Lake on an east-west peninsula. The slope of the land varies from 10 to 27 percent slope. The elevation of most of the Birch Lake Recreation Area is approximately 850 feet.

3.2.2.2.5.2 Birch Lake Recreation Area Geology, Soils, and Permafrost

The geology of the general vicinity of the Birch Lake Recreation Area is described in Section 3.1.1.3. The soil in the Birch Lake Recreation Area is Steese silt loam to approximately 22 inches in depth followed by fractured schist bedrock.

3.2.2.2.5.3 Birch Lake Recreation Water Resources

The site has no permanent bodies of water or streams. Groundwater at the Birch Lake Recreation Area is encountered around lake level. There are two wells at this site that supply water for the facility. The static water table was encountered at 74 feet. The wells are 250-feet-deep and 600-feet-deep and capable of producing a flow of 9.2 gallons per minute.

3.2.2 Eielson AFB Wetlands

Wetlands are a dominant physical feature of Eielson AFB managed lands with approximately 78.5 percent of the total acreage managed by Eielson AFB classified as wetlands (**Photo 2**). Typically they form in low-lying areas where permafrost underlays the soils and impedes surface drainage. About 97 percent of the wetlands are low

Photo 2 – Eielson AFB Wetlands

quality wetlands vegetated with black spruce and associated shrub species, although sedge and sedge/grass meadows are common also. The remaining wetlands are high quality and consist of lakes, ponds, streams, and marshes. Almost all of the high quality wetlands are located on the main base. About 46 percent of the high quality wetlands are man-made as a result of base development. A summary of wetlands on Eielson AFB managed lands is shown in **Table 3.5.**

Table 3.5 Wetlands

Management Area	Size of Area (Acres)	Wetlands (Acres)	Percentage of Area
Eielson AFB	19,920	10,227	51.7
C Battery	18	0	0
Chena River Research Site	3,791	1,099	29
Blair Lake AF Range	33,964	33,896	99.8
Birch Lake Recreation Area	51	8	16
Total	57,614	45,200	78.5

3.2.3 Recreational Resources

Eielson actively promotes the use of natural resources on Eielson managed lands to provide the maximum outdoor recreational benefits within the constraints of the military mission and the capability of the available resources, and to preserve these resources for future generations. Some of the most common activities are fishing, hunting, camping, picnicking, skiing, and off-road vehicle use. The Air Force provides and maintains a downhill skiing facility, cross-country ski trails, a parcours exercise trail, nature trail, campgrounds, shooting ranges, dog mushing trail, winter sports area, and other facilities.

3.2.4 Cultural Resources

A cultural resource survey for Eielson AFB was conducted in 1996. The purpose of the survey was to identify and evaluate prehistoric and historic archeological sites in terms of their location, significance, and eligibility for nomination to the National Register of Historic Places. The completed survey provides the basis for the Eielson AFB Cultural Resource Management Plan.

3.3 Eielson AFB Biological Resources

3.3.1 Vegetation

3.3.1.1 Due to the variations in the surrounding terrain on Eielson AFB managed lands, the plant communities vary based on slope, aspect, elevation, and fire history. Differences in vegetation are also influenced by spatial variations in soil temperature, moisture content, soil fertility, and presence of permafrost. The major plant community types include white and black spruce coniferous forests; paper birch and poplar broadleaf forests; mixed coniferous-broadleaf forests; tall scrub-shrub; herbaceous wetlands; and man made semi-improved and improved grounds. The Natural Resources vegetation inventory was last updated in 2002. A detailed vegetation inventory map for Eielson AFB lands including plant species list is included in the INRMP. A summary listing dominant vegetation cover types is provided in **Table 3.6.**

3.3.1.2 Open and closed mixed spruce/broadleaf forest tends to occur on well-drained sites with little permafrost. This forest type is commonly found on south-facing slopes throughout the area.

Tree species include white spruce, paper birch, quaking aspen, and balsam poplar. Willows, alder, wild rose, blueberry, and high-bush cranberry are common shrubs. Lower elevation ridge tops usually consist of tall shrub communities characterized by dwarf birch and herbaceous species interspersed with widely scattered black spruce.

3.3.1.3 White and black spruce coniferous forests are common in the river valleys and are the predominant vegetation types along stream drainages. Spruce stands occur as open and closed forests with common associated shrubs and grasses consisting of dwarf birch, Labrador Tea, low-bush cranberry, blueberry, horsetail, and bluejoint grass.

3.3.1.4 Black spruce lowland forests tend to occur on poorly drained sites underlain by permafrost. Black spruce forests are common in low-lying areas, drainage basins, and north-facing slopes common throughout the area. Black spruce occurs in closed canopy stands and as scrubby open stands of dwarf trees. Other species commonly occurring in this forest type include tamarack, blueberry, low-bush cranberry, Labrador tea, and mosses. Closed canopy black spruce forest tends to return to its original composition after fire (Viereck et al., 1992). In the absence of fire, closed canopy black spruce may transition into scrubby open stands of black spruce as the moss layer thickens. A thicker mat of moss tends to better insulate soils, causing the permafrost level to rise and the soil to be colder and wetter over time.

3.3.1.5 Wetlands can be grouped as having high or low wildlife habitat value.

High-value wetland habitat includes seasonally flooded open habitats suitable for waterfowl nesting and feeding. It generally occurs as lakes, ponds, slow-moving streams, and marshes. Almost all of the high quality wetlands are located in the main base area. Low-value wetland habitat is composed of scrubby stands of black spruce/tamarack, tall and low willows, dwarf birch, alder shrubs, and graminoids. About 97 percent of the wetlands on Eielson AFB managed lands are low quality wetlands that offer foraging habitat for relatively few species.

Table 3.6 Vegetation

Management Area	**Vegetation Cover Type**	Percent (of total vegetation)
Eielson AFB	Black Spruce/Tamarack Mixed Needleleaf/ Broadleaf	44 30
C Battery	Alder	75
Chena River Research Site	Paper Birch: Open Mixed Needleleaf/ Broadleaf: Closed Black Spruce/ Tamarack: Open/ Woodland	47 20 19
Blair Lake AF Range	Black Spruce/Tamarack: Open/Woodland Resin Birch/Willow Scrub	45 42
Birch Lake Recreation Area	Mixed Needleleaf/Broadleaf:Closed Man-made/Beach	51 25

3.3.2 Wildlife

3.3.2.1 Eielson AFB lands support a wide diversity of habitat types. Approximately 32 species of mammals play key roles in the ecosystems occurring in the vicinity of Eielson managed lands. Wildlife species in the surrounding areas are typical of those found in Interior Alaska. Large mammals that are likely to be found in nearby habitat include moose and black bear. Small mammals present consist of gray wolf, red fox, wolverine, beaver, river otter, mink, snowshoe hare, red squirrel, lynx, marten, grouse, ptarmigan, passerines, and various waterfowl. A list of fish and wildlife species occurring on Eielson managed lands, along with descriptive habitat types, is included in the INRMP.

3.3.2.2 The main base area has four designated wildlife management areas consisting primarily of rehabilitated man-made gravel pits and wetlands. These areas are managed more intensely for biological diversity, limited wildlife production, wetlands restoration, and outdoor recreation opportunities. Wildlife management areas include Mullins Pit Wildlife Management Area (65.2 Acres); Bear Lake Wildlife Management Area (64.8 Acres); Scout Lake Wildlife Management Area (30.2 Acres); and Manchu Ponds Wildlife/Wetlands Management Area. Management plans for the various wildlife management areas are included in the INRMP.

3.3.3 Fish

Numerous species of fish occur naturally in the streams and lakes of interior Alaska. The Alaska Department of Fish and Game (ADF&G) stocks rainbow trout, arctic grayling, arctic char, and Chinook salmon in seven lakes and one stream on Eielson AFB. The ADF&G stocks Birch Lake, the location of the Birch Lake Recreation Area, with rainbow trout, grayling, arctic char, and Chinook salmon. Lakes and streams are stocked to enhance the sport fishing potential. Other fish on Eielson AFB managed lands include indigenous northern pike, burbot, whitefish, lake chub, and longnose sucker.

3.3.4 Threatened, Endangered Species, or Sensitive Species

3.2.4.1 In FY93, Eielson contracted a biological survey for all base managed lands. One objective of the survey was to inventory and map the occurrence of all federal and state listed and proposed threatened and endangered species and their habitats. A final report was published in August 1994. No listed or proposed threatened or endangered species and critical habitats were found to occur on base lands.

3.2.4.2 Several species of birds and mammals that occur in the area have been identified as a sensitive species or of particular concern. They have been classified as sensitive either because they are subject to special protection of the law (such as eagles) or because they have appeared in various listings of species of concern, most notably as former federal Category 2 candidate species or as state Species of Special Concern. Besides the American Peregrine Falcon, sensitive species known to occur in the area include the Bald Eagle, Golden Eagle, Northern Goshawk, Harlequin Duck, Olive-sided Flycatcher. The population of these species in Alaska is considered healthy with the exception of the Olive-sided Flycatcher, which is declining across its range (ABR 2000).

4.1 ENVIRONMENTAL CONSEQUENCES

Chapter 4 is organized by resource, with the environmental consequences evaluated for each alternative. This discussion provides a scientific and analytic basis for the comparisons of the alternatives and describes the probable consequences (impacts and effects) of each alternative on selected environmental resources. The effects of each alternative upon each resource are discussed in the same order that they were presented in Chapter 3, beginning with the Proposed Action. Impacts that are common to all alternatives are stated as such and are addressed in the appropriate sections.

The No Action Alternative would not implement an INRMP for Eielson AFB. As mandated by the Sikes Act (16 U.S.C. 670a et seq.) as amended, the Secretary of Defense is authorized to carry out a program of planning for, and the development, maintenance, and coordination of, wildlife, fish, and game conservation and rehabilitation in each military reservation. Selection of the No Action Alternative will result in the Air Force's noncompliance with this federal law in addition to noncompliance with other regulatory acts.

4.2 Physical Resources

4.2.1 Geology, Soils, and Permafrost

4.2.1.1 Impacts Common to all Action Alternatives

The INRMP provides protection and guidance for the development and use of areas with permafrost and areas classified as moist tundra. The INRMP includes plans to minimize erosion and sedimentation of soils and for the repair of damaged soil structure particularly that caused by the military mission.

4.2.1.2 Impacts Common to Proposed Action-Substantial Implementation of INRMP and Alternative 1-Full Implementation of INRMP

The Proposed Action would implement 100 percent of goals identified as high priority, 75 percent of medium priority goals, and 36 percent of low priority goals. Alternative 1 would implement 100 percent of high, medium, and low priority goals identified in the INRMP. Under these alternatives, the Geographic Information System (GIS) would be maintained. The GIS is a resource tool used to assist base planners in the environmental management decision-making process and is useful in evaluating land use effects.

4.2.1.3 Alternative 2-Minimal Implementation of INRMP

This alternative would take a less proactive approach to resource management and would implement 44 percent of goals identified as high priority, 1 percent of medium priority goals, and 0 percent of low priority goals. This alternative would place emphasis only on those actions required for compliance of federal and state regulations and mandated Air Force initiatives. The GIS would not be maintained under this alternative.

4.2.1.4 No Action Alternative

Although Natural Resource personnel are not the only staff on base that provide guidance and oversight for issues related to minimizing impacts to soils from base activities, they do provide an important source of local resource information and expertise that is extremely important in the protection and management of soil resources. It is likely that without the guidance provided by the INRMP and Natural Resources staff that increased impacts to soil resources from erosion, sedimentation, and inadequate soil resource protection would occur.

4.1.2 Climate and Air Quality

4.1.2.1 Impacts Common to all Alternatives

The Central Heat and Power Plant (CH&PP) located on main base has six coal-fired boilers, which are the largest air emission sources on Eielson AFB. The Air Force continues to monitor air quality in accordance with Eielson's ADEC Title V Air Quality operating permit. There would be no changes in air quality under the Proposed Action or alternatives.

4.1.3 Noise

4.1.3.1 Impacts Common to all Alternatives

In July 2001, the Fairbanks North Star Borough began restructuring the comprehensive land use plan. The plan provides the framework for the community to make decisions related to land use, future development, and preservation of natural resources. Although planning within the base boundaries is not under the borough's jurisdiction, the Air Force will continue coordination with the Fairbanks North Star Borough in order to avoid land use and noise conflicts between the air base and the surrounding community.

4.1.4 Ground and Surface Water

4.1.4.1 Impacts Common to all Action Alternatives

The INRMP includes management practices designed to minimize the impacts to erosion, sedimentation, and point and nonpoint water pollution in order to protect watersheds and water bodies on Eielson AFB managed lands. Management practices include the following:

- Revegetating disturbed areas.
- Monitoring the water quality of discharges from the industrial and sanitary wastewater treatment plant as required under the Alaska Department of Environmental Conservation Wastewater Disposal Permit at the outfall sampling station.
- Incorporation of a Storm Water Pollution Prevention Plan to prevent nonpoint water pollution in storm water runoff from urban developed areas.

4.1.4.2 No Action Alternative

The INRMP provides for management of all surface water systems that are located on base lands. If the INRMP is not implemented, significant impacts could result to surface water systems as a result of a lack of management and oversight that is provided for in the plan. This would include monitoring for water quality as well as implementing best management practices that would protect water systems from impacts that may occur as a result of base activities.

4.1.5 Wetlands

4.1.5.1 Impacts Common to all Action Alternatives

About 79 percent of the total acreage managed by Eielson AFB is wetlands and approximately 51.7 percent of the main base is wetlands. Eielson AFB recognizes the importance of floodplains and wetlands for natural moderation of floods, water quality maintenance, groundwater recharge, fish and wildlife habitat, recreation, and other functions. The Air Force places a high priority on wetlands and seeks to minimize the amount of wetlands impacted and comply with required mitigation. The INRMP includes mitigation measures and best management practices to protect wetlands. Wetlands and floodplain maps would be up-dated on an annual basis to aid base planners in the decision making process.

4.1.5.2 Impacts common to Proposed Action and Alternative 1

4.1.5.2.1 Under these alternatives, fish habitat would be developed in Bear Lake, Mullins Pit, and Cathers Lake and in new gravel borrow pits. The development of fish habitat creates a higher value wetland offering wildlife production and enhancing sport fishing potential. The

GIS system would be updated and maintained with these alternatives and would assist base planners in land use planning.

4.1.5.3 Alternative 2

Fish habitat would not be developed in Bear Lake, Mullins Pit, and Cathers Lake or in new gravel borrow pits. The GIS would not be maintained with this alternative.

4.1.5.4 No Action Alternative

Due to the preponderance of wetlands on Eielson AFB lands, it has been necessary to encroach on wetlands to provide additional facilities needed to meet the mission of the base. When a Corps of Engineers wetlands permit is obtained for these wetland fills, Eielson has provided for mitigation for wetland losses by incorporating into the design of gravel borrow pits the creation of enhanced wetland systems. The design and implementation of this mitigation for wetland losses is provided for in the INRMP. If no INRMP is implemented, this mitigation would not be undertaken and completed and Eielson AFB would be out of compliance with their permits.

4.2 Biological Resources

4.2.1 Vegetation

4.2.1.1 Impacts Common to Proposed Action and Alternative 1

Selection of these alternatives would include forestry resource management practices such as clearing and thinning for fire protection, insect and disease protection, personal use firewood sales, and Christmas tree sales. These actions would help protect base facilities in event of wildfire, enhance the overall health of the forest, and provide resources for base residents. Construction and maintenance of forest roads, forestry management of Arctic Survival Field Training Area, and updating urban forest map would also occur under these alternatives. These actions would contribute to the long-term health and sustainability of forest resources on base.

4.2.1.2 Alternative 2

The forestry resource management practices stated above would not be implemented. Benefits such as increased wildfire protection, improvement in overall health of forest, and personal use of forest products would be limited.

4.2.1.3 No Action Alternative

If the INRMP is not implemented numerous management programs and plans would not be undertaken that could have an effect on vegetation. Those programs listed in Sections 4.2.2.1 and 4.2.2.2 would not be accomplished. In addition, benefits associated with activities completed annually with the Tree City USA program would not be available.

4.2.2 Fish and Wildlife

The differences between the various alternatives are most noticeable in the management of fish and wildlife resources on Eielson AFB managed lands. Alternative 1 would offer the most comprehensive approach to management of fish and wildlife resources and would require additional funding in order to implement. Alternative 2 is the least comprehensive and takes a less proactive approach in the management of natural resources. The Proposed Action is the alternative that most closely resembles current resource management practices on Eielson AFB lands and is achievable with the funding that is annually available for the Natural Resources program.

4.2.2.1 Impacts Common to all Action Alternatives

4.2.2.1.1 Fish and wildlife practices would be incorporated into natural resource management of base lands as required by Air Force Initiative AFI 32-7064.

4.2.2.1.2 The airfield has about 1.2 surface acres of man-made ponds attractive to waterfowl and shorebirds. Waterfowl and shorebirds on the airfield are a possible threat to aircraft. Annually, Eielson conducts a bird harassment/depredation program in the bird exclusion zone and adjacent areas in accordance with Air Force policy. The harassment program consists of sound cannons, pyrotechnics, mylar tape, and bird detection and dispersal teams. The depredation program is conducted within the Bird Exclusion Zone and Waterfowl Exclusion Zone, but only after obtaining the required federal and state permits. There has not been a survey of the extent to which this program of bird harassment reduces annual bird nesting productivity; however there is no doubt that it has an affect. This is an acknowledged tradeoff that must be made to ensure the safety of military aircraft at Eielson AFB.

4.2.2.2 Impacts Common to Proposed Action and Alternative 1

4.2.2.2.1 The goal with these alternatives is to manage game and nongame fish and wildlife species for long-term sustainability, diversity, and productivity of the ecosystem considering the

needs of other natural resources. To achieve these goals, the INRMP uses an integrated ecosystem approach to resource management that includes the following management practices:

- Conduct ecosystem monitoring to measure the quality of habitat. Annual studies and surveys help evaluate the success of management goals and objectives, document habitat trends, and assist base planners and resource managers in the decision making process. Surveys and data collection would include items such as trapping and hunting harvest data, monitoring fish populations in lakes and streams, and inventory of winter/summer dissolved oxygen in lakes.
- Development and improvement of fish habitat conditions favorable to the production of indigenous and stocked species. The Alaska Department of Fish and Game stocks rainbow trout, arctic grayling, arctic char, and Chinook salmon in seven lakes and one stream on Eielson AFB. Lakes and streams are stocked to enhance the sport fishing potential.
- Maintain Moose Lake/Polaris Lake, Bear Lake, and Mullins Pit dikes. Maintenance of dikes is necessary to protect fish habitat.
- Resolve wildlife conflicts/problems such as nuisance beaver problems. Beaver populations need to be controlled as beaver dams can cause flooding of underground utilidors on base and cause problems in the waterways draining the main base area.

4.2.2.3 Alternative 1

4.2.2.3.1 Management practices resulting in additional surveys and data collection would occur with this alternative. Additional surveys would include avian survey, and conducting a creel census. The data collected from surveys would be used as a basis for making resource management decisions. The creel census would provide information on fishing use of lakes (total fisherman and hours spent fishing per lake), fish size, and fishing success (fish caught and kept per man-hour fished). A creel census provides a barometer by which to evaluate fish stocking.

4.2.2.3.2 The construction of Mullins Pit habitat development/wildlife display would also be accomplished under this alternative. This would be an interpretative resource display informing recreational users of the various habitat types located in the Mullins Pit Wildlife Management Area.

4.2.2.4 Alternative 2

Emphasis would be placed only on actions required for compliance of federal and state regulations. As a result, fish and wildlife management practices stated in Section 4.2.2.2 would not be implemented with selection of this alternative. This would result in decreased long-term sustainability, diversity, and productivity of the ecosystem compared to the Proposed Action and Alternative 1. In addition, related activities such as sport fishing would diminish due to lack of stocked fish in selected lakes and gravel pits.

4.2.2.5 No Action Alternative

Under the No Action Alternative none of the fish and wildlife management programs listed in the INRMP would be implemented. Numerous beneficial, habitat enhancing programs would not be undertaken with a resulting loss in productivity of Eielson AFB managed lands. In addition, several actions required by Corps of Engineers wetlands permits would not be completed, putting Eielson AFB out of compliance with their wetland permits.

4.2.3 Threatened or Endangered Species

4.2.3.1 Impacts Common to all Action Alternatives

In FY93, Eielson contracted a biological survey for all base managed lands. A final report was published in August 1994. No listed or proposed threatened or endangered species and critical habitats were found to occur on base lands. The Air Force will continue to monitor for the presence of listed or proposed threatened and endangered species and critical habitats on Eielson managed lands. Should any threatened or endangered species become resident to Eielson managed lands, consultation with the US Fish and Wildlife Service will be initiated.

4.2.3.2 No Action Alternative

No impacts to Threatened or Endangered Species would result if an INRMP were not implemented.

4.3 Cultural and Historic Resources

4.3.1 Impacts Common to all Alternatives

There would be no impact to cultural or historic resources with the implementation of these alternatives.

4.4 Recreational Resources

4.4.1 Impacts Common to Proposed Action and Alternative 1

Annual maintenance of outdoor recreation facilities and trails would be accomplished, thus providing continued use of facilities. Outdoor recreation facilities on Eielson AFB lands include a downhill skiing facility, cross-country ski trails, a parcours exercise trail, nature trail, campgrounds, shooting ranges, dog mushing trail, winter sports area, and other facilities.

4.4.2 Alternative 1

Selection of this alternative would result in an increase in outdoor recreation facilities and recreational opportunities and would include expansion of Heritage Park, and the establishment of canoe routes on French Creek. Heritage Park contains static displays of various aircraft that have been assigned to Eielson AFB, several memorials, and a pavilion. The park could be expanded to the south as aircraft are made available for the display. The establishment of canoe routes would provide recreational boating opportunities, and opportunity for fishing and wildlife observation for base and public users.

4.4.3 Alternative 2

There would be no annual maintenance of outdoor recreational facilities with this alternative. Facilities such as nature trials, dog mushing trials, and cross-country ski trails would eventually revegetate and become unusable over time. Outdoor recreational opportunities would decrease with this alternative.

4.4.4 No Action Alternative

Selection of this alternative would have an immediate impact on recreational resources available on base. The activities that are routinely undertaken under the direction of the INRMP are significant. Such activities as skiing, fishing, hiking, trapping, and hunting would either be eliminated or greatly diminished under this alternative.

4.5 Environmental Justice

4.5.1 Impacts Common to all Alternatives

4.5.1.1 Environmental justice, as it pertains to the NEPA process, requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. To accomplish these requirements the Air Force must conduct an environmental justice analysis of all potential impacts that may result from the proposed actions.

4.5.1.2 The residential populations of Eielson AFB are not distributed in such a manner that there are areas or neighborhoods that are low income or have concentrated within them minority populations. As a result, there would be no disproportionate impact to minority or low-income

populations as a result of implementation of any of the actions associated with the Proposed Action or Alternatives 1 and 2.

4.6 Cumulative Impacts

Cumulative impact is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Individual actions may result in minor impacts but collectively may result in significant actions taking place over a period of time. In general, nearly all the actions that would result from implementation of the INRMP would be cumulatively beneficial. Many of the programs that are described in the document either maintain existing resource values, or even enhance them, as is the case with the wetland enhancement projects at the gravel borrow pits. The greatest degree of cumulative benefits would result from Alternative 1and the Proposed Action. A lesser degree of cumulative benefits would result from Alternative 2. Selection of the No Action Alternative would likely result in some cumulative impacts as many of the monitoring programs that identify environmental impacts such as water quality monitoring and applying best management practices to base related construction activities, would not occur.

4.7 Unavoidable Adverse Impacts

The goal of INRMP plan is to integrate all management activities in a way that sustains and restores the health and integrity of ecosystems on Eielson AFB lands. Implementation of these alternatives would not result in adverse impacts. However, selection of the No Action Alternative would likely result in some unavoidable adverse impacts. These would be in the form of unmitigated wetland losses resulting from base activities and a lack of monitoring and oversight of base resources that could be in jeopardy from these activities.

4.8 Relationship of Short-Term Uses and Long-Term Productivity

4.8.1 Proposed Action and Alternative 1

The short-term uses and benefits with the substantial or full implementation of the INRMP is that all compliance regulations would be met and the USAF would achieve a healthy balance between natural resource enhancement and stewardship, while supporting the military mission. Proper management of natural resources would provide long-term sustainability, diversity, and productivity for the ecosystem on Eielson AFB managed lands.

4.8.2 Alternative 2

The short-term uses and benefits associated with this alternative are that the USAF would remain in compliance with federal and state regulations. Long-term sustainability, diversity, and productivity of the ecosystem would however, diminish with this limited approach to resource management.

4.9 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments are those that cannot be reversed, except perhaps in the extreme long term. Irretrievable commitments are those that are lost for a period of time.
There are no identifiable irreversible commitments associated with the Proposed Action, Alternative 1, or Alternative 2. The only irretrievable commitments of resources may be the loss of suitable habitat, fish and wildlife productivity, and outdoor recreation opportunities if Alternative 2, and to a greater extent, the No Action Alternative, were selected.

4.10 Mitigations

No mitigation would be required with the implementation of the Proposed Action or other alternatives. The INRMP does however include mitigation measures and best management practices to protect wetlands that are required by state and federal permits.

5.1 List of Preparers

5.2 Writers

The Environmental Assessment (EA) was prepared by Lyle Gresehover, Boreal Environmental Services and Technology, Fairbanks, Alaska

In addition Eielson CEV staff edited and produced the final document.

5.3 List of Agencies Consulted

Alaska Department of Fish and Game
Habitat Protection Division

Eielson AFB
Base Development
Environmental Quality
Environmental Planning
Horizontal Construction
Installation Restoration Section
Maintenance Engineering
Services Squadron

Fort Wainwright
Environmental Section

US Fish and Wildlife Service
Ecological Services - Fairbanks

6.0 Bibliography

Alaska's Wildlife and Habitat 1973. State of Alaska Department of Fish and Game

Ft. Wainwright Integrated Natural Resources Management Plan and Environmental Assessment 1998-2002, U.S. Army Alaska, Volume 3 – Fort Wainwright.

Freeman, L.H. 1995. Guidelines for NEPA Documents. Franklin Quest Co., Shipley Associates Division. Bountiful, Utah.
Integrated Natural Resource Management Plan Eielson Air Force Base June 1998-May 2003.
Resources of Alaska – A Regional Summary Joint Federal State Land Use Planning Commission 1974.

U.S. Air Force. 1995. Environmental Impact Statement of Alaska Military Operations Areas – Volume 1 – 3.

U.S. Army Alaska, Department of the Army.1998. Alaska Army Lands Withdrawal Renewal. Final Legislative Environmental Impact Statement Volume 1 – 2.

Viereck, L.A.; Dyrness, C.T.; Batten, A.R.; and Wenzlick, K.J. 1992. The Alaska Vegetation Classification. U.S. Department of Agriculture Forest Service.

APPENDIX K

Taxonomic Classes and General Characteristics of Soils Found at Eielson AFB

Histels, terric (9)

Composition: Histels, terric, and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Histels, terric and similar soils:
V*egetation:* sedges, low shrubs, stunted black spruce, and mosses
Organic mat on surface: 16 to 39 inches thick
Typical profile: 0 to 17 inches - black mucky peat
17 to 25 inches - very dark brown muck
25 to 29 inches - very dark brown frozen muck
25 to 39 inches - very dark gray frozen silt loam
Drainage class: very poorly drained
Permeability: rapid in the slightly decomposed surface peat, moderate to low in the subsurface peat, and impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July-Aug): 16 to 35 inches
Runoff: high
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 3.6 - 4.5/4.5 - 5.5

Mosquito peat (20)

Composition: Mosquito peat and similar inclusions - 85 percent and Contrasting inclusions - 15 percent

Characteristics of Mosquito peat and similar soils:
V*egetation:* stunted tamarack and black spruce, with shrub birch and cottonsedge under story
Organic mat on surface: 9 to22 inches (20 to 40 cm) thick
Typical profile: 0 to 10 inches - black peat and mucky peat
10 to 19 inches - dark gray and dark grayish brown mottled silt loam
19 to 29 inches - dark grayish brown frozen silt loam
Drainage class: very poorly drained
Permeability: moderate in organic mat and unfrozen mineral soil; impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July-August): 13 to 43 inches
Runoff: high
Depth to seasonally high water table: 0 to 12 inches or ponded
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.1/5.6 - 6.6

Goldstream peat, 0 to 3 percent slopes (21A)

Composition: Goldstream soil and similar inclusions - 80 percent and Contrasting inclusions - 20 percent

Characteristics of Goldstream and similar soils:
V*egetation:* stunted black spruce with low shrubs, sedge tussocks, and moss
Organic mat on surface: 8 to16 inches thick
Typical profile: 0 to 3 inches - dark brown peat
3 to 9 inches - black mucky peat
9 to 20 inches - very dark grayish brown and gray mucky silt loam
20 to 27 inches - gray frozen silt loam
Drainage class: very poorly drained
Permeability: rapid in the slightly decomposed organic matter, moderate in the unfrozen mineral soil; impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July-August): 12 to 24 inches
Runoff: high and very high
Depth to seasonally high water table: 0 to 6 inches or ponded
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 3.6 - 4.5/4.5 - 5.5

Goldstream peat, 3 to 7 percent slopes (21B)

Composition: Goldstream soil and similar inclusions - 85 percent and Contrasting inclusions - 15 percent

Characteristics of Goldstream and similar soils:
V*egetation:* stunted black spruce with low shrubs, sedge tussocks, and moss
Organic mat on surface: 8 to16 inches (20 to 40 cm) thick
Typical profile: 0 to 3 inches - dark brown peat
3 to 9 inches - black mucky peat
9 to 20 inches - very dark grayish brown and gray mucky silt loam
20 to 27 inches - gray frozen silt loam
Drainage class: very poorly drained
Permeability: rapid in the slightly decomposed organic matter, moderate in the unfrozen mineral soil; impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July-August): 12 to 24 inches
Runoff: high and very high
Depth to seasonally high water table: 0 to 6 inches or ponded
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 3.6 - 4.5/4.5 - 5.5

Tanacross peat (22)

Composition: Tanacross peat and similar inclusions - 85 percent and Contrasting inclusions - 15 percent

Characteristics of Tanacross peat and similar soils:
V*egetation:* stunted black spruce trees, with low shrubs and moss ground cover
Organic mat on surface: 8 to 16 inches thick
Typical profile: 0 to 9 inches - dark brown peat
9 to 12 inches - black mucky silt loam
12 to 20 inches - dark gray and dark yellowish brown stratified sand and silt loam
20 to 40 inches - dark gray and dark yellowish brown frozen stratified sand and silt loam
Drainage class: poorly drained
Permeability: rapid in the slightly decomposed organic matter, moderate in the unfrozen mineral soil; impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July-Aug): 12 to 28 inches
Runoff: high
Depth to seasonally high water table: 0 to 10 inches or ponded
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 3.5 - 5.0/5.1 - 6.0

Tanana silt loam (25)

Composition: Tanana soils and similar inclusions - 85 percent and Contrasting inclusions - 15 percent

Characteristics of Tanana and similar soils:
V*egetation:* black spruce, paper birch, and willows
Organic mat on surface: 2 to 8 inches thick
Typical profile: 0 to 5 inches - very dark brown slightly decomposed forest litter
5 to 29 inches - very dark grayish brown, grayish brown and dark gray silt loam
29 to 39 inches - dark grayish brown frozen silt loam
Drainage class: poorly drained
Permeability: moderate in the unfrozen mineral soil, impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July - Aug.): 15 to 30 inches
Runoff: high
Depth to seasonally high water table: 12 to 24 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 3.5 - 5.0/5.1 - 6.0

Eielson - Piledriver complex, occasionally flooded (31)

Composition: Eielson soils and similar inclusions - 50 percent, Piledriver soils and similar inclusions - 40 percent, and Contrasting inclusions - 10 percent

Characteristics of Eielson and similar soils:
V*egetation:* white spruce and balsam poplar forest
Organic mat on surface: 1 to 5 inches
Typical profile: 0 to 3 inches - very dark brown slightly decomposed forest litter
3 to 28 inches - dark grayish brown silt loam or very fine sandy loam
28 to 65 inches - olive brown and dark gray mottled stratified very fine sandy loam and sand
65 to 69 inches - very dark gray silt loam
Drainage class: somewhat poorly drained
Permeability: moderate
Available water capacity: high
Depth to contrasting sandy and gravelly material: more than 40 inches
Runoff: negligible
Depth to seasonally high water table: 35 to 60 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 7.1/5.6 - 7.1

Characteristics of Piledriver and similar soils:
V*egetation:* paper birch and white spruce forest
Organic mat on surface: 1 to 5 inches
Typical profile: 0 to 3 inches - dark brown slightly decomposed forest litter and moss
3 to 15 inches - light olive brown mottled very fine sandy loam or silt loam
15 to 33 inches - grayish brown mottled loamy fine sand
33 to 45 inches - grayish brown extremely gravely sand
Drainage class: somewhat poorly drained
Permeability: permeability is moderate in the upper part and rapid in underlying material
Available water capacity: low
Depth to contrasting sandy and gravelly material: 10 to 40 inches
Runoff: negligible
Depth to seasonally high water table: 35 to 60 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.63 - 6.6/5.1 - 6.5

Salchaket very fine sandy loam (32)

Composition: Salchaket soils and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Salchaket and similar soils:
V*egetation:* white spruce, balsam poplar, and paper birch forest
Organic mat on surface: 1 to 7 inches
Typical profile: 0 to 2 inches dark brown partially decomposed forest litter
2 to 10 inches - olive brown stratified very fine sandy loam and very fine sand
10 to 55 inches - dark grayish brown mottled stratified very fine sandy loam, loamy very fine sand and loamy fine sand
55 to 75 inches - dark grayish brown sand or stratified sand and gravel
Drainage class: well drained
Permeability: moderate in the loamy soil and rapid in the gravelly substratum
Available water capacity: high
Depth to contrasting sandy and gravelly material: more than 40 inches
Runoff: negligible
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed.
Surface pH/subsoil pH: 5.1 - 6.0/5.6 - 6.5

North Pole very fine sandy loam (35)

Composition: North Pole and similar inclusions: 70 percent and Contrasting inclusions: 30 percent

Characteristics of North Pole and similar soils:
V*egetation:* tamarack and black spruce forest, with bog birch and Labrador tea understory and moss ground cover
Organic mat on the surface: 2 to 7 inches thick
Typical profile: 0 to 7 inches - dark brown and black slightly to well-decomposed forest litter and moss
7 to 32 inches - variegated stratified very fine sandy loam, silt loam, loamy very fine sand and loamy fine sand
32 to 51 inches - grayish brown loamy sand, sand, gravelly or very gravelly sand
Drainage class: poorly drained
Permeability: Permeability is restricted by seasonally frozen soil in early summer; when thawed, permeability is moderate in the upper part and rapid in underlying material
Available water capacity: low
Depth to contrasting sandy or gravelly material: 10 to 35 inches
Runoff: negligible
Depth to seasonally high water table: 20 to 40 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 6.1 - 7.3/6.1 - 7.3

Jarvis very fine sandy loam (36)

Composition: Jarvis soils and similar inclusions - 85 percent and Contrasting inclusions - 15 percent

Characteristics of Jarvis and similar soils:
V*egetation:* white spruce, balsam poplar, and paper birch forest
Organic mat on the surface: 2 to 5 inches thick
Typical profile: 0 to 3 inches - black to brown peat
3 to 6 inches - olive brown and olive gray mottled very fine sandy loam
6 to 24 inches - variegated stratified fine sand and very fine sand
24 to 51 inches - gray sand, loamy sand, gravelly and very gravelly sand
Drainage class: well drained
Permeability: moderate in the loamy upper part; rapid to excessive in the underlying sand and gravel
Available water capacity: low
Depth to contrasting sand and gravel: 10 to 40 inches
Runoff: negligible
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.6/5.1 - 6.5

Chena very fine sandy loam (37)

Composition: Chena soils and similar inclusions - 95 percent and Contrasting inclusions - 5 percent

Characteristics of Chena and similar soils:
V*egetation:* white spruce and balsam poplar forest
Organic mat on the surface: 0 to 6 inches thick
Typical profile: 0 to 3 inches - very dark gray slightly decomposed forest litter
3 to 6 inches - olive brown and olive gray mottled very fine sandy loam
6 to 10 inches - dark grayish brown stratified very fine sandy loam and fine sand
10 to 41 inches - grayish brown grayish brown sand, loamy sand, gravelly to extremely gravelly sand
Drainage class: excessively drained
Permeability: moderate in the loamy surface soil, rapid in the sand and gravel
Available water capacity: low
Depth to contrasting sand and gravel: 0 to 9 inches
Runoff: negligible
Depth to seasonally high water table: 72 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.0/5.1 - 6.5

Chatanika silt loam, 0 to 3 percent slopes (40A)

Composition: Chatanika soils and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Chatanika and similar soils:
V*egetation:* black spruce and paper birch forest
Organic mat on the surface: 2 to 8 inches thick
Typical profile: 0 to 4 inches - very dark grayish brown slightly decomposed forest litter
4 to 6 inches - very dark grayish brown mucky silt loam
6 to 9 inches - grayish brown silt loam and very dark grayish brown mucky silt loam
9 to 21 inches - grayish brown mottled silt loam
21 to 24 inches - grayish brown mottled frozen silt loam
Drainage class: poorly drained
Permeability: rapid in the slightly decomposed organic matter, moderate in the mineral soil above the permafrost, impermeable in the permafrost
Available water capacity: high
Depth to frozen soil (July-August): 12 to 40 inches
Runoff: low
Depth to seasonally high water table: 12 to 24 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 6.1/4.5 - 5.5

Chatanika silt loam, 3 to 7 percent slopes (40B)

Composition: Chatanika soils and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Chatanika and similar soils:
V*egetation:* black spruce and paper birch forest
Organic mat on the surface: 2 to 8 inches thick
Typical profile: 0 to 4 inches - very dark grayish brown slightly decomposed forest litter
4 to 6 inches - very dark grayish brown mucky silt loam
6 to 9 inches - grayish brown silt loam and very dark grayish brown mucky silt loam
9 to 21 inches - grayish brown mottled silt loam
21 to 24 inches - grayish brown mottled frozen silt loam
Drainage class: poorly drained
Permeability: rapid in the slightly decomposed organic matter, moderate in the mineral soil above the permafrost, impermeable in the permafrost
Available water capacity: high
Depth to frozen soil (July-August): 12 to 40 inches
Runoff: medium

Depth to seasonally high water table: 12 to 24 inches
Hazard of erosion: by water - none if organic mat is not removed, moderate if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 6.1/4.5 - 5.5

Chatanika silt loam, 12 to 20 percent slopes (40D)

Composition: Chatanika soils and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Chatanika and similar soils:
V*egetation:* black spruce and paper birch forest
Organic mat on the surface: 2 to 8 inches thick
Typical profile: 0 to 4 inches - very dark grayish brown slightly decomposed forest litter
4 to 6 inches - very dark grayish brown mucky silt loam
6 to 9 inches - grayish brown silt loam and very dark grayish brown mucky silt loam
9 to 21 inches - grayish brown mottled silt loam
21 to 24 inches - grayish brown mottled frozen silt loam
Drainage class: poorly drained
Permeability: rapid in the slightly decomposed organic matter, moderate in the mineral soil above the permafrost, impermeable in the permafrost
Available water capacity: high
Depth to frozen soil (July-August): 12 to 40 inches
Runoff: very high
Depth to seasonally high water table: 12 to 24 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 6.1/4.5 - 5.5

Minto silt loam, 0 to 3 percent slopes (41A)

Composition: Minto soils and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Minto and similar soils:
V*egetation:* paper birch and white spruce forest
Organic mat on the surface: 2 to 6 inches thick
Typical profile: 0 to 5 inches - dark brown slightly decomposed forest litter
5 to 9 inches - very dark grayish brown silt loam
9 to 16 inches - light olive brown mottled silt loam
16 to 70 inches - grayish brown mottled silt loam
Drainage class: moderately well drained
Permeability: moderate
Available water capacity: very high
Depth to frozen soil (July-August): more than 71 inches

Runoff: low
Depth to seasonally high water table: 3 to 5 feet
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 5.5/4.5 - 5.0

Minto silt loam, 3 to 7 percent slopes (41B)
Composition: Minto soils and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Minto and similar soils:
V*egetation:* paper birch and white spruce forest
Organic mat on the surface: 2 to 6 inches thick
Typical profile: 0 to 5 inches - dark brown slightly decomposed forest litter
5 to 9 inches - very dark grayish brown silt loam
9 to 16 inches - light olive brown mottled silt loam
16 to 70 inches - grayish brown mottled silt loam
Drainage class: moderately well drained
Permeability: moderate
Available water capacity: very high
Depth to frozen soil (July-August): more than 71 inches
Runoff: medium
Depth to seasonally high water table: 3 to 5 feet
Hazard of erosion: by water - none if organic mat is not removed, moderate if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 5.5/4.5 - 5.0

Minto silt loam, 7 to 12 percent slopes (41C)

Composition: Minto soils and similar inclusions - 85 percent and Contrasting inclusions - 15 percent

Characteristics of Minto and similar soils:
V*egetation:* paper birch and white spruce forest
Organic mat on the surface: 2 to 6 inches thick
Typical profile: 0 to 5 inches - dark brown slightly decomposed forest litter
5 to 9 inches - very dark grayish brown silt loam
9 to 16 inches - light olive brown mottled silt loam
16 to 70 inches - grayish brown mottled silt loam
Drainage class: moderately well drained
Permeability: moderate
Available water capacity: very high
Depth to frozen soil (July-August): more than 71 inches
Runoff: medium
Depth to seasonally high water table: 3 to 5 feet

Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 5.5/4.5 - 5.0

Minto silt loam, 12 to 20 percent slopes (41D)

Composition: Minto soils and similar inclusions - 85 percent and Contrasting inclusions - 15 percent
Characteristics of Minto and similar soils:
V*egetation:* paper birch and white spruce forest
Organic mat on the surface: 2 to 6 inches thick
Typical profile: 0 to 5 inches - dark brown slightly decomposed forest litter
5 to 9 inches - very dark grayish brown silt loam
9 to 16 inches - light olive brown mottled silt loam
16 to 70 inches - grayish brown mottled silt loam
Drainage class: moderately well drained
Permeability: moderate
Available water capacity: very high
Depth to frozen soil (July-August): more than 71 inches
Runoff: medium
Depth to seasonally high water table: 3 to 5 feet
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 5.5/4.5 - 5.0

Fairbanks silt loam, 3 to 7 percent slopes (42B)

Composition: Fairbanks soils and similar inclusions - 85 percent and Contrasting inclusions - 15 percent

Characteristics of Fairbanks and similar soils:
V*egetation:* white spruce, paper birch and quaking aspen forest
Organic mat on the surface: 1 to 6 inches
Typical profile: 0 to 3 inches - slightly decomposed forest litter
3 to 9 inches - very dark grayish brown silt loam
9 to 71 inches - light olive brown or grayish brown mottled silt loam
Drainage class: well drained
Permeability: moderate
Available water capacity: very high
Depth to weathered bedrock: more than 40 inches
Runoff: low
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, moderate if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.0/5.6 - 6.0

Fairbanks silt loam, 7 to 12 percent slopes (42C)

Composition: Fairbanks soils and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Fairbanks and similar soils:
V*egetation:* white spruce, paper birch and quaking aspen forest
Organic mat on the surface: 1 to 6 inches
Typical profile: 0 to 3 inches - slightly decomposed forest litter
3 to 9 inches - very dark grayish brown silt loam
9 to 71 inches - light olive brown or grayish brown mottled silt loam
Drainage class: well drained
Permeability: moderate
Available water capacity: very high
Depth to weathered bedrock: more than 40 inches
Runoff: medium
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.0/5.6 - 6.0

Fairbanks silt loam, strongly sloping and steep (42CG)

Composition: Fairbanks strongly sloping and similar inclusions - 65 percent, Fairbanks steep and similar inclusions - 25 percent, and Contrasting inclusions - 10 percent

Characteristics of Fairbanks strongly sloping and similar soils:
V*egetation:* white spruce, paper birch and quaking aspen forest
Organic mat on the surface: 1 to 6 inches
Typical profile: 0 to 3 inches - slightly decomposed forest litter
3 to 9 inches - very dark grayish brown silt loam
9 to 71 inches - light olive brown or grayish brown mottled silt loam
Drainage class: well drained
Permeability: moderate
Available water capacity: very high
Depth to weathered bedrock: more than 40 inches
Runoff: medium
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.63 - 6.0/5.6 - 6.0

Characteristics of Fairbanks steep and similar soils:
V*egetation:* white spruce, paper birch and quaking aspen forest
Organic mat on the surface: 1 to 6 inches
Typical profile: 0 to 3 inches - decomposed forest litter

3 to 9 inches - very dark grayish brown silt loam
9 to 71 inches - light olive brown or grayish brown mottled silt loam
Drainage class: well drained
Permeability: moderate
Available water capacity: very high
Depth to weathered bedrock: more than 40 inches
Runoff: high
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.0/5.6 - 6.0

Fairbanks silt loam, 12 to 20 percent slopes (42D)

Composition: Fairbanks soils and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Fairbanks and similar soils:
V*egetation:* white spruce, paper birch and quaking aspen forest
Organic mat on the surface: 1 to 6 inches thick
Typical profile: 0 to 3 inches - slightly decomposed forest litter
3 to 9 inches - very dark grayish brown silt loam
9 to 71 inches - light olive brown or grayish brown mottled silt loam
Drainage class: well drained
Permeability: moderate
Available water capacity: very high
Depth to weathered bedrock: more than 40 inches
Runoff: low
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.0/5.6 - 6.0

Fairbanks silt loam, more than 45 percent slopes (42G)

Composition: Fairbanks soils and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Fairbanks and similar soils:
V*egetation:* white spruce, paper birch and quaking aspen forest
Organic mat on the surface: 1 to 6 inches thick
Typical profile: 0 to 3 inches - slightly decomposed forest litter
3 to 9 inches - very dark grayish brown silt loam
9 to 71 inches - light olive brown or grayish brown mottled silt loam
Drainage class: well drained

Permeability: moderate
Available water capacity: very high
Depth to weathered bedrock: more than 40 inches
Runoff: high
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.0/5.6 - 6.0

Steese silt loam, 7 to 12 percent slopes (44C)

Composition: Steese soils and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Steese and similar soils:
V*egetation:* paper birch, white spruce, and quaking aspen forest with alder shrubs
Organic mat on the surface: 1 to 6 inches thick
Typical profile: 0 to 2 inches - dark brown slightly decomposed forest litter
2 to 5 inches - brown silt loam
5 to 27 inches - light olive gray mottled silt loam
27 to 33 inches - light olive brown channery silt loam
33 to 35 inches - highly weathered schist bedrock
Drainage class: well drained
Permeability: moderate
Available water capacity: moderate to high
Depth to bedrock: 20 to 40 inches
Runoff: medium
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.0/5.1 - 6.0

Steese silt loam, 12 to 20 percent slopes (44D)

Composition: Steese soils and similar inclusions - 80 percent and Contrasting inclusions - 20 percent

Characteristics of Steese and similar soils:
V*egetation:* paper birch, white spruce, and quaking aspen forest
Organic mat on surface: 1 to 6 inches thick
Typical profile: 0 to 2 inches - dark brown slightly decomposed forest litter
2 to 5 inches - brown silt loam
5 to 27 inches - light olive gray mottled silt loam
27 to 33 inches - light olive brown channery silt loam
33 to 35 inches - highly weathered schist bedrock
Drainage class: well drained
Permeability: moderate

Available water capacity: moderate to high
Depth to weathered bedrock: 20 to 40 inches
Runoff: medium
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.0/5.6 - 6.0

Gilmore silt loam, 12 to 20 percent slopes (45D)

Composition: Gilmore soils and similar inclusions - 85 percent and Contrasting inclusions - 15 percent

Characteristics of Gilmore and similar soils:
V*egetation:* white spruce, paper birch, and quaking aspen forest
Organic mat on surface: 2 to 4 inches thick
Typical profile: 0 to 3 inches - partially decomposed forest litter and moss
3 to 13 inches - dark brown or dark yellowish brown silt loam
13 to 16 inches - olive brown channery silt loam
16 inches - weathered fractured schist bedrock
Drainage class: well drained
Permeability: moderate
Available water capacity: moderate to high
Depth to bedrock: less than 20 inches
Runoff: very high
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.0/5.6 - 6.0

Gilmore silt loam, 20 to 30 percent slopes (45E)

Composition: Gilmore soils and similar inclusions - 85 percent and Contrasting inclusions - 15 percent

Characteristics of Gilmore and similar soils:
V*egetation:* white spruce, paper birch, and quaking aspen forest
Organic mat on surface: 2 to 4 inches thick
Typical profile: 0 to 3 inches - partially decomposed forest litter and moss
3 to 13 inches - dark brown or dark yellowish brown silt loam
13 to 16 inches - olive brown channery silt loam
16 inches - weathered fractured schist bedrock
Drainage class: well drained
Permeability: moderate
Available water capacity: moderate to high
Depth to bedrock: less than 20 inches

Runoff: very high
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.0/5.6 - 6.0

Saulich peat, 3 to 7 percent slopes (51B)

Composition: Saulich soils and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Saulich and similar soils:
V*egetation:* sparse forest of black spruce with an understory of low shrubs
Organic mat on surface: 8 to 16 inches thick
Typical profile: 0 to 9 inches - very dark brown peat
9 inches to 16 - black and dark brown mucky peat
16 to 21 inches - very dark grayish brown and black mottled silt loam
21 to 39 inches - dark grayish brown frozen silt loam with clear ice lenses
Drainage class: poorly drained
Permeability: rapid in the fibric organic matter, moderate in the thawed mineral soil and impermeable in the frozen soil
Available water capacity: high
Depth to the frozen soil (July-August): 11 to 18 inches
Runoff: very high
Depth to seasonally high water table: 6 to 18 inches
Hazard of erosion: by water - none if organic mat is not removed, moderate if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 5.5/5.1 - 6.6

Saulich peat, 7 to 12 percent slopes (51C)

Composition: Saulich soils and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Saulich and similar soils:
V*egetation:* sparse forest of black spruce with an understory of low shrubs
Organic mat on surface: 8 to 16 inches (20 to 40 cm) thick
Typical profile: 0 to 9 inches - very dark brown peat
9 inches to 16 - black and dark brown mucky peat
16 to 21 inches - very dark grayish brown and black mottled silt loam
21 to 39 inches - dark grayish brown frozen silt loam with clear ice lenses
Drainage class: poorly drained
Permeability: rapid in the fibric organic matter, moderate in the thawed mineral soil and impermeable in the frozen soil
Available water capacity: high
Depth to the frozen soil (July-August): 11 to 18 inches

Runoff: very high
Depth to seasonally high water table: 6 to 18 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 5.5/5.1 - 6.6

Piledriver very fine sandy loam (61)

Composition: Piledriver and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Piledriver and similar soils:
V*egetation:* white spruce, paper birch, and balsam poplar forest
Organic mat on the surface: 2 to 6 inches thick
Typical profile: 0 to 3 inches - dark brown slightly decomposed forest litter and moss
3 to 15 inches - light olive brown mottled very fine sandy loam or silt loam
15 to 33 inches - grayish brown mottled loamy fine sand
33 to 45 inches - grayish brown extremely gravely sand
Drainage class: somewhat poorly drained
Permeability: moderate in the upper part and rapid in underlying material
Depth to contrasting sand and gravel: 12 to 40 inches
Available water capacity: low
Runoff: negligible
Depth to seasonally high water table: 35 to 60 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.6/5.1 - 6.5

Peede-Mosquito complex (62)

Composition: Peede soils and similar inclusions - 60 to 80 percent, Mosquito soils and similar inclusions - 20 to 30 percent, and Contrasting inclusions - 10 percent

Characteristics of Peede and similar soils:
V*egetation:* grass and sedge vegetation with some willow shrubs
Organic mat on the surface: 2 to 6 inches thick
Typical profile: 0 to 5 inches - very dark brown moderately decomposed sedge peat
5 to 40 inches - dark gray mottled silt loam
40 to 55 inches - dark greenish gray mottled very fine sandy loam
55 to 70 inches - dark olive gray fine sand
Drainage class: very poorly drained
Permeability: moderate
Depth to contrasting sand and gravel: 40 to more than 60 inches
Available water capacity: high
Runoff: negligible
Depth to seasonally high water table: 0 to 12 inches or ponded

Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 6.1 - 7.3/6.1 - 7.3

Characteristics of Mosquito and similar soils:
V*egetation:* tamarack and black spruce, with shrub birch and cottonsedge in the understory
Organic mat on the surface: 9 to 22 inches thick
Typical profile: 0 to10 inches - black peat and mucky peat
10 to 19 inches - dark gray and dark grayish brown mottled silt loam
19 to 29 inches - dark grayish brown frozen silt loam
Drainage class: very poorly drained
Permeability: moderate in the unfrozen soil, impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July - Aug): 13 to 28 inches
Runoff: high
Depth to seasonally high water table: 0 to 12 inches or ponded
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.1/5.6 - 6.6

Eielson-Tanana complex (64)

Composition: Eielson soils and similar inclusions - 30 to 60 percent, Tanana soils and similar inclusions - 20 to 50 percent, and Contrasting inclusions - 15 percent

Characteristics of Eielson and similar soils:
V*egetation:* white spruce, paper birch and balsam poplar forest
Organic mat on the surface: 2 to 6 inches thick
Typical profile: 0 to 3 inches - very dark brown slightly decomposed forest litter
3 to 28 inches - dark grayish brown silt loam or very fine sandy loam
28 to 65 inches - olive brown and dark gray mottled stratified very fine sandy loam and sand
65 to 69 inches - very dark gray silt loam
Drainage class: somewhat poorly drained
Permeability: moderate
Depth to contrasting sand and gravel: 40 to more than 60 inches
Available water capacity: high
Runoff: negligible
Depth to seasonally high water table: 35 to 60 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 7.1/5.6 - 7.1

Characteristics of Tanana and similar soils:
V*egetation:* black spruce, paper birch, and willows
Organic mat on the surface: 2 to 8 inches thick

Typical profile: 0 to 5 inches - very dark brown slightly decomposed forest litter
5 to 29 inches - very dark grayish brown, grayish brown and dark gray silt loam
29 to 39 inches - dark grayish brown frozen silt loam
Drainage class: poorly drained
Permeability: moderate above the frozen soil, impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July - Aug.): 15 to 30 inches
Runoff: high
Depth to seasonally high water table: 12 to 24 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 3.5 - 5.0/5.1 - 6.0

Chatanika-Goldstream complex, 0 to 3 percent slopes (211)

Composition: Goldstream soils and similar inclusions - 60 percent, Chatanika soils and similar inclusions - 20 percent, and Contrasting inclusions - 20 percent

Characteristics of Chatanika and similar soils:
V*egetation:* paper birch and black spruce forest
Organic mat on the surface: 2 to 8 inches thick
Typical profile: 0 to 4 inches - very dark grayish brown slightly decomposed forest litter
4 to 6 inches - very dark grayish brown mucky silt loam
6 to 9 inches - grayish brown silt loam and very dark grayish brown mucky silt loam
9 to 21 inches - grayish brown mottled silt loam
21 to 24 inches - grayish brown mottled frozen silt loam
Drainage class: poorly drained
Permeability: rapid in the slightly decomposed organic matter, moderate in the unfrozen mineral soil, impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July-August): 16 to 40 inches
Runoff: low
Depth to seasonally high water table: 12 to 24 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 6.1/4.5 - 5.5

Characteristics of Goldstream and similar soils:
V*egetation:* stunted black spruce with low shrubs, sedge tussocks, and moss
Organic mat on surface: 8 to16 inches thick
Typical profile: 0 to 3 inches - dark brown peat
3 to 9 inches - black mucky peat
9 to 20 inches - very dark grayish brown and gray mucky silt loam
20 to 27 inches - gray frozen silt loam
Drainage class: very poorly drained

Permeability: rapid in the slightly decomposed organic matter, moderate in the unfrozen mineral soil; impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July-August): 14 to 24 inches
Runoff: high
Depth to seasonally high water table: 0 to 6 inches or ponded
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 3.6 - 4.5/4.5 - 5.5

Goldstream-Bolio complex, 0 to 3 percent slopes (212)

Composition: Goldstream soil and similar inclusions - 50 percent, Bolio and similar inclusions - 40 percent, and Contrasting inclusions - 10 percent

Characteristics of Goldstream and similar soils:
V*egetation:* stunted black spruce with low shrubs, sedge tussocks, and moss
Organic mat on surface: 8 to16 inches thick
Typical profile: 0 to 3 inches - dark brown peat
3 to 9 inches - black mucky peat
9 to 20 inches - very dark grayish brown and gray mucky silt loam
20 to 27 inches - gray frozen silt loam
Drainage class: very poorly drained
Permeability: rapid in the slightly decomposed organic matter, moderate in the unfrozen mineral soil; impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July-August): 14 to 24 inches
Runoff: high
Depth to seasonally high water table: 0 to 6 inches or ponded
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 3.6 - 4.5/4.5 - 5.5

Characteristics of Bolio peat and similar soils:
V*egetation:* sedge tussocks, low shrubs, stunted tamarack and black spruce, and mosses
Organic mat on surface: >16 inches thick
Typical profile: 0 to 6 inches - strong brown peat
6 to 23 inches - black and very dark gray mucky peat
23 to 26 inches - very dark grayish brown frozen mucky peat
Drainage class: very poorly drained
Permeability: rapid in the slightly decomposed organic matter, moderate to low in the more highly decomposed organic matter, impermeable in the permafrost
Available water capacity: high
Depth to frozen soil (July-Aug): 16 to 28 inches
Runoff: negligible
Depth to seasonally high water table: 0 to 6 inches or ponded

Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 3.6 - 5.5/3.6 - 6.0

Tanana-Mosquito complex (251)

Composition: Tanana soils and similar inclusions - 70 percent, Mosquito soils and similar inclusions - 20 percent, and Contrasting inclusions - 10 percent
Characteristics of Tanana and similar soils:
V*egetation:* black spruce, with low shrubs and moss groundcover
Organic mat on surface: 2 to 8 inches thick
Typical profile: 0 to 5 inches - very dark brown slightly decomposed forest litter
5 to 29 inches - very dark grayish brown, grayish brown and dark gray silt loam
29 to 39 inches - dark grayish brown frozen silt loam
Drainage class: poorly drained
Permeability: moderate in the unfrozen mineral soil, impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July - Aug.): 15 to 30 inches
Runoff: high
Depth to seasonally high water table: 12 to 24 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 3.5 - 5.0/5.1 - 6.0

Characteristics of Mosquito peat and similar soils:
V*egetation:* tamarack and black spruce, with shrub birch and cottonsedge in the understory
Organic mat on the surface: 4 to 16 inches thick
Typical profile: 0 to10 inches - black peat and mucky peat
10 to 19 inches - dark gray and dark grayish brown mottled silt loam
19 to 29 inches - dark grayish brown frozen silt loam
Drainage class: very poorly drained
Permeability: moderate in the organic mat and unfrozen mineral soil; impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July - Aug): 13 to 43 inches
Runoff: high
Depth to seasonally high water table: 0 to 12 inches or ponded
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.1/5.6 - 6.6

Jarvis-Chena complex (361)

Composition: Jarvis soil and similar inclusions - 60 percent, Chena soils and similar inclusions - 30 percent, and Contrasting inclusions - 20 percent
Characteristics of Jarvis and similar soils:

V*egetation:* white spruce, balsam poplar, and paper birch and forest
Organic mat on the surface: 2 to 5 inches thick
Typical profile: 0 to 3 inches - black to brown peat
3 to 6 inches - olive brown and olive gray mottled very fine sandy loam
6 to 24 inches - variegated stratified fine sand and very fine sand
24 to 51 inches - gray sand, loamy sand, gravelly and very gravelly sand
Drainage class: well drained
Permeability: moderate in the upper part; rapid to excessive in the underlying material
Available water capacity: low
Depth to contrasting sand and gravel: 10 to 40 inches
Runoff: negligible
Depth to seasonally high water table: > 72 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.6/5.1 - 6.5

Characteristics of Chena and similar soils:
V*egetation:* paper birch and white spruce forest
Organic mat on the surface: 0 to 6 inches thick
Typical profile: 0 to 3 inches - very dark gray slightly decomposed forest litter
3 to 6 inches - olive brown and olive gray very fine sandy loam
6 to 10 inches - dark grayish brown stratified very fine sandy loam and fine sand
10 to 41 inches - grayish brown grayish brown sand, loamy sand, gravelly to extremely gravelly sand
Drainage class: excessive
Permeability: moderate in the loamy surface soil, rapid in the sand and gravel
Available water capacity: low
Depth to contrasting sand and gravel: 0 to 9 inches
Runoff: negligible
Depth to seasonally high water table: >72 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.0/5.6 - 6.5

Piledriver-Fubar complex (362)

Composition: Piledriver soil and similar inclusions - 40 percent, Fubar soils and similar inclusions - 40 percent, and Contrasting inclusions - 20 percent

Characteristics of Piledriver and similar soils:
V*egetation:* and white spruce, balsam poplar, and paper birch forest
Organic mat on the surface: 2 to 7 inches thick
Typical profile: 0 to 3 inches - dark brown slightly decomposed forest litter and moss
3 to 15 inches - light olive brown mottled very fine sandy loam or silt loam
15 to 33 inches - grayish brown mottled loamy fine sand
33 to 45 inches - grayish brown extremely gravely sand

Drainage class: somewhat poorly drained
Permeability: moderate in the upper part and rapid in underlying sand and gravel
Available water capacity: low
Depth to contrasting sand and gravel: 10 to 40 inches
Runoff: negligible
Depth to seasonally high water table: 35 to 60 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.6/5.1 - 6.5

Characteristics of Fubar and similar soils:
V*egetation:* white spruce, balsam poplar, and paper birch forest
Organic mat on the surface: 2 to 8 inches thick
Typical profile: 0 to 4 inches - dark brown and black slightly and partially decomposed forest litter
4 to 10 inches - grayish brown silt loam
10 to 55 inches - dark grayish brown stratified sand and fine sand
55 to 71 inches - very dark gray very gravelly loamy fine sand
Drainage class: moderately well drained
Permeability: moderate in the loamy surface soil, rapid in the sand and gravel
Available water capacity: very low
Depth to contrasting sand and gravel: 1 to 10 inches
Runoff: negligible
Depth to seasonally high water table: 36 to 72 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.1/5.6 - 6.5

Jarvis-Salchaket complex (363)

Composition: Jarvis soil and similar inclusions - 45 percent, Salchaket soils and similar inclusions - 35 percent, and Contrasting inclusions - 20 percent

Characteristics of Jarvis and similar soils:
V*egetation:* white spruce, balsam poplar, and paper birch forest
Organic mat on the surface: 2 to 7 inches thick
Typical profile: 0 to 3 inches - black to brown peat
3 to 6 inches - olive brown and olive gray mottled very fine sandy loam
6 to 24 inches - variegated stratified fine sand and very fine sand
24 to 51 inches - gray sand, loamy sand, gravelly and very gravelly sand
Drainage class: well drained
Permeability: moderate in the upper part; rapid to excessive in the underlying material
Available water capacity: low
Depth to contrasting sand and gravel: 10 to 40 inches
Runoff: negligible
Depth to seasonally high water table: >72 inches

Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.6/5.1 - 6.5

Characteristics of Salchaket and similar soils:
V*egetation:* white spruce, balsam poplar, and paper birch forest
Organic mat on the surface: 2 to 7 inches thick
Typical profile: 0 to 2 inches - dark brown partially decomposed forest litter
2 to 10 inches - olive brown stratified very fine sandy loam and very fine sand
10 to 55 inches - dark grayish brown mottled stratified very fine sandy loam, loamy very fine sand and loamy fine sand
55 to 75 inches - dark grayish brown sand or stratified sand and gravel
Drainage class: well drained
Permeability: moderate in the control section and rapid in the substratum
Available water capacity: high
Depth to contrasting sand and gravel: more than 40 inches
Runoff: negligible
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.0/5.6 - 6.5

Minto-Chatanika complex, 3 to 7 percent slopes (411B)

Composition: Minto soil and similar inclusions - 60 percent, Chatanika soils and similar inclusions - 30 percent, and Contrasting inclusions - 10 percent

Characteristics of Minto and similar soils:
V*egetation:* paper birch and white spruce forest
Organic mat on the surface: 2 to 6 inches thick
Typical profile: 0 to 5 inches - dark brown slightly decomposed forest litter
5 to 9 inches - very dark grayish brown silt loam
9 to 16 inches - light olive brown mottled silt loam
16 to 70 inches - grayish brown mottled silt loam
Drainage class: moderately well drained
Permeability: moderate
Available water capacity: very high
Depth to frozen soil (July-August): more than 71 inches
Runoff: medium
Depth to seasonally high water table: 3 to 5 feet
Hazard of erosion: by water - none if organic mat is not removed, moderate if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 5.5/4.5 - 5.0

Characteristics of Chatanika and similar soils:
V*egetation:* black spruce paper birch forest

Organic mat on the surface: 2 to 8 inches thick
Typical profile: 0 to 4 inches - very dark grayish brown slightly decomposed forest litter
4 to 6 inches - very dark grayish brown mucky silt loam
6 to 9 inches - grayish brown silt loam and very dark grayish brown mucky silt loam
9 to 21 inches - grayish brown mottled silt loam
21 to 24 inches - grayish brown mottled frozen silt loam
Drainage class: poorly drained
Permeability: rapid in the slightly decomposed organic matter, moderate in the mineral soil above the permafrost, impermeable in the permafrost
Available water capacity: high
Depth to frozen soil (July-August): 12 to 40 inches
Runoff: medium
Depth to seasonally high water table: 12 to 24 inches
Hazard of erosion: by water - none if organic mat is not removed, moderate if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 6.1/4.5 - 5.5

Minto-Chatanika complex, 7 to 12 percent slopes (411C)

Composition: Minto soil and similar inclusions - 60 percent, Chatanika soils and similar inclusions - 30 percent, and Contrasting inclusions - 10 percent

Characteristics of Minto and similar soils:
V*egetation:* paper birch and white spruce forest
Organic mat on the surface: 2 to 6 inches thick
Typical profile: 0 to 5 inches - dark brown slightly decomposed leaves and moss
5 to 9 inches - very dark grayish brown silt loam
9 to 16 inches - light olive brown silt loam
16 to 70 inches - grayish brown silt loam concentrations
Drainage class: moderately well drained
Permeability: moderate
Available water capacity: very high
Depth to frozen soil (July-August): more than 71 inches
Runoff: medium
Depth to seasonally high water table: 3 to 5 feet
Hazard of erosion: by water - none if organic mat is not removed, moderate if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 5.5/4.5 - 5.0

Characteristics of Chatanika and similar soils:
V*egetation:* black spruce paper birch forest
Organic mat on the surface: 2 to 8 inches thick
Typical profile: 0 to 4 inches - very dark grayish brown slightly decomposed forest litter
4 to 6 inches - very dark grayish brown mucky silt loam
6 to 9 inches - grayish brown silt loam and very dark grayish brown mucky silt

loam
9 to 21 inches - grayish brown mottled silt loam
21 to 24 inches - grayish brown mottled frozen silt loam
Drainage class: poorly drained
Permeability: rapid in the slightly decomposed organic matter, moderate in the mineral soil above the permafrost, impermeable in the permafrost
Available water capacity: high
Depth to frozen soil (July-August): 12 to 40 inches
Runoff: medium
Depth to seasonally high water table: 12 to 24 inches
Hazard of erosion: by water - none if organic mat is not removed, moderate if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 5.5/4.5 - 5.0

Fairbanks-Steese complex, 7 to 12 percent slopes (421C)

Composition: Fairbanks soil and similar inclusions - 45 percent, Steese soils and similar inclusions - 45 percent, and Contrasting inclusions - 10 percent

Characteristics of Fairbanks and similar soils:
V*egetation:* white spruce, paper birch and quaking aspen forest
Organic mat on the surface: 1 to 6 inches
Typical profile: 0 to 3 inches - slightly decomposed forest litter
3 to 9 inches - very dark grayish brown silt loam
9 to 71 inches - light olive brown or grayish brown mottled silt loam
Drainage class: well drained
Permeability: moderate
Available water capacity: very high
Depth to weathered bedrock: more than 40 inches
Runoff: medium
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.0/5.6 - 6.0

Characteristics of Steese and similar soils:
V*egetation:* paper birch, white spruce, and quaking aspen forest
Organic mat on the surface: 1 to 6 inches thick
Typical profile: 0 to 2 inches - dark brown slightly decomposed forest litter
2 to 5 inches - brown silt loam
5 to 27 inches - light olive gray mottled silt loam
27 to 33 inches - light olive brown channery silt loam
33 to 35 inches - highly weathered schist bedrock
Drainage class: well drained
Permeability: moderate
Available water capacity: moderate to high

Depth to weathered bedrock: 20 to 40 inches
Runoff: medium
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.0/5.1 - 6.0

Fairbanks-Steese complex, 12 to 20 percent slopes (421D)
Composition: Fairbanks soil and similar inclusions - 45 percent, Steese soils and similar inclusions - 45 percent, and Contrasting inclusions - 10 percent

Characteristics of Fairbanks and similar soils:
V*egetation:* white spruce, paper birch and quaking aspen forest.
Organic mat on the surface: 1 to 6 inches
Typical profile: 0 to 3 inches - slightly decomposed forest litter
3 to 9 inches - very dark grayish brown silt loam
9 to 71 inches - light olive brown or grayish brown mottled silt loam
Drainage class: well drained
Permeability: moderate
Available water capacity: very high
Depth to weathered bedrock: more than 40 inches
Runoff: medium
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.0/5.6 - 6.0

Characteristics of Steese and similar soils:
V*egetation:* paper birch, white spruce, and quaking aspen forest
Organic mat on the surface: 1 to 6 inches thick
Typical profile: 0 to 2 inches - dark brown slightly decomposed forest litter
2 to 5 inches - brown silt loam
5 to 27 inches - light olive gray mottled silt loam
27 to 33 inches - light olive brown channery silt loam
33 to 35 inches - highly weathered schist bedrock
Drainage class: well drained
Permeability: moderate
Available water capacity: moderate to high
Depth to bedrock: 20 to 40 inches
Runoff: medium
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.1/5.1 - 6.0
Gilmore-Steese complex, 3 to 15 percent slopes (452)

Composition: Gilmore soil and similar inclusions - 70 percent, Steese soils and similar inclusions - 30 percent, and Contrasting inclusions - 0 to 5 percent

Characteristics of Gilmore and similar soils:
V*egetation:* white spruce, paper birch, and quaking aspen forest
Organic mat on surface: 2 to 4 inches thick
Typical profile: 0 to 3 inches - partially decomposed forest litter and moss
3 to 13 inches - dark brown or dark yellowish brown silt loam
13 to 16 inches - olive brown channery silt loam
16 inches - weathered fractured schist bedrock
Drainage class: well drained
Permeability: moderate
Available water capacity: moderate to high
Depth to weathered bedrock: less than 20 inches
Runoff: very high
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.0/5.6 - 6 0

Characteristics of Steese and similar soils:
Vegetation: paper birch, white spruce, and quaking aspen forest with alder shrubs
Organic mat on surface: 1 to 6 inches thick
Typical profile: 0 to 2 inches - dark brown slightly decomposed forest litter
2 to 5 inches - brown silt loam
5 to 27 inches - light olive gray mottled silt loam
27 to 33 inches - light olive brown channery silt loam
33 to 35 inches - highly weathered schist bedrock
Drainage class: well drained
Permeability: moderate
Available water capacity: moderate to high
Depth to weathered bedrock: 20 to 40 inches
Runoff: medium
Depth to seasonally high water table: more than 72 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.0/5.1 - 6.0

Eielson-Piledriver complex (611)

Composition: Eielson soil and similar inclusions - 50 percent, Piledriver soils and similar inclusions - 40 percent, and Contrasting inclusions - 10 percent

Characteristics of Eielson and similar soils:
V*egetation:* white spruce, paper birch, and balsam poplar forest
Organic mat on the surface: 2 to 7 inches thick

Typical profile: 0 to 3 inches - very dark brown slightly decomposed forest litter
3 to 28 inches - dark grayish brown silt loam or very fine sandy loam
28 to 65 inches - olive brown and dark gray mottled stratified very fine sandy loam and sand
65 to 69 inches - very dark gray silt loam
Drainage class: somewhat poorly drained
Permeability: permeability is moderate
Depth to contrasting sand and gravel: more than 40 inches
Available water capacity: high
Runoff: negligible
Depth to seasonally high water table: 35 to 60 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 7.1/5.6 - 7.1

Characteristics of Piledriver and similar soils:
V*egetation:* paper birch and white spruce forest
Organic mat on the surface: 2 to 6 inches thick
Typical profile: 0 to 3 inches - dark brown slightly decomposed forest litter and moss
3 to 15 inches - light olive brown mottled very fine sandy loam or silt loam
15 to 33 inches - grayish brown mottled loamy fine sand
33 to 45 inches - grayish brown extremely gravely sand
Drainage class: somewhat poorly drained
Permeability: permeability is moderate in the upper part and rapid in underlying material
Depth to contrasting sand and gravel: 16 to 40 inches
Available water capacity: low
Runoff: negligible
Depth to seasonally high water table: 35 to 60 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.6/5.1 - 6.5

Typic Cryorthents, pit spoil (CL)

Composition: Cryorthents and similar inclusions - 80 percent and Contrasting inclusions - 20 percent

Characteristics of Cryorthents and similar soils:
Vegetation: paper birch, and balsam poplar forest and alder scrub
Organic mat on surface: 0 to 3 inches thick
Typical profile: 0 to 1 inches - dark brown forest litter
1 to 18 inches - light olive brown loamy very fine sand
18 to 75 inches - olive brown stratified loamy fine sand and very fine sandy loam
Drainage class: well drained
Permeability: moderate

Available water capacity: high
Runoff: high
Thickness of loamy fill: 40 to greater than 75 inches
Hazard of erosion: by water - none if organic mat is not removed, severe if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 6.6 - 7.3/6.6 - 7.8

Gravel pits (Gv)
Composition: Gravel pits and similar inclusions - 95 percent and Contrasting inclusions - 5 percent

Characteristics of Gravel pits:
Vegetation: none or very sparse herbaceous vegetation and willows
Organic mat on surface: none
Runoff: rapid

Landfills (Lf)

Composition: Landfills and similar inclusions - 95 percent and Contrasting inclusions - 5 percent

Characteristics of Landfills:
Vegetation: none or very sparse herbaceous vegetation and willows
Organic mat on surface: none
Runoff: rapid

Quarries (Qu)

Composition: Quarries and similar inclusions - 95 percent and Contrasting inclusions - 5 percent

Characteristics of Gravel pits:
Vegetation: none or very sparse herbaceous vegetation and willows
Organic mat on surface: none
Runoff: rapid

Urban Land – Typic Cryorthents complex, 0 to 1 percent slopes (UC)

Composition: Urban Land similar inclusions - 30 to 60 percent, Cryorthents and similar inclusions - 40 to 60 percent, and Contrasting inclusions - 0 to 15 percent

Characteristics of Urban Land:
Vegetation: none
Organic mat on surface: none
Runoff: rapid

Characteristics of Typic Cryorthents and similar soils:
Vegetation: seeded or planted grasses, shrubs, and trees
Organic mat on surface: 0 to 1 inches (0 to 3 cm) thick
Typical profile: 0 to 3 inches - very dark grayish brown gravelly fine sand
3 to 30 inches - light olive brown stratified gravelly very fine sandy loam and gravelly sand
30 to 63 inches - light olive brown stratified very fine sandy loam and silt loam
63 to 75 inches - light brownish gray sand
Drainage class: moderately well to well drained
Permeability: moderate in the loamy portions, (variable depending on amount of compaction), rapid in the sandy portions
Available water capacity: high
Runoff: negligible
Thickness of gravelly fill: 20 to 57 inches over stratified loamy material
Depth to contrasting sand and gravel: more than 40 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 6.6 - 7.3/6.6 - 7.8

Typic Cryaquents, Terric Cryofibrists, and Histic Cryaquepts (WAH)

Composition: Typic Cryaquent soils and similar inclusions - 0 to 90 percent, Terric Cryofibrist soils and similar inclusions - 0 to 80 percent, Histic Cryaquept soils and similar inclusions - 20 to 50 percent, and Water - 0 to 50 percent

Characteristics of Typic Cryaquents and similar soils:
V*egetation:* sedges, grass, and low shrubs
Organic mat on surface: 1 to 4 inches thick

Typical profile: 0 to 1 inches - dark yellowish brown peat
1 to 71 inches - dark gray and dark grayish brown, mottled silt loam
Drainage class: poorly drained
Permeability: moderate
Available water capacity: high
Runoff: high
Depth to seasonally high water table: 5 to 10 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 7.3/6.1 - 7.3

Characteristics of Terric Cryofibrists and similar soils:
V*egetation:* sedges
Organic mat on surface: 16 to 51 inches
Typical profile: 0 to 22 inches - very dark brown mucky peat
22 to 59 inches - dark grayish brown, mottled silt loam
Drainage class: very poorly drained

Permeability: very rapid in the organic surface materials and moderate in the loamy substratum
Available water capacity: high
Runoff: high
Depth to seasonally high water table: 0 to 4 inches
Hazard of erosion: by water - none if the organic mat is not removed, slight if the mat is removed; by wind - none
Surface pH/subsoil pH: 5.0 - 6.0/5.6 - 6.6

Characteristics of Histic Cryaquepts and similar soils:
V*egetation:* sedges, grass, and low shrubs
Organic mat on surface: 8 to 16 inches thick
Typical profile: 0 to 15 inches - very dark grayish brown peat
15 to 60 inches - dark gray mottled silt loam
Drainage class: very poorly drained
Permeability: rapid in the slightly decomposed surface peat, moderate to low in the subsurface peat and loamy mineral soil
Available water capacity: high
Runoff: high
Depth to seasonally high water table: 0 to 4 inches
Hazard of erosion: by water - none if the organic mat is not removed, slight if the mat is removed; by wind - none
Surface pH/subsoil pH: 4.5 - 5.6/5.1 - 6.0

Chena River Research Site Soils

Histels, terric (9)

Composition: Histels, terric and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Histels, terric and similar soils:
V*egetation:* sedges, low shrubs, stunted black spruce, and mosses
Organic mat on surface: 16 to 39 inches thick
Typical profile: 0 to 17 inches - black mucky peat
17 to 25 inches - very dark brown muck
25 to 29 inches - very dark brown frozen muck
25 to 39 inches - very dark gray frozen silt loam
Drainage class: very poorly drained
Permeability: rapid in the slightly decomposed surface peat, moderate to low in the subsurface peat, and impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July-Aug): 16 to 35 inches
Runoff: high
Depth to seasonally high water table: 0 to 10 inches or ponded
Hazard of erosion: by water - none if the vegetation is not disturbed, slight if the vegetation is removed; by wind - none if the vegetation is not disturbed, severe if the vegetation is removed

Surface pH/subsoil pH: 3.6 - 4.5/3.6 - 5.0

Tanacross peat (22)

Composition: Tanacross peat and similar inclusions - 85 percent and Contrasting inclusions - 15 percent

Characteristics of Tanacross peat and similar soils:
V*egetation:* stunted black spruce trees, with low shrubs and moss ground cover
Organic mat on surface: 8 to 16 inches thick
Typical profile: 0 to 9 inches - dark brown peat
9 to 12 inches - black mucky silt loam
12 to 20 inches - dark gray and dark yellowish brown stratified sand and silt loam
20 to 40 inches - dark gray and dark yellowish brown frozen stratified sand and silt loam
Drainage class: poorly drained
Permeability: rapid in the slightly decomposed organic matter, moderate in the unfrozen mineral soil; impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July-Aug): 12 to 28 inches
Runoff: high
Depth to seasonally high water table: 0 to 10 inches or ponded
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 3.5 - 5.0/5.1 - 6.0

Tanana silt loam (25)

Composition: Tanana soils and similar inclusions - 85 percent and Contrasting inclusions - 15 percent

Characteristics of Tanana and similar soils:
V*egetation:* black spruce, paper birch, and willows
Organic mat on surface: 2 to 8 inches thick
Typical profile: 0 to 5 inches - very dark brown slightly decomposed forest litter
5 to 29 inches - very dark grayish brown, grayish brown and dark gray silt loam
29 to 39 inches - dark grayish brown frozen silt loam
Drainage class: poorly drained
Permeability: moderate in the unfrozen mineral soil, impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July - Aug.): 15 to 30 inches
Runoff: high
Depth to seasonally high water table: 12 to 24 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed

Surface pH/subsoil pH: 3.5 - 5.0/5.1 - 6.0

Minto silt loam, 3 to 7 percent slopes (41B)

Composition: Minto soils and similar inclusions - 90 percent and Contrasting inclusions - 10 percent

Characteristics of Minto and similar soils:
V*egetation:* paper birch and white spruce forest
Organic mat on the surface: 2 to 6 inches thick
Typical profile: 0 to 5 inches - dark brown slightly decomposed forest litter
5 to 9 inches - very dark grayish brown silt loam
9 to 16 inches - light olive brown mottled silt loam
16 to 70 inches - grayish brown mottled silt loam
Drainage class: moderately well drained
Permeability: moderate
Available water capacity: very high
Depth to frozen soil (July-August): more than 71 inches
Runoff: medium
Depth to seasonally high water table: 3 to 5 feet
Hazard of erosion: by water - none if organic mat is not removed, moderate if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 4.5 - 5.5/4.5 - 5.0

Peede-Mosquito complex (62)

Composition: Peede soils and similar inclusions - 60 to 80 percent, Mosquito soils and similar inclusions - 20 to 30 percent, and Contrasting inclusions - 10 percent

Characteristics of Peede and similar soils:
V*egetation:* grass and sedge vegetation with some willow shrubs
Organic mat on the surface: 2 to 6 inches thick
Typical profile: 0 to 5 inches - very dark brown moderately decomposed sedge peat
5 to 40 inches - dark gray mottled silt loam
40 to 55 inches - dark greenish gray mottled very fine sandy loam
55 to 70 inches - dark olive gray fine sand
Drainage class: very poorly drained
Permeability: moderate
Depth to contrasting sand and gravel: 40 to more than 60 inches
Available water capacity: high
Runoff: negligible
Depth to seasonally high water table: 0 to 12 inches or ponded
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 6.1 - 7.3/6.1 - 7.3

Characteristics of Mosquito and similar soils:
V*egetation:* tamarack and black spruce, with shrub birch and cottonsedge in the understory
Organic mat on the surface: 9 to 22 inches thick
Typical profile: 0 to10 inches - black peat and mucky peat
10 to 19 inches - dark gray and dark grayish brown mottled silt loam
19 to 29 inches - dark grayish brown frozen silt loam
Drainage class: very poorly drained
Permeability: moderate in the unfrozen soil, impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July - Aug): 13 to 28 inches
Runoff: high
Depth to seasonally high water table: 0 to 12 inches or ponded
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.1/5.6 - 6.6

Goldstream-Bolio complex, 0 to 3 percent slopes (212)

Composition: Goldstream soil and similar inclusions - 50 percent, Bolio and similar inclusions - 40 percent, and Contrasting inclusions - 10 percent

Characteristics of Goldstream and similar soils:
V*egetation:* stunted black spruce with low shrubs, sedge tussocks, and moss
Organic mat on surface: 8 to16 inches thick
Typical profile: 0 to 3 inches - dark brown peat
3 to 9 inches - black mucky peat
9 to 20 inches - very dark grayish brown and gray mucky silt loam
20 to 27 inches - gray frozen silt loam
Drainage class: very poorly drained
Permeability: rapid in the slightly decomposed organic matter, moderate in the unfrozen mineral soil; impermeable in the frozen soil
Available water capacity: high
Depth to frozen soil (July-August): 14 to 24 inches
Runoff: high
Depth to seasonally high water table: 0 to 6 inches or ponded
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 3.6 - 4.5/4.5 - 5.5

Characteristics of Bolio peat and similar soils:
V*egetation:* sedge tussocks, low shrubs, stunted tamarack and black spruce, and mosses
Organic mat on surface: >16 inches thick
Typical profile: 0 to 6 inches - strong brown peat
6 to 23 inches - black and very dark gray mucky peat
23 to 26 inches - very dark grayish brown frozen mucky peat
Drainage class: very poorly drained

Permeability: rapid in the slightly decomposed organic matter, moderate to low in the more highly decomposed organic matter, impermeable in the permafrost
Available water capacity: high
Depth to frozen soil (July-Aug): 16 to 28 inches
Runoff: negligible
Depth to seasonally high water table: 0 to 6 inches or ponded
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 3.6 - 5.5/3.6 - 6.0

Jarvis-Salchaket complex (363)

Composition: Jarvis soil and similar inclusions - 45 percent, Salchaket soils and similar inclusions - 35 percent, and Contrasting inclusions - 20 percent

Characteristics of Jarvis and similar soils:
V*egetation:* white spruce, balsam poplar, and paper birch forest
Organic mat on the surface: 2 to 7 inches thick
Typical profile: 0 to 3 inches - black to brown peat
3 to 6 inches - olive brown and olive gray mottled very fine sandy loam
6 to 24 inches - variegated stratified fine sand and very fine sand
24 to 51 inches - gray sand, loamy sand, gravelly and very gravelly sand
Drainage class: well drained
Permeability: moderate in the upper part; rapid to excessive in the underlying material
Available water capacity: low
Depth to contrasting sand and gravel: 10 to 40 inches
Runoff: negligible
Depth to seasonally high water table: >72 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 6.6/5.1 - 6.5

Characteristics of Salchaket and similar soils:
V*egetation:* white spruce, balsam poplar, and paper birch forest
Organic mat on the surface: 2 to 7 inches thick
Typical profile: 0 to 2 inches - dark brown partially decomposed forest litter
2 to 10 inches - olive brown stratified very fine sandy loam and very fine sand
10 to 55 inches - dark grayish brown mottled stratified very fine sandy loam, loamy very fine sand and loamy fine sand
55 to 75 inches - dark grayish brown sand or stratified sand and gravel
Drainage class: well drained
Permeability: moderate in the control section and rapid in the substratum
Available water capacity: high
Depth to contrasting sand and gravel: more than 40 inches
Runoff: negligible
Depth to seasonally high water table: more than 72 inches

Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.1 - 6.0/5.6 - 6.5

Riverwash (Rv)

Composition: Riverwash and similar inclusions - 95 percent and Contrasting inclusions - 5 percent

Characteristics of Riverwash:
Vegetation: none or very sparse herbaceous vegetation and willows
Organic mat on surface: none
Runoff: rapid

Typic Cryaquents, Terric Cryofibrists, and Histic Cryaquepts (WAH)

Composition: Typic Cryaquent soils and similar inclusions - 0 to 90 percent, Terric Cryofibrist soils and similar inclusions - 0 to 80 percent, Histic Cryaquept soils and similar inclusions - 20 to 50 percent, and Water - 0 to 50 percent

Characteristics of Typic Cryaquents and similar soils:
V*egetation:* sedges, grass, and low shrubs
Organic mat on surface: 1 to 4 inches thick
Typical profile: 0 to 1 inches - dark yellowish brown peat
1 to 71 inches - dark gray and dark grayish brown, mottled silt loam
Drainage class: poorly drained
Permeability: moderate
Available water capacity: high
Runoff: high
Depth to seasonally high water table: 5 to 10 inches
Hazard of erosion: by water - none if organic mat is not removed, slight if the mat is removed; by wind - none if organic mat is not removed, severe if the mat is removed
Surface pH/subsoil pH: 5.6 - 7.3/6.1 - 7.3

Characteristics of Terric Cryofibrists and similar soils:
V*egetation:* sedges
Organic mat on surface: 16 to 51 inches
Typical profile: 0 to 22 inches - very dark brown mucky peat
22 to 59 inches - dark grayish brown, mottled silt loam
Drainage class: very poorly drained
Permeability: very rapid in the organic surface materials and moderate in the loamy substratum
Available water capacity: high
Runoff: high
Depth to seasonally high water table: 0 to 4 inches
Hazard of erosion: by water - none if the organic mat is not removed, slight if the mat is removed; by wind - none

Surface pH/subsoil pH: 5.0 - 6.0/5.6 - 6.6

Characteristics of Histic Cryaquepts and similar soils:
V*egetation:* sedges, grass, and low shrubs
Organic mat on surface: 8 to 16 inches thick
Typical profile: 0 to 15 inches - very dark grayish brown peat
15 to 60 inches - dark gray mottled silt loam
Drainage class: very poorly drained
Permeability: rapid in the slightly decomposed surface peat, moderate to low in the subsurface peat and loamy mineral soil
Available water capacity: high
Runoff: high
Depth to seasonally high water table: 0 to 4 inches
Hazard of erosion: by water - none if the organic mat is not removed, slight if the mat is removed; by wind - none
Surface pH/subsoil pH: 4.5 - 5.6/5.1 - 6.0