U. S. AIR FORCE

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

JOINT BASE ELMENDORF-RICHARDSON

(See INRMP signature pages for plan approval date)

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS, JOINT BASE ELMENDORF-RICHARDSON
JOINT BASE ELMENDORF-RICHARDSON, ALASKA

29 January 2020

MEMORANDUM FOR 673 ABW/XP

FROM: 673 CES/CC

SUBJECT: Request to waive JBERI 10-409 formatting for JBER INRMP

1. The Joint Base Elmendorf-Richardson Integrated Natural Resource Management Plan (JBER INRMP) cannot be formatted IAW JBERI 10-409. The Air Force Civil Engineer Center (AFCEC) provides a standardized template (updated October 2018) in accordance with AFI 32-7064 Attachment 2 *INRMP Format and Content* that installation INRMPs are required to follow. To comply with AFI 32-7064 guidelines, this plan conflicts with local plans formatting guidance.

2. For any questions or concerns regarding this memorandum, please contact Ms. Cassandra Schoofs at DSN 317-384-0276.

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CHRISTOPHER A. SCHNIPKE, Lt Col, USAF
Commander, 673d Civil Engineer Squadron

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 includes Sikes Act cooperating agencies and/or local equivalents, to document how natural resources will be managed. Where applicable, external resources, including Air Force Instructions (AFIs); Department of Defense Instructions (DoDIs); USAF Playbooks; federal, state, and local requirements; Biological Opinions; and permits 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 USAF-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 the approved plan owner.

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, Natural Resources Conservation Program.

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ACRONYMS

°F	Fahrenheit
637 ABW	673d Air Base Wing
673 CEG	673d Civil Engineering Group
673 CES	673d Civil Engineering Squadron
673 CES/CEIE	673d CES, Environmental Element
673 CES/CEIEC	673d CES, Environmental Element, Compliance/Conservation
773 CES	773d Civil Engineering Squadron
AAFES	Army and Air Force Exchange Service
ABW	Air Base Wing
ABWI	Air Base Wing Instruction
ACES	Automated Cost Evaluation System
ACES-PM	Automated Civil Engineer System - Project Management
ACMI	Air Combat Maneuver Instrument
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AFCEC	Air Force Civil Engineer Center
AFI	Air Force Instruction
AFWA	International Association of Fish and Wildlife Agencies
AKDOF	Alaska Department of Natural Resources Division of Forestry
APU	Alaska Pacific University
ARNG	Army National Guard
ARPA	Archaeological Resources Protection Act
ASOP	Airborne Standard Operating Procedures
AST	Alaska State Troopers
ATV	All-terrain Vehicle
AWC	Anadromous Waters Catalog
BA	Biological Assessment
BAAF	Bryant Army Airfield
BASH	Bird Aircraft Strike Hazard
BCT	Brigade Combat Team
BEZ	Bird Exclusion Zone
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BMP	Best Management Practices
BO	Biological Opinion
C	Candidate species
CAC	Common Access Card
CAFI	Cooperative Alaska Forest Inventory
CBD	Center for Biological Diversity
CEG	Civil Engineer Group
CEMML	Center for Environmental Management of Military Lands
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CES	Civil Engineer Squadron

CFR	Code of Federal Regulations
CIBW	Cook Inlet Beluga Whale
CLEO	Conservation Law Enforcement Officer
CLEP	Conservation Law Enforcement Program
CWA	Clean Water Act
CY	Calendar Year
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DoDI	Department of Defense Instruction
DoDM	Department of Defense Manual
DOI	Department of Interior
DZ	Drop Zone
EA	Environmental Assessment
EAB	Echelon Above Brigade
EAFB	Elmendorf Air Force Base
EAP	Environmental Action Plan
EBC	European Bird Cherry
EFH	Essential Fish Habitat
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EO	Executive Order
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ERF	Eagle River Flats
ESA	Endangered Species Act
ESRI	Environmental Systems Research Institute
FEMA	Federal Emergency Management Agency
FIA	Forest Inventory and Analysis
FIRM	Flood Insurance Rate Maps
FISMP	Federal Invasive Species Management Plan
FLETC	Federal Law Enforcement Training Center
FONPA	Finding of No Practicable Alternative
FONSI	Finding of No Significant Impact
FRA	Fort Richardson, Alaska
FSP	Field Sampling Plan
FSS	Force Support Squadron
ft	Feet
FY	Fiscal Year
GEM	Golf Course Environmental Management
GIS	Geographic Information System
gpm	Gallons per Minute
GSU	Geographically-Separated Unit
Ha	hectare
HAARP	High Frequency Active Auroral Research Program

HUC	Hydrologic Unit Code
IAW	In Accordance With
ICRMP	Integrated Cultural Resources Management Plan
ID/IQ	Indefinite Delivery/Indefinite Quantity
IED/C-IED	Improvised Explosive Device/Counter Improvised Explosive Device
INRMP	Integrated Natural Resources Management Plan
IPMP	Integrated Pest Management Plan
ITAM	Integrated Training Area Management
JA	Judge Advocate's Office
JBER	Joint Base Elmendorf-Richardson
JBER-E	Joint Base Elmendorf-Richardson - Elmendorf
JBER-R	Joint Base Elmendorf-Richardson - Richardson
LRAM	Land Rehabilitation and Maintenance
LTEM	Long-Term Ecological Monitoring
LZ	Landing Zone
MBTA	Migratory Bird Treaty Act
MCA	Military Conservation Agent
METL	Mission Essential Task List
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement
MOA	Municipality of Anchorage
MOU	Memorandum of Understanding
MWH	MWH Global Inc.
MWR	Morale Welfare Recreation
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NJP	Nonjudicial Punishment
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRCS	National Resources Conservation Service
NRM	Natural Resource Manager
NWI	National Wetlands Inventory
NWP	Nationwide Permit
O&M	Operation and Maintenance
ORV	Off-road Vehicle
PDZ	Potential Development Zones
PEA	Programmatic Environmental Assessment
PSWCD	Palmer Soil and Water Conservation District
QA/QC	Quality Assurance/Quality Control
R&D	Research and Development
REV	Relative Ecological Value
RTLA	Range and Training Land Assessment
RYFO	Resumption of Year-Round Firing Opportunity

SERDP	Strategic Environmental Research and Development Program
SGCN	Species of Greatest Conservation Need
SOW	Statement or Scope of Work
SRA	Sustainable Range Awareness
SRP	Sustainable Range Program
SWPPP	Storm Water Pollution Prevention Plan
T&E Species	Threatened and Endangered Species
TA	Training Area
TRI	Training Requirements Integration
U.S.	United States
UAA	University of Alaska Anchorage
UAS	Unmanned Aerial System
UCMJ	Uniform Code of Military Justice
USACE	U.S. Army Corps of Engineers
USAF	United States Air Force
USAG-AK	United State Army Garrison, Alaska
USARAK	United States Army, Alaska
USC	United States Code
USDA	United States Department of Agriculture
USDA-APHIS-WS	USDA Animal Plant Health Inspection Service and Wildlife Services
USFS	U.S. Forest Service
USFWS	United States Fish and Wildlife Service
UXO	Unexploded Ordnance
WEC	Wildlife Education Center
WEZ	Waterfowl Exclusion Zone
WFA	Wetland Functional Assessment
WFMP	Wildland Fire Management Plan

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 no less than every five years. An INRMP is considered compliant with the Sikes Act if it has been approved in writing by the appropriate representative from each cooperating agency within the past five years. Approval of a new or revised INRMP is documented by signature on a signature page signed by the Installation Commander (or designee), and a designated representative of the United States Fish and Wildlife Service (USFWS), Alaska Department of Fish and Game (ADF&G), and National Oceanic and Atmospheric Administration (NOAA) Fisheries when applicable (AFI 32-7064).

Annual reviews and updates are accomplished by the installation Natural Resources Manager (NRM), and/or a Section 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 Section Natural Resources Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of USFWS, ADF&G, and NOAA Fisheries, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INRMP Review Summary. By signing 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

On following pages.

JOINT BASE ELMENDORF-RICHARDSON INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

673d Air Base Wing

673d Civil Engineer Squadron
Installation Management Flight
Environmental Element
Joint Base Elmendorf-Richardson, Alaska

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

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KIRSTEN G. AGUILAR
Colonel, USAF
Commander, 673d Air Base Wing

1/21/21
Date

JOINT BASE ELMENDORF-RICHARDSON INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

673d Air Base Wing

673d Civil Engineer Squadron
Installation Management Flight
Environmental Element
Joint Base Elmendorf-Richardson, Alaska

Cooperating Agency Endorsement: Alaska Department of Fish and Game

Douglas Vincent-Lang
Commissioner
Alaska Department of Fish and Game

Oct 26, 2020
Date

JOINT BASE ELMENDORF-RICHARDSON INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

673d Air Base Wing

673d Civil Engineer Squadron
Installation Management Flight
Environmental Element
Joint Base Elmendorf-Richardson, Alaska

Cooperating Agency Endorsement: National Marine Fisheries Service

James W. Balsiger Ph.D.
Regional Administrator, Alaska Region
NOAA Fisheries' National Marine
Fisheries Service

11/13/2020
Date

JOINT BASE ELMENDORF-RICHARDSON INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

673d Air Base Wing

673d Civil Engineer Squadron
Installation Management Flight
Environmental Element
Joint Base Elmendorf-Richardson, Alaska

Cooperating Agency Endorsement: U.S. Fish and Wildlife Service

Stewart Cogswell
Field Supervisor
Anchorage Fish and Wildlife Field Office
U.S. Fish and Wildlife Service

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EXECUTIVE SUMMARY

Purpose and Scope

This Integrated Natural Resources Management Plan (INRMP) guides the management of installation land, water, air, and natural resources to support the Joint Base Elmendorf-Richardson (JBER) mission and guarantee continued access to its land, air, and water resources for realistic military training and to sustain the long-term ecological integrity of the resources base and the ecosystem services it provides.

This INRMP is a routine update of the J*oint Base Elmendorf-Richardson Integrated Natural Resources Management Plan* (2016). The INRMP applies to organizations internal and external to the 673 Air Base Wing (ABW) that are involved with or interested in the management or use of natural resources and lands on JBER.

This plan is part of the installation comprehensive planning process. It contains management strategies, goals, objectives, and actions/projects to guide the management of JBER lands and natural resources. It is intended to supplement the JBER Installation Development Plan and is itself supplemented by annual, agency-coordinated updates and other related JBER plans.

The physical scope of the plan is generally JBER lands. However, several remote training and support sites will be managed under the same strategies outlined in this INRMP.

This document also serves to outline the conservation and protection programs carried out on JBER to ensure conservation and recovery of threatened and endangered species on or adjacent to JBER, specifically the Cook Inlet beluga whale (*Delphinapterus leucas*) as required under Sec 4 (a)(3)(B)(i) of the Endangered Species Act (ESA) (PL 95-632, 16 United States Code [USC] 1531 *et seq.*), as amended through the 108th Congress.

INRMP Support of the Air Force Mission

Preparation and implementation of this INRMP is required by the Sikes Act (16 USC 670 *et seq.*). Additional INRMP guidance and requirements are provided by the Department of Defense Manual (DoDM), 4715.03 *INRMP Implementation Manual*, (August 31, 2018); DoD Instruction (DoDI) 4715.03, *Natural Resources Conservation Program* (August 31, 2018); and Air Force Instruction (AFI) 32-7064, *Integrated Natural Resource Management* (November 18, 2014, Incorporating Change 2, November 22, 2016).

This INRMP assists the 673 ABW in complying with other federal and state laws, most notably laws associated with environmental documentation, wetlands, endangered species, and wildlife management, in general. Compliance requirements, at least partially affecting implementation of the INRMP, are included in Section 1.3, Authority. This plan describes how the 673 ABW will implement provisions of AFI 32-7064 on JBER and adjacent waters.

Complete involvement in the JBER comprehensive planning process by environmental and natural resources personnel is critical to the successful implementation of this plan. Natural resources and environmental constraints must be formally included in the JBER Installation Development Plan (October 2015). Coordination and communication between engineering planners, community planners, and 673d Civil Engineer Squadron Natural Resources personnel are also critical, particularly in terms of coordinating new projects through the National Environmental Policy Act (NEPA) and JBER work order request process.

Medium and long-term installation planning should also be coordinated. Long-term changes in mission should be anticipated and planned for. Failure to coordinate between engineering designers, community

planners, and environmental planners is likely to result in degrading natural habitats and could result in violations of federal and/or state laws.

Implementation of the INRMP directly supports the military mission in numerous ways. Avian and habitat monitoring projects contribute to airfield management by monitoring and manipulating movement of birds and reducing desirable avian habitat near runways thus minimizing bird aircraft strike hazard (BASH) risks. In addition, potential human-wildlife conflicts are monitored and hazed, if needed, to prevent interruptions of military training and decrease any potential BASH risk. Human safety and catastrophic loss of personnel and/or aircraft is more likely to occur without these reoccurring natural resource initiatives.

This INRMP supports the military mission by protecting and enhancing lands upon which military training is critically dependent. Without an INRMP for guidance, incidental or even intentional adverse effects can occur to wildlife, wetlands, and ecological resources by personnel activities and actions to accomplish the military mission, such as training activities, construction, and maintenance. Conversely, these mission operations or support activities and indirect actions can be adversely affected by natural resources.

Summary of the Benefits of INRMP Implementation

INRMP implementation provides guidance of natural resources through adaptive ecosystem management necessary for the sustainment of military uses. The INRMP ensures the developed plans provide for the conservation and rehabilitation of natural resources on JBER and are consistent with the current use of JBER lands for the readiness of the Armed Forces. It also assists the 673 ABW in complying with federal and state laws.

Implementation of the INRMP

This INRMP is a living document utilizing an adaptive management approach to sustain natural resources on JBER. In implementing projects to achieve goals and objectives in the plan, assumptions leading to management decisions are based on the latest scientific information, past experience, and input from stakeholders. As projects are implemented under this plan, results will be reviewed and compared with initial assumptions. If some assumptions are shown to be invalid, adaptations will be made. This adaptive approach allows resource managers to make slight corrections in a timely fashion to conserve resources and ensure mission flexibility.

General Natural Resources Management Goals

Under the philosophy of ecosystem management, the focus of this plan will be to maintain or restore native ecosystem types across their natural range, including the suite of plants and animals that inhabit them in a healthy, functioning state. This landscape level, ecological approach will blend needs of the military mission with the health of the environment to ensure JBER ecosystems provide a landscape to support realistic military training, are diverse, productive, and economically sustainable. Below are JBER's major goals identified for this plan. Projects and tasks supporting the goals and specific objectives are identified in Section 7, Natural Resources Program Management and Section 8, Management Goals, Objectives, and Projects.

> ***Natural Resources Mission Statement*****:** *Support the military mission and enhance readiness by sustaining natural environments on JBER for training, minimizing conflicts between mission requirements and land and the natural resources it supports. Serve as stewards of the land by maintaining natural landscape features and ecosystem integrity at a broad landscape scale.*

The primary objective of the Air Force natural resources program is to sustain, restore and modernize natural infrastructure to ensure operational capability and no net loss in the capability of the Air Force lands to support the military mission of the installation.

Goal 1: Minimize conflicts between military mission, wildlife, natural resources, and land use.

Goal 2: Manage JBER natural resources under the guidelines and principles of adaptive ecosystem management, which aims to maintain functional ecosystems and natural diversity to include sustainable populations, native species, and ecological communities.

Goal 3: Manage human use of resources for long-term sustainability by offering products and services at levels compatible with the military mission and ecosystem diversity, health, and productivity and placing equal emphasis on consumptive and non-consumptive use and conservation and preservation of natural resources on JBER consistent with Sikes Act requirements.

Goal 4: Contribute to the recovery of the Cook Inlet beluga whale.

***Implementation of INRMP Goals and Relation to Changes in Management Direction*.**

Implementation of INRMP goals will not require a substantial change in management direction on JBER. Management direction may change, specific to certain natural resources (land, plant, and wildlife) which may not have been directly managed originally. Such changes will be implemented to (1) support Air Force and Army missions on JBER, (2) respond to requirements agreed to by the Department of Defense (DoD), U.S. Fish and Wildlife Service (USFWS), and Association of Fish and Wildlife Agencies (AFWA) when all parties signed the updated "*Memorandum of Understanding For A Cooperative Integrated Natural Resource Management Program On Military Installation*" (July 29, 2013), (3) enact actions required in response to regulations by other federal agencies or the State of Alaska, and/or (4) respond to requirements of Air Force regulations, e.g., AFI 91-202, *The US Air Force Mishap Prevention Program* (5 Aug 2011).

Environmental Impacts of INRMP Implementation

This INRMP is not an environmental document prepared to satisfy requirements of NEPA. Prior to implementation of land disturbance type actions, or other proposed projects, the Environmental Impact Analysis Process (EIAP) will be performed, per NEPA, to determine environmental impacts. For further information see Section 9, INRMP Implementation, Update, and Revision Process in this INRMP and Section 3.7, Environmental Impact Analysis Process (EIAP) and INRMP Implementation of AFI 32-7064 *Integrated Natural Resource Management* (November 22, 2016).

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 USAF. 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

Purpose of this INRMP is to manage and provide continued access to installation lands, waters, airspace, and natural resources to support the JBER mission for realistic military training. Additionally, its purpose is to sustain the long-term ecological integrity of the base resources and ecosystem services it provides, in accordance with the Sikes Act.

JBER is the congressionally directed combining of U.S. Army Garrison Alaska's Fort Richardson with Elmendorf Air Force Base under the over-riding management of the U.S. Air Force (USAF), effective 1 October 2010. For purposes of this document "Fort Richardson Alaska (FRA)" and "Elmendorf Air Force Base (EAFB)" usage will reflect actions conducted prior to joint basing. The usage of JBER, JBER-Richardson (JBER-R), and JBER-Elmendorf (JBER-E) usage represent post joint base basing actions, current and future actions.

This INRMP is a routine annual update of the *Joint Base Elmendorf-Richardson Integrated Natural Resources Management Plan* (2016). The INRMP applies to organizations internal and external to the 673 Air Base Wing (ABW) that are involved with or interested in the management or use of natural resources and lands on JBER.

The physical scope of the plan covers JBER lands within the JBER installation boundary. The following remote training and support sites are part of JBER, but not actively managed by the strategies outlined in this INRMP; Eklutna Mountain Training Site, Gulkana Army Training Site, Kenai Airport Annex, and ACMI sites 1 - 8. Figure 2-1 shows the location of these sites. Further discussion of the remote sites is included in Section 2.1, Installation Overview.

This plan is part of the installation comprehensive planning process. It contains management strategies, goals, objectives, and actions/projects to guide the management of JBER lands and natural resources.

1.2 Management Philosophy

The principal purpose of DoD lands, waters, airspace, and coastal resources is to support mission-related activities. All DoD natural resources conservation program activities shall work to guarantee DoD continued access to its land, air, and water resources for realistic military training and testing, and sustain the long-term ecological integrity of the base resources and the ecosystem services it provides, in

accordance with section 670a-670o of title 16, United States Code (U.S.C.) (also known as the Sikes Act) (DoDI 4715.03).

In 1994, DoD issued an *Ecosystem Management Policy Directive*. The directive defined the principles of ecosystem management and directed that ecosystem management become the basis of natural resources and land management in the DoD. In 1996, DoDI 4715.03, *Environmental Conservation Program*, was published, further amplifying and implementing the policy of ecosystem management.

DoDI 4715.03, *Natural Resources Conservation Program* (August 31, 2018) provides that DoD *shall follow an ecosystem-based management approach to natural resources-related practices and decisions, using scientifically sound conservation procedures, techniques, and data*.

Ecosystem Management

Ecosystem management is complex because of the variability and uncertainty found within them. Ecosystem management often takes a high degree of manpower, time, money, education, and analysis. Benefits of managing natural resources by ecosystem management are enormous, affecting all biological systems within the parameters of the ecosystem.

DoDI 4715.03 defines ecosystem management as *a goal-driven approach to managing natural and cultural resources that supports present and future mission requirements; preserves ecosystem integrity; is at a scale compatible with natural processes; is cognizant of nature's timeframes; recognizes social and economic viability within functioning ecosystems; is adaptable to complex and changing requirements; and is realized through effective partnerships among private, local, State, tribal, and Federal interests. Ecosystem management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are a part of the whole.*

DoDI 4715.03, *Natural Resources Conservation Program* (August 31, 2018) states that within the context of ecosystem-based management, natural resources management will include the following:

- *Avoid single-species management and implement an ecosystem-based multiple species management approach, insofar as that is consistent with the requirements of the Endangered Species Act (ESA).*
- *Use an adaptive management approach to manage natural resources such as climate change.*
- *Evaluate and engage in the formation of local or regional partnerships that benefit the goals and objectives of the INRMP.*
- *Use best available scientific information in decision-making and adaptive management techniques in natural resource management.*
- *Foster long-term sustainability of ecosystem services.*

AFI 32-7064 *Integrated Natural Resources Management* (November 22, 2016) states that *the INRMP implements ecosystem management on AF installations by setting goals for attaining a desired land condition.* The Air Force principles for ecosystem management identified in AFI 32-7064 are to:

- *Maintain or restore native ecosystem types across their natural range where practical and consistent with military mission.*
- *Maintain or restore ecological processes such as fire and other disturbance regimes where practical and consistent with the military mission.*

- *Maintain or restore the hydrological processes in streams, floodplains, and wetlands when feasible and practical and consistent with the military mission.*
- *Use regional approaches to implement ecosystem management on an installation by collaboration with other DoD components as well as other federal, state and local agencies, and adjoining property owners.*
- *Provide for outdoor recreation, agricultural production, harvesting of forest products, and other practical utilization of the land and its resources, provided that such use does not inflict long-term ecosystem damage or negatively impact the AF mission.*

Biodiversity

In the early 1980's, biodiversity and ecosystem management began to emerge nationwide as a better way of managing natural resources and public lands. Air Force policy began to move in this direction as well.

Department of Defense Directives for Biodiversity

In 1989, DoD Directive 4700.4 *Natural Resources Management Program*, (January 24, 1989) called for integration of the various natural resources programs, such as forestry, wildlife, and outdoor recreation, and the development of INRMPs. This important first step led to the military establishing partnerships with other natural resources and land management agencies that were already utilizing principles of ecosystem management.

The DoD Biodiversity Management Strategy (*The Keystone Center*, 1996) identifies the INRMP as the primary vehicle for implementing biodiversity protection on military lands. This implementation is conducted by:

- Monitoring and inventory efforts to provide information for adaptive management;
- protection of sensitive areas;
- use of native species and natural landscaping techniques;
- wetlands management and protection;
- conservation of biodiversity; and
- restrictions on activities that negatively affect biodiversity.

DoDI 4715.03 includes biodiversity directives to be followed whenever practicable, which include:

- Maintain or restore remaining native ecosystem types across their natural range of variation.
- Maintain or reestablish viable populations of native species on an installation, when practical.
- Maintain ecological processes, such as disturbance regimes, hydrological processes, and nutrient cycles, to the extent practicable.
- Manage and monitor resources over sufficiently long time periods to allow for adaptive management and assessment of changing ecosystem dynamics (i.e., incorporate a monitoring component to management plans).

The Air Force identifies biodiversity conservation as an integral part of ecosystem management. The AFI 32-7064 includes the following:

- *Maintain or reestablish viable populations of all native species on USAF controlled lands when practical and consistent with the military mission and not in conflict with airfield operations.*
- *Consider the effects of climate change in plans to restore native ecosystems.*

1.2.1 Management Strategy at Joint Base Elmendorf-Richardson

The key to effective natural resource management is identifying compatible and sustainable multipurpose landscape components capable of supporting military training requirements and consumptive or non-consumptive recreational use. Managing biodiversity on JBER includes projects and tasks to identify and protect critical habitat, travel corridors of sensitive wildlife species, minimize fragmentation, and ensure sustainable populations of native species and communities remain intact and functional. Important ecological features are illustrated on GeoBase layers as a planning tool.

Biodiversity on JBER has been quantified in several studies throughout the history of the installation, prior to and since joint-basing. In order to manage biodiversity on JBER, and thus measure the impact of mission dependent activities on the environment, many stand-alone and recurring studies are conducted to measure biodiversity and the ecological environment. Focused biodiversity studies, including marine mammal surveys, boreal forest and wetland bird surveys, Bald and Golden Eagle surveys, vegetation ecology surveys, fish speciation and enumeration studies, and other wildlife studies, are frequently integrated across disciplines to efficiently gather information on habitat availability, usage, and quality.

Effective habitat management is necessary to ensure that populations of plants and wildlife that share natural resources with the military are sustainable. Whether from anthropogenic influence or naturally occurring conditions, changes in the landscape affect biodiversity. Non-self-sustaining fish populations in kettle lakes and the exclusion of salmon from upper Ship Creek as a result of constructed dams could represent a decrease in aquatic biodiversity for fish. Changes in the presence and abundance of vegetative ecotypes from climatic factors have been observed in alpine areas where tall shrub species are encroaching above elevations they've previously been known to occur. The potential impact of changes in habitat structure to wildlife utilizing the alpine habitat on JBER, such as Dall sheep and collared pika, will require further study. Additionally, changes to the availability, connectivity, and quality of wetlands tributary to anadromous waters may have an effect on fisheries, upon which the Cook Inlet beluga whale is dependent. Changes in diversity and abundance of boreal wetlands and forest birds will be dependent on the connectivity and health of JBER's forest and forested wetland resources.

Interfacing with military trainers, collecting and storing data, and utilizing the tools to analyze that data, including geographic information systems (GIS), provides a better understanding of where compatible and sustainable multipurpose landscape components exist. Sustainable biodiversity can be attained by understanding military training requirements and identifying limiting ecological conditions.

Adaptive Management

Adaptive management is a process for managers to address and handle uncertainties and complexities inherent in natural systems by treating ecosystem management as an experiment (Leslie *et al.* 1996). Adaptive management is an adaptive approach exploring alternative ways to meet management objectives, predicting the outcomes of alternatives based on the current state of knowledge, implementing one or more of these alternatives, monitoring to learn about the impacts of management actions, and then using the results to update knowledge and adjust management actions.

673d CES Natural Resources recognizes that current management methods are continually evolving and uses control treatments and monitoring to measure effects and efficiency of management techniques.

Emphasis is being placed on monitoring activities to help facilitate adaptive management. Results of monitoring management activities can change future management both for JBER and other natural resources managers.

Air Force Policy

AFI 32-7064, *Integrated Natural Resource Management* (November 22, 2016) states that when preparing or revising an INRMP, ecosystem management principles and guidelines of DoDI 4715.03, *Natural Resources Conservation Program* (August 31, 2018) are considered. AFI 32-7064 specifies five Air Force principles for ecosystem management. AFI 32-7064 also states that biodiversity conservation is an integral part of ecosystem management, and that viable populations of all native species should be maintained or reestablished on all Air Force-controlled lands when practical and consistent with the military mission.

673 ABWI 32-7001, *Conservation and Management of Cultural and Natural Resources* (July 25, 2012) states that JBER vegetation, wildlife resources, wetlands, lakes, and streams will be managed within the limitations of the overriding military mission under the principles of ecosystem management, and that the 673 ABW will strive to protect, improve, and enhance environmental quality on JBER. 673 ABWI 32-7001 (Section 2.2) further states that lands and natural resources will be managed with the following priorities in mind:

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

1.3 Authority

The Sikes Act (16 USC 670 et seq.): is the cornerstone legislative mandate that provides for natural resources management on Department of Defense (DoD) lands. The Sikes Act states, *the Secretary of Defense shall carry out a program to provide for the conservation and rehabilitation of natural resources on military installations. To facilitate the program, the Secretary of each military department shall prepare and implement an integrated natural resources management plan for each military installation...*

The Sikes Act (16 U.S.C. 670c-1) allows the Secretary of a military department to enter into cooperative agreements with the states, local governments, Native American tribes, nongovernmental organizations and individuals to provide for the maintenance and improvement of natural resources, or to benefit natural and historic research on DoD installations and, under certain circumstances, off of such installations as well.

The Sikes Act (16 U.S.C. 670a(a)(2)) requires that the military *prepare each plan in cooperation with … the head of each appropriate State fish and wildlife agency for the State in which the installation is located. Consistent with paragraph (4), the resulting plan for the military installation … shall reflect the mutual agreement of the parties concerning conservation, protection, and management of fish and wildlife resources.*

The Sikes Act (16 U.S.C. 670a(a)(4)) *and neither enlarge or diminish the responsibility and authority of any State for the protection and management of fish and resident wildlife.*

Department of Defense Instruction (DoDI) 4715.03: *Natural Resources Conservation Program* (August 31, 2018) requires that… *installations prepare, maintain, and implement Integrated Natural Resources Management Plans (INRMPs) in coordination with the U.S. Fish and Wildlife Service (USFWS) and the appropriate State fish and wildlife management agency(s), and ensure that those plans are fully coordinated with appropriate installation offices responsible for preparing, maintaining, and implementing other programs and plans that may affect land use or be affected by land use decisions, to include but not be limited to operation and training plans, range sustainment plans, installation master plans, outdoor recreation plans, integrated cultural resources management plans, pest management plans, and other installation plans as appropriate.*

DoDI 4715.03 also has provisions for INRMP self-assessment and external reviews, to include annual reviews with stakeholders and external reviews for operation and effect no less than every five years, using Natural Resources Conservation metrics. INRMPs are to be updated or revised and evaluated as necessary, based on results of these reviews standards.

Air Force Instruction (AFI) 32-7064: *Integrated Natural Resources Management* (November 22, 2016) implemented Air Force and DoD Policy Directives. It explains how to manage natural resources on Air Force property in the United States so as to be in compliance with state, federal and local laws and standards for natural resources management.

673d Air Base Wing (ABW) Instruction (673 ABWI) 32-7001: *Conservation and Management of Cultural and Natural Resources.* This ABWI implements Air Force environmental and natural resources policy directives at the installation or wing level. It prescribes policies and responsibilities for the management and conservation of water, forest, fish, wildlife, and outdoor recreation resource access, resource enforcement and historical and archeological site protection on JBER. It details management priorities, program staffing, and requirements for plans and cooperative agreements. Basic objectives of the various programs are also described, as well as responsibilities of various base-level offices and units.

Other Air Force Guidance: Other guidance documents that have some bearing on natural resources management include current Air Force manuals on *Pest Management Programs and Operations*, which details pest management programs for the installation, 673 ABWI 32-2001 *Fire Prevention Program*, which covers wildland firefighting procedures and policy, and Air Force Policy Directive 32-70, *Environmental Quality*. Appendix C, *Annotated Summary of Key Legislation* lists other laws and regulatory instruments that may have bearing on natural resources management on JBER.

Other Related Authorities: Appendix C, *Annotated Summary of Key Legislation* lists federal laws, executive orders, Presidential memoranda, DoD directives/instructions, Air Force regulatory instruments, state laws, and other regulatory instruments that may affect implementation of this INRMP. The INRMP is prepared to assure compliance with these regulatory authorities.

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

1.4 Integration with Other Plans

The INRMP is a component of the JBER Installation Development Plan and is, itself, supplemented by annual, agency-coordinated updates and other related JBER plans (Integrated Cultural Resources Management Plan, Installation Restoration Management Plan, Storm Water Pollution Prevention Plan, Golf Course Environmental Management Plan, Landscape Development Plan, Integrated Pest Management Plan, Bird and Wildlife Aircraft Strike Hazard Management Plan, the U.S. Army Alaska Integrated Training Area Management Plan, and Wildland Fire Management Plan). This INRMP was prepared with cognition of these plans. Coordination with appropriate JBER offices is imperative to the success of this INRMP.

This INRMP will guide JBER's natural resources management program. The INRMP has been developed primarily by JBER 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 JBER, including Army, Air Force, and 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	673 ABW 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	Name: Brent Koenen Phone: (907) 384-6224 Email: brent.koenen@us.af.mil
State and/or local regulatory POCs (For US-bases, include agency name for Sikes Act cooperating agencies)	U.S. Fish and Wildlife Service Alaska Department of Fish and Game National Marine Fisheries Service
Total acreage managed by installation	73,041
Total acreage of wetlands	7,439
Total acreage of forested land	39,053
Does installation have any Biological Opinions? (If yes, list title and date, and identify where they are maintained)	No
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 ☑ Land Management ☑ 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

JBER is strategically located at the air crossroad connecting the United States with the Pacific Far East and Europe. JBER is located within the Municipality of Anchorage in Southcentral Alaska (latitude/longitude: 61 degrees 15 minutes N/149 degrees 42 minutes W). The 73,041-acre installation is bordered on the east by the community of Eagle River and Chugach State Park, on the south by the Bureau of Land Management Campbell Tract and Stuckagain Heights, on the southwest by Bicentennial Park and the communities of Muldoon, Mountain View, and Government Hill and on the north and west by the Knik Arm of Cook Inlet (Figure 2-1). The Glenn Highway to the north and the Seward Highway to the south connect JBER to other road accessible portions of Alaska. The Alaska Railroad passes through JBER as it runs from Seward to Fairbanks. Utility lines between Anchorage and areas to the north run along both the Glenn Highway and the Alaska Railroad.

Table 2-1: Installation/GSU Location and Area Descriptions

Base/GSU Name	Main Use/Mission	Acreage	Addressed in INRMP?	Describe NR Implications
JBER	Air Force and Army Missions	73,013	YES	See Chapter 7
Eklutna Mountain Training Site	Glacier training	68.53	Not included in the INRMP	N/A
Gulkana Army Training Site	Convoy rendezvous and staging area	44.06	Not included in the INRMP	N/A
Kenai Airport Annex	Civil Air Patrol hangar	5.51	Not included in the INRMP	N/A
Alaska ACMI Sites 1	Aerial combat training and analysis	1.0	Not included in the INRMP	N/A
Alaska ACMI Sites 2	Aerial combat training and analysis	1.0	Not included in the INRMP	N/A
Alaska ACMI Sites 3	Aerial combat training and analysis	1.04	Not included in the INRMP	N/A
Alaska ACMI Sites 4	Aerial combat training and analysis	1.02	Not included in the INRMP	N/A
Alaska ACMI Sites 5	Aerial combat training and analysis	1.03	Not included in the INRMP	N/A
Alaska ACMI Sites 6	Aerial combat training and analysis	1.07	Not included in the INRMP	N/A
Alaska ACMI Sites 7	Aerial combat training and analysis	1.0	Not included in the INRMP	N/A
Alaska ACMI Sites 8	Aerial combat training and analysis	1.05	Not included in the INRMP	N/A
HAARP Site	Disposal Status	5408	Not included in the INRMP	N/A

JBER includes an additional 5534.31 acres at 12 other geographically separated units (GSU), locations outside of the contiguous JBER boundary. The remote training and support sites are part of JBER, but not actively managed by the strategies outlined in this INRMP; Eklutna Mountain Training Site, Gulkana Army Training Site, Kenai Airport Annex, ACMI sites 1 – 8, and the HAARP Site. Figure 2-2 shows the location of these sites. These lands are associated with the JBER military mission in the following ways:

Eklutna Mountain Training Site: Not currently in use, but was formerly used for training on the glacier.

Gulkana Army Training Site: Utilized as a rendezvous and staging site for Army convoys.

Kenai Airport Annex: Used by the Civil Air Patrol. The site consists of a hangar for storing Civil Air Patrol aircraft. The Kenai Airport airstrip is also utilized by C130s for touch and go's.

ACMI sites 1 – 8: The Air Combat Maneuver Instrumentation (ACMI) Sites are approximately one-acre satellite sites located on mountain tops. These sites consist of a radio/satellite tower and small generator buildings supplied by propane tanks used to record an aircraft's inflight data during aerial combat training and analysis.

HAARP Site: The High Frequency Active Auroral Research Program (HAARP) site near Gakona is currently in disposal status after a legislative action in 2017. The University of Alaska Fairbanks is poised to take full ownership of the site once the disposal action is complete.

Figure 2-1: Location of Joint Base Elmendorf-Richardson, Alaska

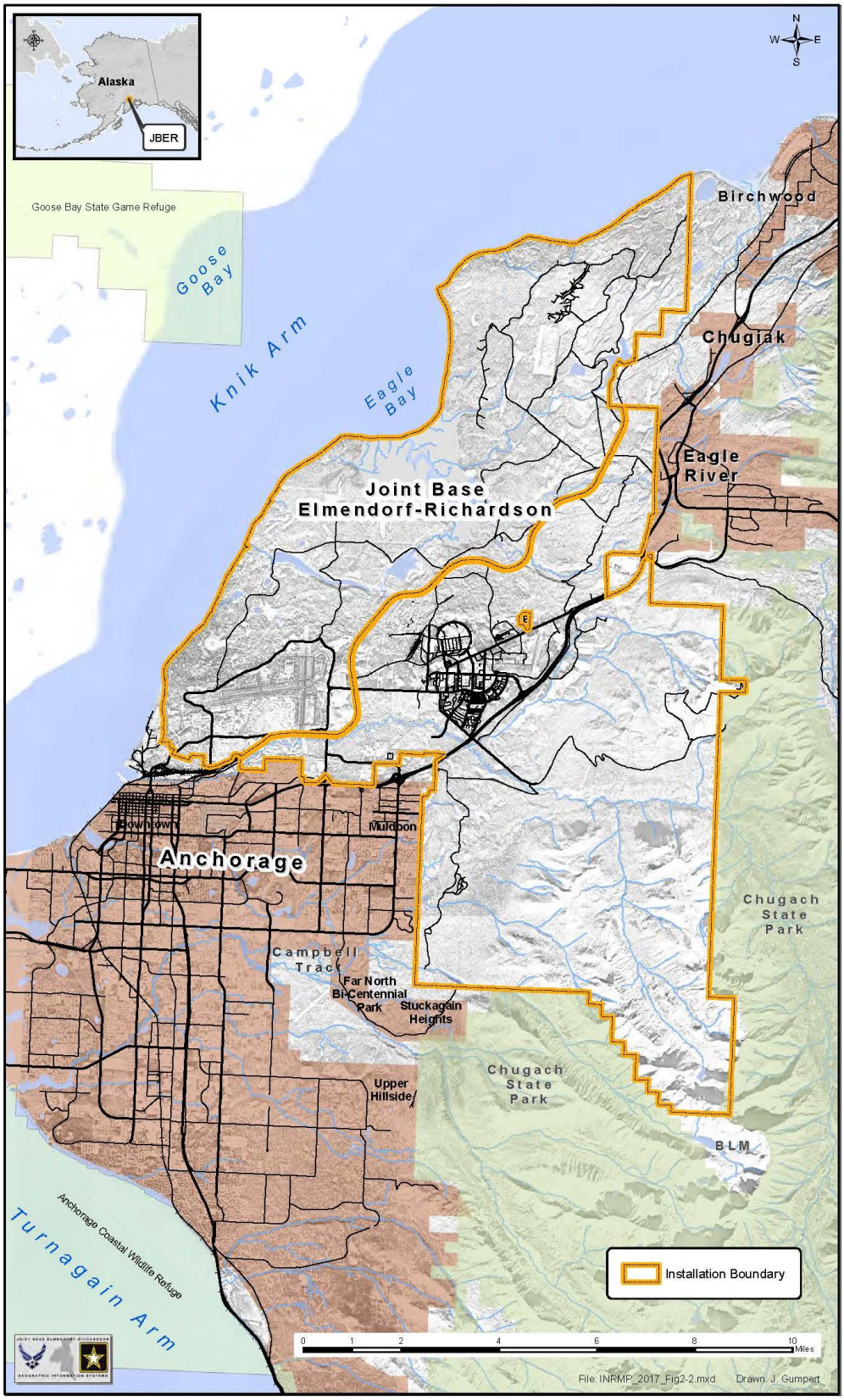
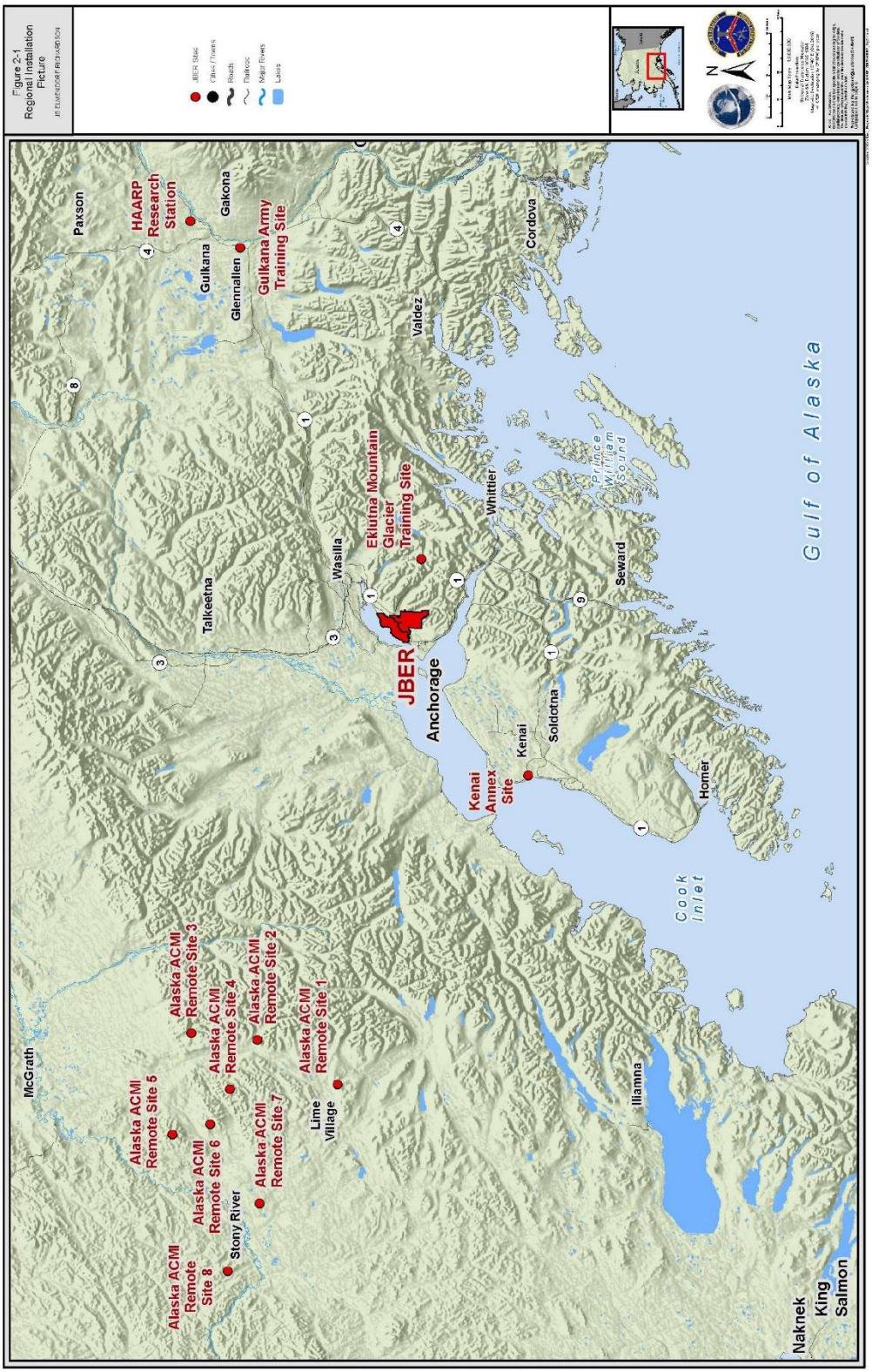


Figure 2-2: Locations of Joint Base Elmendorf-Richardson and GSUs, Alaska



2.1.2 Installation History

The most recent indigenous inhabitants of the Cook Inlet Region are the Dena'ina; one of 11 Athabascan languages spoken throughout Alaska. The area that is now JBER was inhabited by the Dena'ina at the time of Russian explorer establishment in the late 1700s. The Dena'ina people of Knik, Eklutna, and Tyonek, and the Ahtna of Chickaloon have historic land use ties to installation land and resources. The richness of Ship Creek fisheries seasonally attracted members of these tribes. Early miners and settlers became established in the late 1800s and early 1900s through the Homestead Act.

With the decision to build a railroad with connections to the mouth of Ship Creek, Anchorage was born in 1916. Development associated with the railroad encouraged homesteading on JBER lands. Between 1914 and 1939, there were 79 homestead applications for lands that would eventually become JBER. The homestead program was designed to encourage agriculture, which included livestock (pigs, cows, and cattle) and crops (hay, strawberries, and various vegetables).

In 1939, an Executive Order (EO) was issued that withdrew 36,570 acres of land in Southcentral Alaska from the public domain placing it under War Department jurisdiction for the creation of Fort Richardson and Elmendorf Field. The homesteads in the area were condemned or purchased to make room for the installation development (Daugherty and Saleeby 1998). Land clearing began in 1940 at Whitney Station and soon expanded to house an Army infantry regiment. By January 1941, the 7,500 foot runway was completed.

Fort Richardson's first mission was defense of southern Alaska by establishing a permanent air base, supply depot, and garrison. When the Japanese attacked Pearl Harbor in 1941, Fort Richardson was charged with defending Alaska from invasion and coordinating the Alaskan war effort. As the war progressed, Fort Richardson's mission expanded significantly as the logistics base for numerous Army garrisons and the Air Corps. Between 1939 and 1945, approximately 151,180 acres of land were withdrawn. Before the outbreak of World War II, military strength in Alaska was less than 3,000; it soon grew to 7,800 troops stationed at Fort Richardson alone, including the 4th Infantry, 81st Field Artillery, and 75th Coast Artillery (Anti-Aircraft).

From 1945 to 1955, the military returned approximately 84,555 acres to the Department of the Interior via executive orders. A letter from the Secretary of the Interior, dated Oct. 27, 1952, granted permission for the military to retain jurisdiction over withdrawn lands until they were not needed for military use.

In 1950, 9,042 acres were transferred to the Air Force. The Army vacated Elmendorf Field, moving east to its present location in 1951. During the 1950s, Elmendorf Air Force Base (EAFB) was established and the location for much radar and communication improvements. From 1953 to 1965, the Department of the Army released approximately 10,000 acres to various entities, such as the U.S. Air Force (to complete EAFB acreage), State of Alaska, and the Bureau of Land Management (BLM), and acquired approximately 6,000 acres for Army use. In 1972, 3,340 acres were acquired by the Army (via Public Land Order) for use of the Fort Richardson-Davis Range. Numerous executive orders and public land order occurred over time to create JBER. An explanation of the numerous executive orders and public land orders is presented in Appendix D (U.S. Army Alaska 1998).

Army troops were re-designated as the U.S. Army Alaska in 1947, and assigned to the Alaskan Command, the nation's first unified command staffed jointly by Army, Navy, and Air Force officers. Three off-post Nike-Hercules missile sites were built in 1959. The missile unit was deactivated in 1979. Sites at Goose Bay and Point Campbell were decommissioned, while Nike Site Summit was retained by the Army. The area and its associated buildings were listed on the National Register of Historic Places in 1996.

In 1974, U.S. Army Alaska was inactivated, and Fort Richardson became headquarters for the 172nd Infantry Brigade (Alaska) in 1975. In 1986, the 172nd gave way to the 6th Infantry Division (Light) and U.S. Army Garrison, Alaska. In 1989, the division began reporting to the U.S. Army Western Command in Hawaii (later re-designated United States Army Pacific). In 1990, headquarters for the 6th was moved to Fort Wainwright, and FRA became headquarters for United States Army Alaska. In 1998, the 1st Brigade, 6th Infantry Division (Light) was deactivated, and the 172nd Infantry Brigade was reactivated. In 2004, the 172nd Infantry Brigade was converted to a Stryker Brigade Combat Team and the 1st-501st Airborne Battalion to an Airborne Task Force. In late 2005, the 1st-501st Airborne Task Force was converted to the 4th-25th Airborne Brigade Combat Team.

EAFB has served as a vital location for aircraft responding to aggression and defense of the northern Pacific. The first unit assigned to Elmendorf Airfield was the 18th Pursuit Squadron in 1941. The 23rd Air Base Group arrived shortly after to provide base support. The 11th Air Force was formed at Elmendorf in 1942. The 11th was re-designated as the Alaskan Air Command in 1945 when Elmendorf Airfield became Elmendorf Air Force Base. In 1947, the Alaskan Command was formed at EAFB, tasked as a unified command under the Joint Chiefs of Staff, and though it was disestablished in 1975, it was reestablished in 1989. The 43rd Tactical Fighter Squadron arrived in 1970, providing a new flexible role for Elmendorf based units as the Vietnam War was winding down. The 18th Tactical Fighter Squadron was activated in 1977, but was reassigned to Eielson Air Force Base in 1982. The 3d Wing was reassigned from Clark Air Force Base to replace the 21st Tactical Fighter Wing in 1991 as the host for units at EAFB (Command Information Chief, JBER Public Affairs).

From 1966 to 2010, Fort Richardson boundaries remained fairly stable. Leases from BLM expanded the boundary to the east and in the south. Between 1980 and 2010, Fort Richardson's acreage was re-allocated to the Municipality of Anchorage for a municipal landfill and to EAFB for privatized housing. In 2005, the Base Realignment and Closure Commission called for the realignment of EAFB and Fort Richardson into a single joint installation. The new joint installation became Joint Base Elmendorf-Richardson, effective 1 October 2010. In addition, the 176th Wing, Air National Guard, associated aircraft, and Expeditionary Combat Support from Kulis Air Guard Station became tenants on JBER. The 3d Wing transferred JBER managing responsibility to the 673 ABW. In 2013, after careful mapping, a boundary error was identified. BLM concurred that the extreme southeastern boundary near Long Lake was inaccurate. The BLM and JBER agreed on a redrawn land boundary and reported the information to Headquarters AF and BLM. The redrawn boundary resulted in a loss of 1,283 acres of military training land and is reflected in all the maps within this document. Figure 2-4 shows the jurisdictional history and ownership of JBER land, which is important from a natural resources management viewpoint.

The United States holds fee simple title to all federally owned lands. Figure 2-4 are labeled using Automated Civil Engineer System (ACES) database codes, Public Land Orders (PLO) or Executive Orders (EO) to show how the Air Force holds authority to the lands and identifies if the real property has usage restrictions. Lands identified as "Fee" on Figure 2-4 are government owned property acquired from private landowners through purchase or condemnation proceedings (almost all are former homesteads); PDOM, PLO, and EO labeled lands are within the public domain and have withdrawal restrictions associated with their use.

Figure 2-3: Historical Locations of Elmendorf Air Force Base and Fort Richardson, Alaska

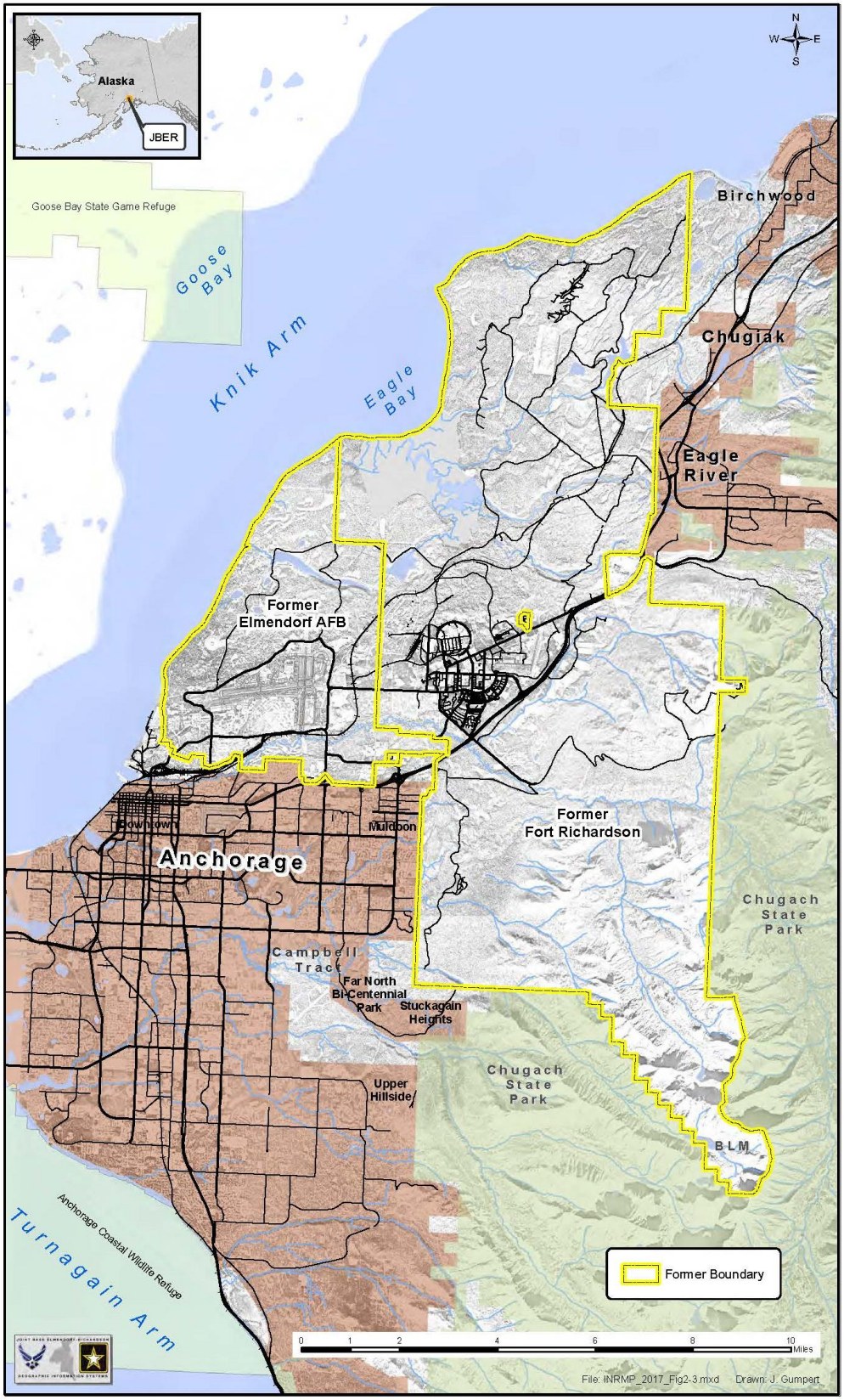
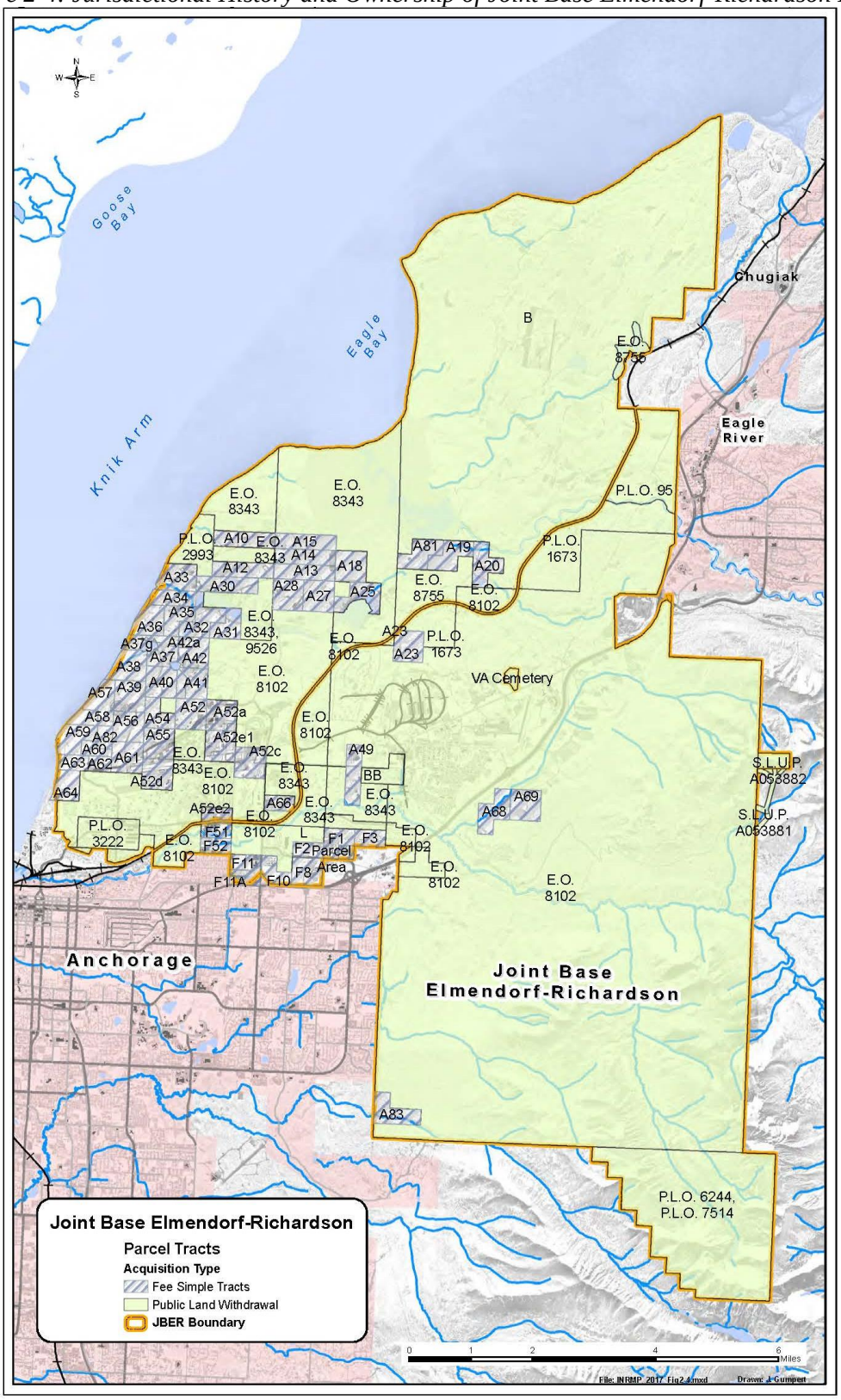


Figure 2-4: Jurisdictional History and Ownership of Joint Base Elmendorf-Richardson Land



2.1.3 Military Missions

673d Air Base Wing

Vision: *JBER… the Pacific's keystone weapon system.*

Mission: *Execute agile combat support to enable and sustain lethality.*

Priorities:

- Mission Ready
- Strong Squadrons
- Caring for People
- Trusted Partners

Implementation of this INRMP will support JBER military missions. The JBER Natural Resources staff is committed to supporting the military mission, providing stewardship of resources entrusted to the Air Force, enhancing the quality of life of JBER and surrounding communities, and being a valued member of the overall JBER team. Implementation of this INRMP will demonstrate those qualities.

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

JBER has approximately 12,500 active duty military personnel. In addition, JBER has about 3,500 civilian personnel and is home to an estimated 15,300 military dependents.

The 673 ABW is the host unit for JBER and is responsible for providing expeditionary combat support and day-to-day operations of the installation, including ensuring timely fire, medical and emergency services; providing deployment and redeployment support for nearly 12,000 deployable Soldiers and Airmen; planning, building and sustaining a $15-billion infrastructure; and much more.

The 673 ABW is composed of the 673d Medical Group, 673d Civil Engineer Group, 673d Logistics Readiness Group, 673d Mission Support Group, and more than a dozen Wing Staff Agencies, including Staff Judge Advocate, Public Affairs, the Installation Safety Office, and the Sexual Assault Prevention and Response Office.

As JBER's host unit, the 673 ABW provides administrative and logistical support to U.S. Army components of U.S. Army Alaska (USARAK), 11th Air Force, 3d Wing, 176th Wing, 732nd Air Mobility Squadron, 373d Intelligence, Surveillance, and Reconnaissance Group, 611th Air Operations Group, 611th Air Support Group, the Air Force Reserve's 477th Fighter Group, the Canadian Forces Detachment, the Marine Corps' Reserve Training Center, the U.S. Army Corps of Engineers District Office, and many other smaller supporting units.

USARAK's mission is to deploy combat ready forces to support joint military operations worldwide and serve as the Joint Force Land Component Command to support Joint Task Force Alaska. Other missions of USARAK are the defense of Alaska and coordination of Army National Guard and Reserve activities in the state.

USARAK has one brigade, which calls JBER home; the 4th Brigade Combat Team (Airborne), 25th Infantry Division. The mission of the Airborne Brigade Combat Team is to… *train to strategically deploy and conduct decisive action operations, to include joint forcible entry, in order to deter and defeat adversaries, facilitate security cooperation, and to contribute to a stable and secure Indo-Pacific AOR.*

Table 2-2: Listing of Tenants and Natural Resources Responsibility

Tenant Organizations	NR Responsibility
673d Air Base Wing	JBER
Alaskan Command (ALCOM)	JBER
11th Air Force	JBER
3d Wing	JBER
477th Fighter Group Air Force Reserve	JBER
176th Wing Air National Guard	JBER
US Army Alaska (USARAK)	JBER
US Army National Guard (AKARNG)	JBER
US Army Reserves	JBER
Alaskan NORAD Region	JBER
373d Intelligence, Surveillance, Reconnaissance Group	JBER
732nd Air Mobility Squadron	JBER
Air Force Office of Special Investigations, Det 631	JBER
Company D (-), Anti-Terrorism Battalion, U.S. Marine Corps Reserve	JBER
Defense Commissary Agency	JBER
Area Defense Council	JBER
Defense Logistics Agency Energy, Alaska Office	JBER
U.S. Army Corps of Engineers, Alaska District	JBER
Military Sealift Command, Anchorage	JBER
Army & Air Force Exchange Service (AAFES)	JBER
U.S. Navy Reserves	JBER
U.S. Coast Guard	JBER

2.1.4 Natural Resources Needed to Support the Military Mission

JBER natural resources are critical to the military mission. The Air Force uses natural areas as a buffer for airfield activities while the Army uses natural areas for mounted and dismounted maneuver training and weapons training. 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 JBER. Implementation of an ecosystem-based management plan ensures that natural resources will provide the proper arena for supporting the military mission and personnel.

2.1.5 Surrounding Communities

Surrounding JBER, the Municipality of Anchorage influences much of the planning on JBER. Anchorage Borough, as of the 2010 census, had an estimated population of 291,826, with a 12.1% growth since 2000. Expansion of the city is greatly restricted by JBER to the east and north, Knik Arm to the west, Turnagain Arm to the south, and Chugach State Park to the south and east.

The communities of Eagle River, Chugiak, Eklutna, and Birchwood are to the northeast and are part of the Municipality of Anchorage. Further north, Palmer and Wasilla, the primary communities of the Matanuska-Susitna Borough, serve as residential communities for many workers of Anchorage businesses and agencies. The 2010 estimated population of the Matanuska-Susitna Borough was 88,995. Figure 2-2 shows JBER surrounding communities.

Transportation Links

JBER is bisected by the Glenn Highway (U.S. Highway 1), which provides primary access to the installation. It is the most heavily used highway in the state, connecting Southcentral Alaska to Interior Alaska and Canada. JBER is accessed from the Glenn Highway by Richardson Drive, Muldoon Road, and Boniface Parkway highway exits. Richardson Drive passes through the JBER-Richardson cantonment area, becoming the Davis Highway as it approaches the JBER-Elmendorf cantonment. JBER is also accessible from Post Road and the A/C Street Couplet.

JBER is intermittently served by the Alaska Railroad Corporation (ARRC). The railroad's main line crosses between the two cantonment areas, and a spur extends to a loading facility and an ammo storage complex. The railroad provides both freight and deployment services with access to Fairbanks and port facilities in Anchorage, Whittier, and Seward, which is a deep-water port at the southern terminus of the railroad. The Municipality of Anchorage operates a deep-water seaport and fuel terminal at the Port of Alaska.

There are two airfields on JBER. The JBER-Elmendorf airfield provides JBER's primary air link. The airfield can support any type of military aircraft including the C-5 Galaxy and the C-17 Globe Master III. Runway 06/24 (east/west) is 10,000 feet long by 200 feet wide and runway 16/34 (north/south) is 7,500 feet long by 150 feet wide. Bryant Army Air Field, adjacent to the JBER-Richardson cantonment area and the Glenn Highway, has a main, hard-surfaced, north/south runway, which is 3,000 feet long. The Bryant airfield was out granted to the Alaska Army National Guard as a base for their fixed-wing and rotary aircraft. Large parking aprons and several hangars are within the airdrome. MWR maintains a recreational aircraft gravel airstrip on the southern shore of Sixmile Lake and a winter ski and summer floatplane strip on the lake.

There are three airports located near JBER. Merrill Field is a municipal-owned public use airport currently used by general aviation and commercial aircraft located in downtown Anchorage. Ted Stevens Anchorage International Airport, is 10 miles southwest of JBER. It is the largest airport in Alaska for both passenger and air cargo operations. More than 30 carriers provide passenger service and it is the 2nd largest air cargo handler and transfer site in the United States. The Lake Hood Seaplane Base is adjacent to the Ted Stevens Anchorage International Airport comprised of lakes Hood and Spenard and is the largest and busiest floatplane base in the world.

Regional Land Use

JBER lies within the geographical confines of the Municipality of Anchorage. The current economic vigor of the municipality and the demand for new housing and business expansion has nearly maximized development on private and municipal lands outside of legislatively designated special areas. The need for more room for development has precipitated frequent attempts to design and fund a bridge to largely undeveloped lands across Knik Arm by passing through or adjacent to JBER. The Port of Alaska expansion required the transfer of EAFB land. Two large shopping malls were also constructed near JBER boundaries. The overall effect of these non-DoD developments is rapidly diminishing wildlife habitat outside JBER boundaries, which, in turn, affects wildlife on JBER. Section 2.4.4, Potential Future Impacts has more detail on this significant issue.

2.1.6 Local and Regional Natural Areas

There are nine significant natural areas managed by state, municipal, and native corporation offices. The largest and most significant natural area is Chugach State Park, JBER's largest neighbor (Figure 2-2). Chugach State Park encompasses approximately one-half million acres, one of the largest state parks in the

nation. Being within and adjacent to the Municipality of Anchorage and JBER, it serves to provide numerous recreational opportunities (e.g., mountaineering, hiking, fishing, hunting, skiing, camping) as well as unique Alaskan ecosystems. The park is within a portion of the Chugach Mountain Range. This mountain range with valleys, rivers, glaciers and alpine is home to numerous Alaskan mega-fauna that also visit JBER.

The state game refuges of Anchorage Coastal, Susitna Flats, Goose Bay, and Palmer Hay Flats border upper Cook Inlet and provide thousands of acres of important coastal wetlands for waterfowl, shorebirds, and other wildlife. These important waterfowl areas surrounding JBER are a source of BASH risks to JBER aircraft.

Far North Bicentennial Park (Figure 2-2) is south of JBER and connects to the western border of Chugach State Park. Aside from the military reservations, this is the largest, mostly intact, lowland boreal forest remaining in the Anchorage bowl. Recreational and land development demands are currently posing threats to the integrity of the wildlife habitat in this park. Eklutna Inc. also manages over 1,000 acres of conservation easements around Eklutna, Knik Arm, Jim Creek, and Mud Lake.

2.2 Physical Environment

2.2.1 Climate

JBER spans elevations from sea level to more than 5,000ft (1600m) in the Chugach Mountains, falling within two ecoregions; Coastal Trough Humid Taiga (Cook Inlet-Susitna Lowlands) and Pacific Coastal Mountain (Bailey 1995). The installation is situated in a transitional zone between the maritime climate effects to the south, and the interior or continental climate zone to the north. Principal factors affecting the climate of the installation include terrain, latitude, altitude, and proximity to the ocean. Coastal mountains to the south act as a barrier to maritime influences of the northern Pacific Ocean, while the Alaska Range to the north and west protects the area from extreme cold air masses of the interior region. The proximity of Cook Inlet also provides additional temperature effects on the climate.

There are two weather stations located on JBER. One is located at the Elmendorf airfield and the other at Bryant Army Airfield. The official temperature recording station for the area is located at the Ted Stevens International Airport. Average yearly temperatures range between approximately 8° F and 65° F, with the highest monthly average occurring in July. The highest temperature recorded was 90° F on July 4, 2019and the lowest temperature recorded was -34° F on Jan 5, 1975 (National Weather Service, 2019). A summary of monthly temperature and precipitation averages from the installation cantonment are presented in the table below.

Table 2-3: Joint Base Elmendorf-Richardson Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg Max Temp (°F)	21.1°	27.9°	32.8°	45.4°	56.8°	64.0°	66.0°	64.2°	55.1°	40.9°	26.8°	23.5°
Avg Min Temp (°F)	7.8°	12.2°	14.5°	27.7°	37.9°	46.2°	50.1°	47.7°	39.9°	26.9°	13.8°	10.2°
Avg Total Precip (in)	0.70	0.82	0.73	0.29	0.63	0.97	1.99	2.32	2.50	1.58	1.17	1.40
Avg Total Snowfall (in)	9.0	9.4	10.0	2.4	0.4	0.0	0.0	0.0	0.0	5.8	10.0	16.1

(Period of Record 5/1/1990-4/30/2016)
Source: Alaska-Western Regional Climate Center (FT Richardson WTP, Alaska [503163], 2018)

On JBER, spring is marked by ice "break-up" usually starting by early-April and lasting into May. Break-up is characterized by a rapid rise in temperature. Summer conditions last from June to early September, with a daily mean of 57° F, with an average high of 64.7° F and low of 48° F (WRCC, 2016). When 28° F is used to define a "killing frost," the average last occurrence is 2 May and the average first occurrence is 30 September, providing a growing season of approximately 124 days. Autumn on JBER is brief, lasting from mid-September to late-October. Autumn ends with the first persistent snowfall. JBER has below freezing temperatures that usually last from mid-October to mid-April. Average daily mean temperature during the winter is around 17° F, with an average high of 24° F and low of 10° F (WRCC, 2016). High-pressure weather systems during winter may lead to successive days with temperatures below -35° F.

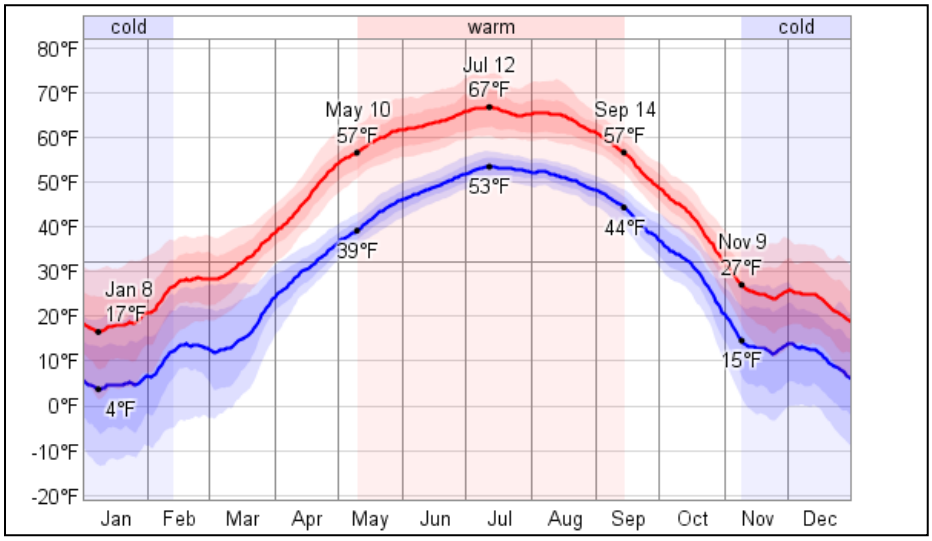


Figure 2-5: Daily Average High and Low Temperatures, with 25th to 75th percentile (inner band) and 10th and 90th percentile (outer band). Elmendorf Weather Station (2004-2012)
Source: WeatherSparks, 2016

A climate analysis conducted by APU (Dial et al. 2015) between 1916 and 2014 indicated the average annual temperature increased 0.22˚C/decade and the growing season temperature increased 0.28 ˚C/decade. This analysis found that increases across seasons (months) were not consistent. More specifically, increases of 0.3˚C/decade in May and July, mean that growing season temperatures are increasing at a higher rate than during other months and spring thaw occurs more than two weeks earlier (Dial et al. 2015). Temperature increases in May would result in faster and more extensive snowmelt, depleting high elevation, seasonally persistent snowbeds, which can have impacts to stream and groundwater recharge and the phenology of alpine plants.

The summer of 2019 was record-setting in the Anchorage area – heat, drought, smoke, and thunder. June and July were the hottest on record, with an all-time high of 90 degrees reached on July 4th, 2019. Smoke from wildfires on the Kenai Peninsula shrouded the Anchorage Bowl, leading to the smokiest summer on record. Thunderstorms were observed on four separate occasions, more than any other year on record. Despite these early-summer storms, Anchorage received just twenty percent of typical rainfall and was classified in "extreme drought" status for most of the summer.

Precipitation Patterns

Average annual precipitation for the JBER area is 15.64 inches. Most of this precipitation falls from June through October as rain. Snow with minor amounts of rain is prevalent from October through April.

Average snowfall is 63.0 inches (approximately 6.3 inches of water). Rainfall during the winter averages 0.4 inches (approximately 3% of the total winter precipitation).

Climate analysis conducted by APU (Dial et al. 2015), indicated that the total annual precipitation in the Anchorage Bowl has increased at a rate of between 8.9 mm/decade and 7.7 mm/decade. The combination of changes in temperature and changes in precipitation, or potential evapotranspiration, however, have a more relevant effect on vegetation, than each factor alone. Their analysis indicates that, despite increased temperature and precipitation documented in the area, the overall water balance in the Anchorage Bowl is negligible; which contrasts to strong "drying" trends that have been observed as nearby as the Kenai Lowlands (Dial et al. 2015).

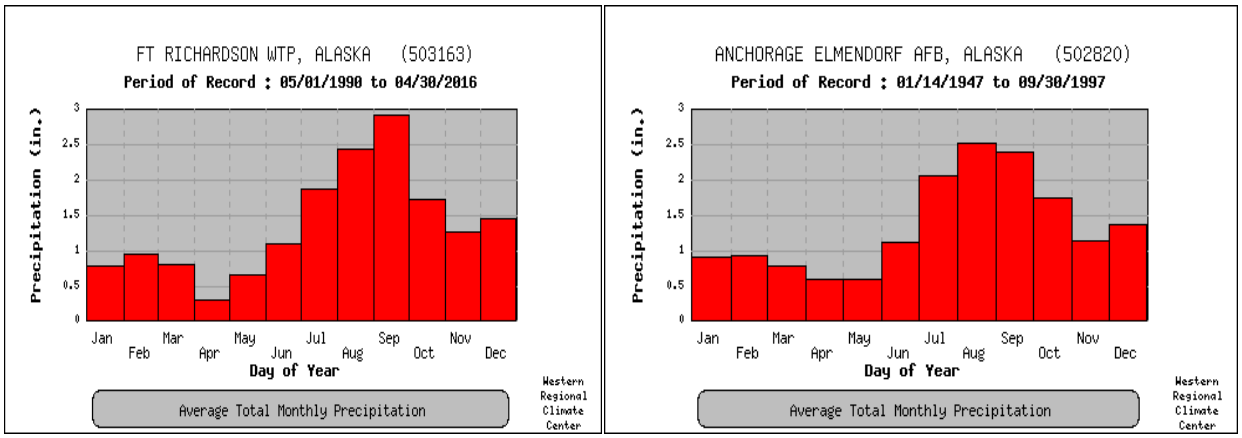


Figure 2-6: Monthly Average Total Precipitation
Source: WRCC, 2016

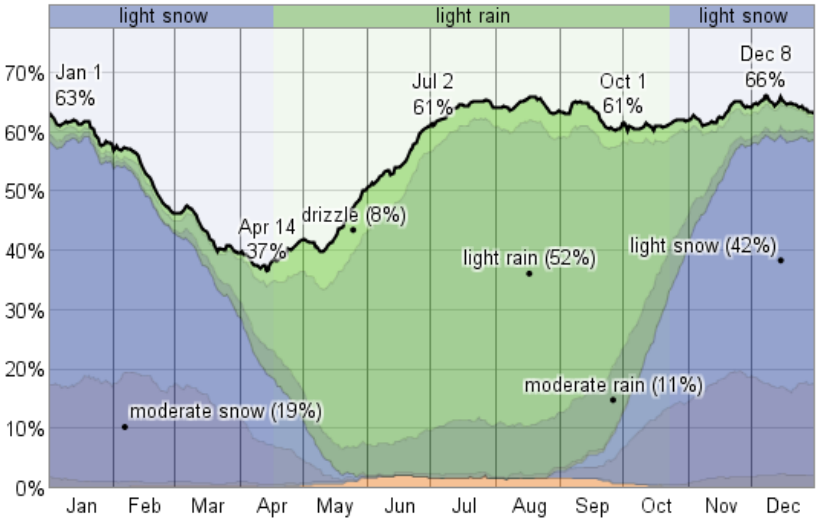


Figure 2-7: Probability of Precipitation at Elmendorf Weather Station (2004-2012)
Source: WeatherSparks, 2016

Wind

High altitude airflow in the JBER area is generally toward the northeast and northwest. Surface flow is more variable. Prevailing winds come from the west in summer and from the north and northeast in winter. Surface wind velocities average about six miles per hour, although wind velocities of 70 knots (80.5 mph)

have been recorded in the Anchorage area. Channeling of the winds near Ship Creek is common with gusts reaching 53 knots. Channeling of south and southeasterly winds passing over the Chugach Mountains, during low- pressure systems, can lead to "chinook" wind gusts up to 100 miles per hour. These gusts can inflict significant property damage (Gossweiler 1984).

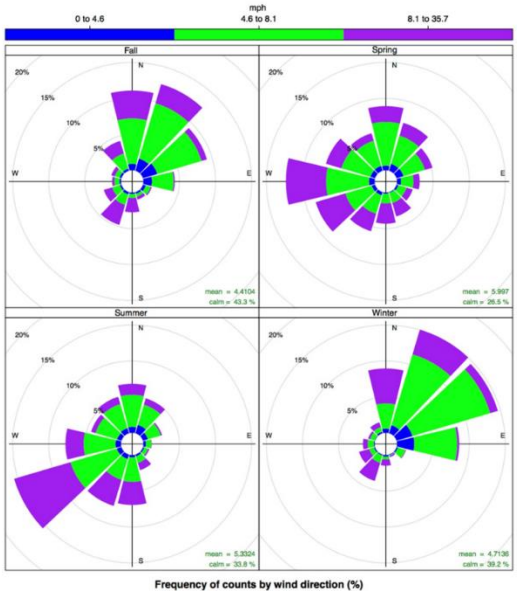


Figure 2-8: Wind Direction at the Elmendorf Weather Station by Season, 2018-2019
Compass-rose diagrams (left) depicting wind direction and relative frequency from the Elmendorf weather station wind speed occurrences (combined) among low (blue), moderate (green), and high (purple) recordings between May 2018 and October 2019. Blue represents frequency of wind recordings between the minimum (0.0 mph) and 1st quartile range (2.0 mph). Green represents frequency of wind recordings between the 1st quartile (2.0 mph) and 3rd quartile range (5.75 mph). Purple represents frequency of wind recordings between the 3rd quartile (5.75 mph) and the maximum (47.18 mph). Outliers are large, but infrequent wind events RAWS data are from https://mesowest.utah.edu.

Remote Climate Monitoring Stations on JBER

Temporary weather stations were erected in Snowhawk Valley and on Eagle River Flats in 2018 in order to gather site specific data from climatically distinctive areas. The Snowhawk Valley station is located at approximately 2,654 feet MSL in a U-shaped valley near the headwaters of Snowhawk Creek, a tributary of Ship Creek in the Chugach Mountains. The Eagle River Flats station is located at 13 feet MSL at the mouth of Eagle River at Eagle Bay along the shore of the Knik Arm of Cook Inlet. An additional temporary station was erected in the lower alpine region of Upper Chester Creek Watershed in 2019. The period of record for the Eagle River Flats station is 13 July 2018 through 29 October 2019. The period of record for the Snowhawk station is 17 July 2018 through 2 October 2019. The period of record for the Chester Creek Headwater station is 14 May 2019 through 29 October 2019. All three stations are currently data logging and will be remain operational as practicable.

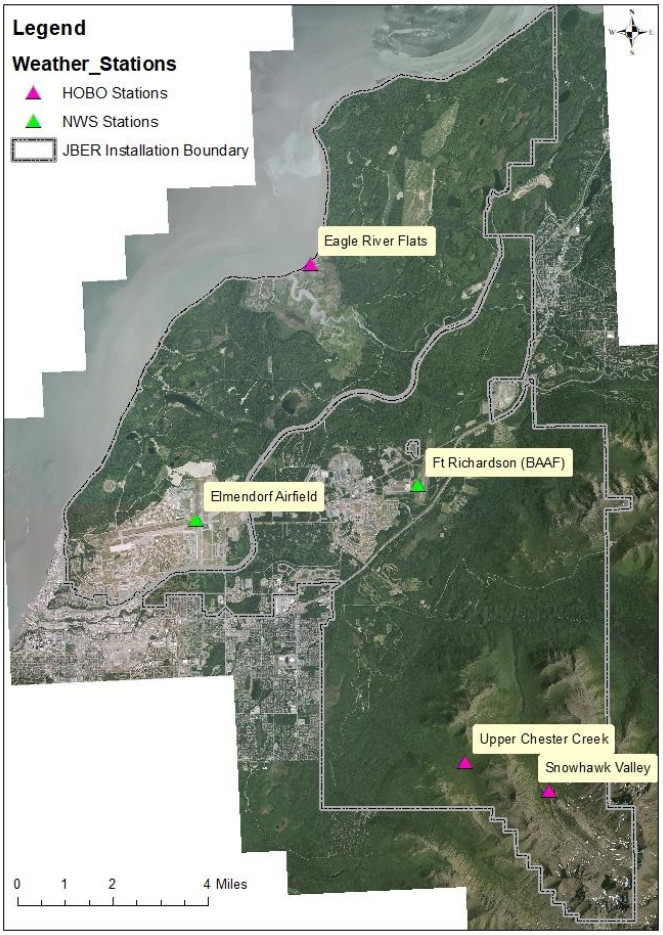


Figure 2-9: 2019 Weather Station Locations on Joint Base Elmendorf-Richardson.

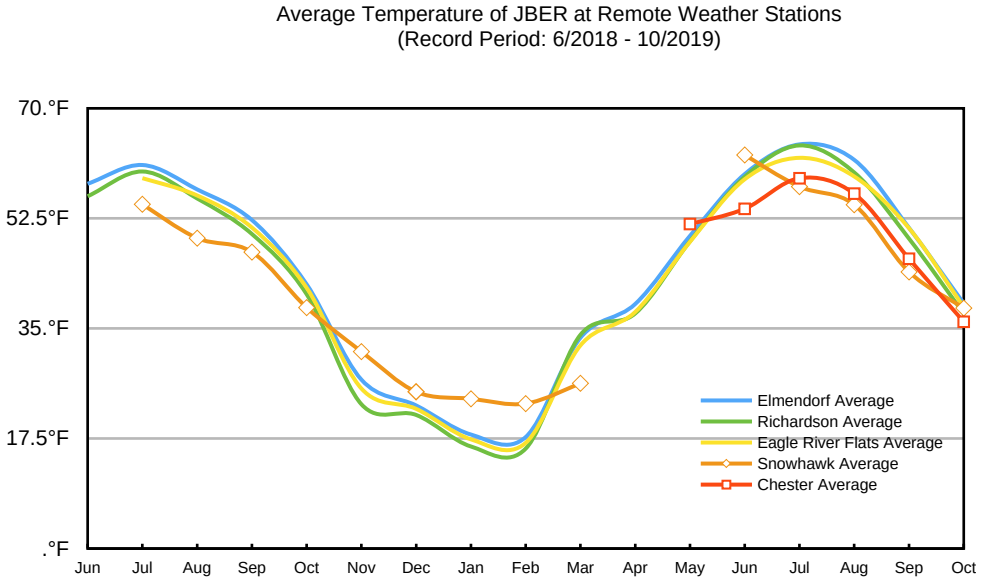


Figure 2-10: Data recorded from remote weather stations alongside data from the Elmendorf Airfield and Bryant Army Airfield RAWS stations. May 2018 to October 2019. RAWS data are from https://mesowest.utah.edu.

Precipitation records for alpine weather stations indicate greater precipitation at higher elevations, frequently visible from lower elevations. Orographic effects stall and accumulate vapor at higher, cooler elevations; commonly referred to as the "rain shadow" effect.

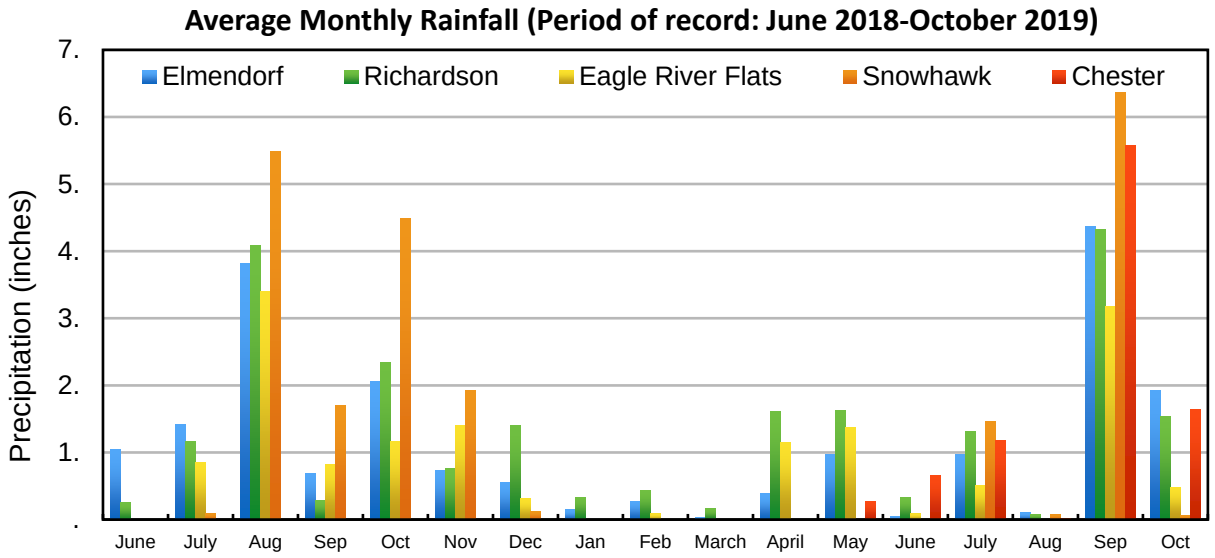


Figure 2-11: Average monthly rainfall recorded at remote weather stations alongside data from the Elmendorf Airfield and Bryant Army Airfield RAWS stations. May 2018 to October 2019. RAWS data are from https://mesowest.utah.edu.

Wind metrics measured at remote stations on JBER indicate a variety of patterns occurring with respect to major landforms and waterbodies. Seasonal variation is expected, concurrent to expected seasonal air mass patterns. There is not enough data yet to reasonably analyze land mass specific air movement patterns at this time, but as data accumulate over a number of years, it is expected that distinct patterns of air movement will emerge between montane and maritime regions of the installation.

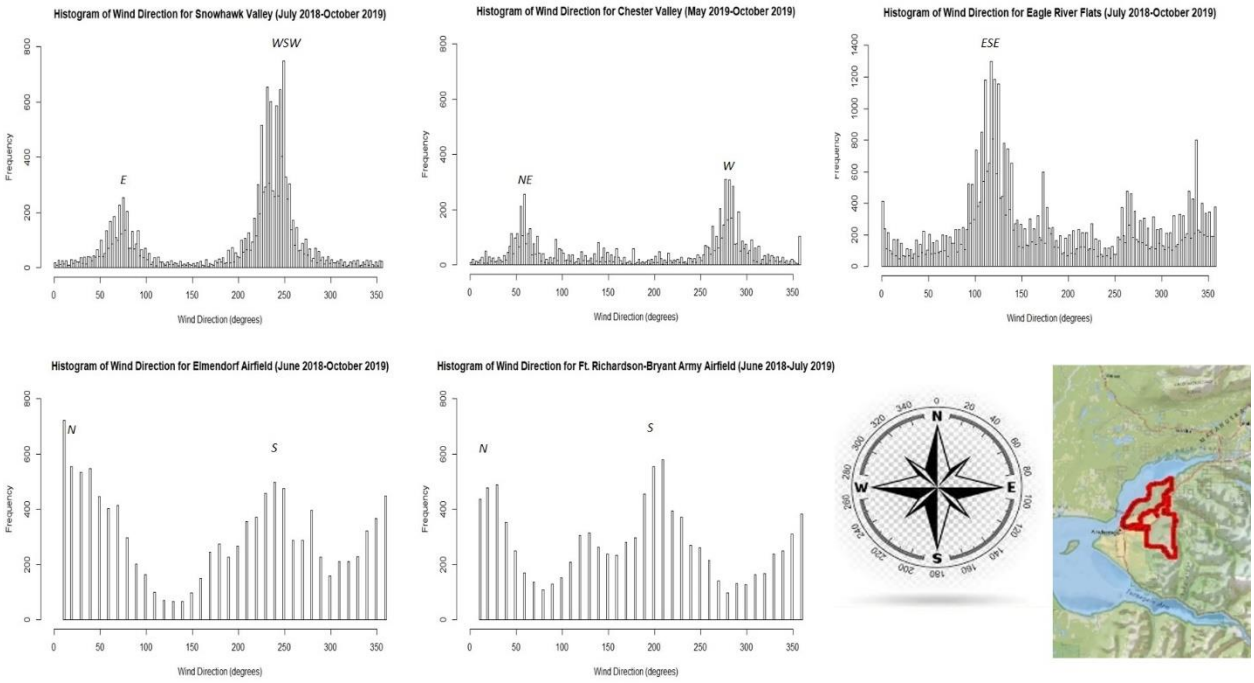


Figure 2-12: Histograms of wind direction recorded at remote weather stations and RAWS stations on JBER.

Climate projections for Joint Base Elmendorf-Richardson (Table 2-4) suggest minimum and maximum temperatures will increase over time under two emission scenarios – a moderate carbon emission scenario (Representative Concentration Pathway [RCP] 4.5) and a high emission scenario (RCP 8.5). The potential impact of these two climate change scenarios on the site's natural resources was analyzed using extracted climate data from 2026 to 2035 to represent the decadal average for 2030, and extracted data from 2046 to 2055 for the decadal average for 2050.

For the decade centered around 2030, both scenarios project an increase in average annual temperature (TAVE) of between 2.9 °F (1.6 °C) and 3.6 °F (2.0 °C) over the historic average. The two emission scenario projections show higher warming by 2050, with RCP 4.5 expressing a warming of 5.4 °F (3.0 °C). RCP 8.5 expresses a slightly greater warming of 7.3 °F (4.1 °C) for this period.

Average annual precipitation (PRECIP) varies between emission scenarios and over time due to larger interconnected ocean-atmosphere dynamics associated with the NCAR CCSM model. For 2030, the RCP 4.5 scenario projects an increase in PRECIP of 10% while RCP 8.5 shows an increase of 3%. For 2050, RCP 4.5 projects a moderate increase in PRECIP of 15% over historic average while RCP 8.5 shows a larger increase of 24% over the historic average (CSU-CEMML 2019).

Table 2-4: Joint Base Elmendorf-Richardson Summary Climate Data

Variable	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (inches)	24.8	27.4	28.6	25.6	30.7

TMIN (°F)	29.0	32.9	34.6	32.1	37.0
TMAX (°F)	43.2	46.5	48.4	46.0	49.9
TAVE (°F)	36.1	39.7	41.5	39.0	43.4
GDD (°F)	924	1347	1566	1286	1690
HOTDAYS	0.0	0.0	0.0	0.0	1.1
WETDAYS	0.0	0.0	0.0	0.0	0.0

Notes: TAVE ºF = annual average temperature; TMAX ºF = annual average maximum temperature; TMIN °F = annual average minimum temperatures; PRECIP (inches) = average annual precipitation; GDD ºF = Average annual accumulated growing degree days with a base temperature of 50 ºF; HOTDAYS (average # of days per year) = average number of hot days exceeding 90 °F; WETDAYS (average # of days per year) = annual number of days with precipitation exceeding 2 inches in a day. (Source: CSU-CEMML 2019)

Understanding changes in daily intensity and total precipitation for multi-day precipitation events is helpful to evaluate precipitation patterns in addition to assessment of annual averages. Three-day storm events (design storms) were generated from projected precipitation data based on RCP 4.5 and 8.5 emission scenarios for the 2030 and 2050 timeframes (**Error! Reference source not found.** and **Error! Reference source not found.**). Historical precipitation data were used to calculate a baseline storm event for the year 2000 for comparison. Design storms were used to model stream channel overflow in the hydrology assessment.

Table 2-5: Design storm precipitation, Eagle River basin.

Design Storm		Baseline	RCP 4.5		RCP 8.5	
		2000	2030	2050	2030	2000
Precipitation (inches)	Day 1	0.81	0.81	0.89	0.96	0.85
	Day 2	1.18	1.09	1.11	1.36	1.46
	Day 3	1.09	0.90	1.29	0.94	1.12
	Total	3.08	2.80	3.29	3.26	3.43
Percent change from baseline			-9%	7%	6%	11%

Table 2-6: Design storm precipitation, Ship Creek basin.

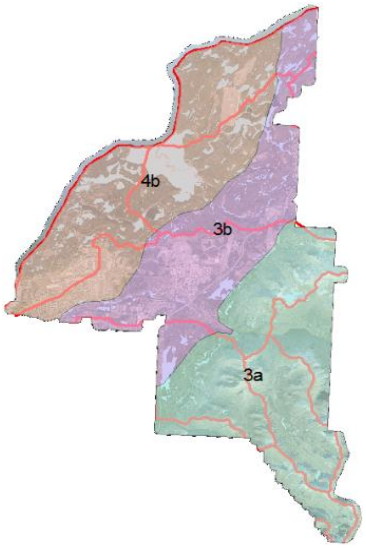
Design Storm		Baseline	RCP 4.5		RCP 8.5	
		2000	2030	2050	2030	2050
Precipitation (inches)	Day 1	0.64	0.64	0.57	0.66	0.71
	Day 2	0.64	0.74	0.70	0.75	1.10

	Day 3	0.81	0.61	0.70	0.53	0.83
	Total	2.09	1.99	1.97	1.94	2.64
Percent change from baseline			-5%	-6%	-7%	26%

Plant Hardiness Zones

Hardiness zones are determined from patterns of primary productivity, nutrient and energy transfer, and biological functions of local food webs (Livingston and Loucks 1978). The longer and the better the growing conditions, the more productive a vegetation community can be. Hardiness zones shown here were derived from the USDA Plant Hardiness Zone Map published in 1990 (Tredici 1990) with major revisions published in the online version in 2012. Based on the data provided by the USDA (2012), all of JBER lies in Zone 4b. Local interpretation of climate and agricultural data was analyzed and zones adapted for JBER by the Alaska Department of Natural Resources Division of Agriculture (ADNR, pers. comm. 2016), showing that the climate of JBER is actually more diverse (See Figure 2-13).

Figure 2-13: JBER Plant Hardiness Zones



2.2.2 Landforms

JBER lies between the Turnagain Arm and the Knik Arm of the Cook Inlet at the north end of a roughly triangular-shaped lowland, referred to as the "Anchorage plain". To the east, the Chugach Mountains rise abruptly to elevations over 5,000 feet. From an elevation of 500 feet at the base of the mountains, the land declines into the Anchorage plain to the coast. The Anchorage plain is a glacial moraine that extends from the mountain front westward and northwestward. Steep bluffs, broken only by principal streams such as Eagle River, characterize the edge of the plain as it drops sharply to the sea (CH2MHill 1992). Major landforms identified on JBER include the Chugach Mountains to the south, bordered by ground moraine, alluvial fan, and the Elmendorf Moraine (Hunter et al. 2000).

Coastal Trough Humid Taiga

JBER is partially situated in the Cook Inlet-Susitna Lowlands, an ecological province within the Coastal Trough Humid Taiga Province (Bailey 1995, Gallant *et al*. 1995). Cook Inlet - Susitna Lowlands cover an extensive area, part of which is submerged under the waters of Cook Inlet. The area is bordered on the west by the Alaska Range, on the east by the Kenai and Chugach mountains, and on the north by the Alaska Range and the Talkeetna Mountains.

Pacific Mountain System

A portion of JBER also lies in the Chugach-Kenai Mountains, an ecological province of the Pacific Mountain System which runs in an arc from southeastern Wrangell-St. Elias Range to south-central Alaska; Chugach and Kenai mountains (Bailey 1995, Gallant *et al.* 1995).

Regional landforms in the Cook Inlet region are largely the result of glacial or glacier-related processes. On JBER, these consist of a terminal moraine, an area of ground moraine, and a large outwash plain (Hunter, *et al.* 2000).

Elmendorf Moraine

The southern edge of the Elmendorf Moraine, a hummocky, long series of ridges, runs east-west across JBER, roughly parallel to Knik Arm (Hunter, et al. 2000). This system of ridges marks the terminus of the last glacial advance in this area. The moraine is one-half to one mile in width and reaches an elevation of 389 feet at its highest point on JBER. In most places south-facing slopes are steep and north-facing slopes gentle. Much of the moraine is covered by kettles (steep-sided depressions) and kames (conical hills or short irregular ridges) created by melting blocks of ice during the glacial retreat. Many kettles on the moraine contain ponds and lakes while others contain bog deposits, and still others remain unfilled. None of the ponds or lakes are drained by streams.

Ground Moraine

Landform features formed under or adjacent to glacier ice are part of a ground moraine that underlies roughly the entire northern third of the installation, beginning on the northern side of the Elmendorf Moraine (Hunter et al. 2000). Along the Knik Arm, the ground moraine is almost continuously exposed, forming bluffs ranging in height from 20 to 100 feet. Away from the Knik Arm, the surface is pitted with kettles and many drumlins (elongated gravel hills parallel to glacial movement) that are oriented towards the southwest. The entire ground moraine is an area of relatively low relief, seldom varying more than 75 feet in elevation. Drainage of the ground moraine is not well integrated, although small streams occupy channels cut during the glacial retreat. Sixmile and Otter creeks occupy a 125-foot deep, abandoned channel cut by Eagle River, which now is three miles farther north. Most channels are oriented towards the southwest and give the area a distinctive, striated appearance from the air. Most kettles on the ground moraine are shallow depressions forming bog lakes or unfilled depressions. Typically streams do not drain them. Moraine kettle wetlands may be interconnected to waters via groundwater or other physical, biological, or chemical connections.

Alluvial Fan

Glacioalluvial, alluvial, and alluvial fan deposits, including outwash plain, are found south of the Elmendorf Moraine, in a broad, gently sloping surface composed of sand and gravel (Hunter et al. 2000). It covers approximately the southern third of JBER-Elmendorf and was formed from alluvial deposits placed down in layers by Eagle River during glacial advances and by Ship Creek in modern times. Ship Creek has cut a flood plain channel varying in depth from 20 to 50 feet below the surface of the plain. The plain's low relief, combined with deep gravel, provides perfect conditions for construction of buildings and runways. The JBER cantonment area and flight line were built almost entirely on the alluvial fan. The high quality sand and gravel soils also promote high quality, productive moose (*Alces alces*) browse plant species.

Chugach Mountains

The Chugach Mountains are a part of the Pacific Mountain physiographic unit, which spans the west coast of North America, southeastern Alaska, arcing northwest through the Wrangell-St. Elias Mountains, Kenai-Chugach Mountains, Talkeetna Mountains in coastal Southcentral Alaska, and then through western Alaska and into the Aleutian Islands (Gallant et al. 1995). The western face of the Chugach Mountains is the visibly dominant geological feature of JBER, rising from the Anchorage Plain to 5,200 feet within the JBER installation boundary, and include steep side slopes and narrow U-shaped valleys such as those occupied

by Eagle River and Ship Creek. On JBER, the Chugach Mountains are composed of both metamorphic and sedimentary rock formations, more prevalent along the Border Range Fault.

2.2.3 Geology and Soils

Geology of the JBER area was shaped by the formation of the Chugach Mountains in the late Paleozoic and Mesozoic eras and the subsequent flow of sediments into lowlands during the Tertiary period (Gossweiler 1984). JBER straddles both the alluvial fan of the Anchorage Plain and the moraine and glacial alluvium complex near the shore of Knik Arm.

The Chugach Mountains have bedrock of metamorphic rocks of the McHugh complex, composed of a mixture of metamorphose siltstone, lithic sandstone, arkose, and conglomerate sandstone. This bedrock is exposed in places along the Chugach Mountains western flank on the southeastern portion of JBER.

The gravel alluvium of the Anchorage plain underlies the JBER main cantonment. Well-bedded and well-sorted gravels and sands provide good foundation conditions and plentiful construction material. The confined gravel aquifer is 200 to 400 feet below the surface in this area of the installation (Selkregg 1972). Groundwater flow in this confined aquifer is a generally west to northwest (CH2M Hill 1994).

The Elmendorf Moraine is chiefly till, including diamicton and poorly sorted gravel. North of the Elmendorf Moraine is a complex of moraine and glacial alluvium deposits in the form of irregularly shaped hills (CH2M Hill 1994).

JBER's lowland bedrock is composed of sedimentary rocks of conglomerate sandstone, mudstone, and coal. It is connected with metamorphic rocks of the mountains along the vertical Border Ranges Fault, which lies at the base of the Chugach Mountains (CH2M Hill 1994).

Bedrock in lowlands rarely surfaces, because it is covered by thick deposits of unconsolidated material that accumulated during the Holocene Period (Gossweiler 1984). These surface deposits begin at the mountain front and thicken as they slope downward to Cook Inlet. Thickness varies from zero at the foot of the mountain range to 900 feet at Point Woronzof (CH2M Hill 1994). The upper part of the deposits is composed of gravels and sands ranging from 30 to 100 feet thick. Underlying the gravel is Bootlegger Cove Clay, a 60-200-foot layer of clay and silt with inter-bedded sand. Below the clay is a 100-200-foot layer of sand and gravel that provides the major groundwater aquifer for the area (CH2M Hill 1994).

Between the aquifer layer and the bedrock is a layer of poorly sorted glacial sediments (Gossweiler 1984).

Bootlegger Cove Clay is nearly impermeable and serves as a confining layer between upper and lower gravel layers. It inhibits downward flow of pollutants from groundwater in upper layers and results in an artesian aquifer in the lower gravel layer. Water from this aquifer flows into the Knik and Turnagain Arms at an estimated rate of 75 million gallons per day (CH2M Hill 1994).

Regional Tectonics

The Alaska Earthquake Information Center detects and reports about 30,000 earthquakes annually in Alaska. Alaska has had 12 of 15 of the largest earthquakes on record in the United States. JBER is within this tectonically active region and experiences numerous earthquakes every year. JBER is bordered by two fault systems: the Bruin Bay-Castle Mountain fault system to the north and west and the Border Ranges fault system to the south running parallel to the base of the Chugach Mountains. Another fault, located in the Chugach Mountains, skirts the Arctic Valley ski area.

The largest earthquake recorded in Alaska was the magnitude 9.2 Good Friday Earthquake that occurred in 1964 in Prince William Sound (AEIC 2018). A record number of 55,000 earthquakes were recorded in

Alaska in 2018, including the magnitude 7.1 Anchorage Earthquake that hit on November 30, 2018. Aftershocks from this earthquake are expected to last for about two and a half years, until June 2021 (AEIC 2019).

Soils

Anchorage area soils were mapped in 1979 by the U.S. Soil Conservation Service. Soils were re-inventoried on JBER-Elmendorf by the Natural Resources Conservation Service in 1997; details of that survey may be found in their interim report (Wikgren and Moore 1997). Soils of the Anchorage area were most recently surveyed in the Soil Survey of Anchorage Area, Alaska (Natural Resources Conservation Service 2001). Current soil data is managed on the NRCS Web Soil Survey at websoilsurvey.nrcs.usda.gov (NRCS 2016).

In general, soils on JBER are dominated by three types of unconsolidated deposits based on grain size, sorting, permeability, and depositional method. These three types are described below.

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

2. Fine-grained deposits consisting of silt and clay deposited in still water, such as former lakes and ponds in the ground moraine, former marine estuaries, and tidal zones. These deposits are often found interbedded with sand and gravel and with till. Silts and clays are usually saturated with water but transmit it so slowly they can be, and commonly are, impermeable in a practical sense. Fine-grained materials also include the Bootlegger Cove clay. This material may contain inter beds of fine sand and is also usually saturated with water, but is classified as impermeable because of slow transmittal time.

3. Till, a mixture of coarse and fine-grained material consisting of boulders, gravel sand, silt, and clay, is found in well-sorted interbeds or poorly-sorted single beds. It originated as the result of glacial deposition; however, it is found intermixed as part of a combination of glacial, marine, and lacustrine deposits. Till deposited by glaciers includes long ridges marking the margins of former glaciers; Elmendorf Moraine is an example. Till of mixed origins includes such elongate hills as drumlins. Till, although saturated with water, can be relatively impermeable because of slow transmittal time; however, water-yielding sand and gravel are commonly present in shallow till.

Figure 2-14 is a generalized map of JBER soil orders that was created by taking a higher-level view of JBER soils from all existing data. In the U.S., all soils are classified into twelve orders and 64 suborders. JBER has representative soils of four orders and 10 suborders, which are described briefly below. The prefix “cry-” refers to cold temperature regimes. The prefix “aqu-” refers to water and is used to name soils that are permanently or frequently saturated.

Entisols show little or no soil development (e.g. horizons, mineral leaching, etc.).

- Aquents form in recent sediments, frequently associated with river systems, and support vegetation tolerant of permanent or periodic wetness.
- Fluvents are freely drained soils formed in recent water-deposited sediments and are frequently flooded. Like aquents, they support vegetation tolerant of flooding.
- Orthents are common on erosional surfaces and support a variety of vegetation used for wildlife habitat.

Histosols are predominantly organic (vs. mineral) and are generally called mucks, peats, etc. These soils do not have permafrost.

- Fibrists are wet, slightly decomposed organic soils that support widely spaced vegetation such as small trees, shrubs, and grasses.
- Hemists are wet, moderately decomposed organic soils that support woodlands.

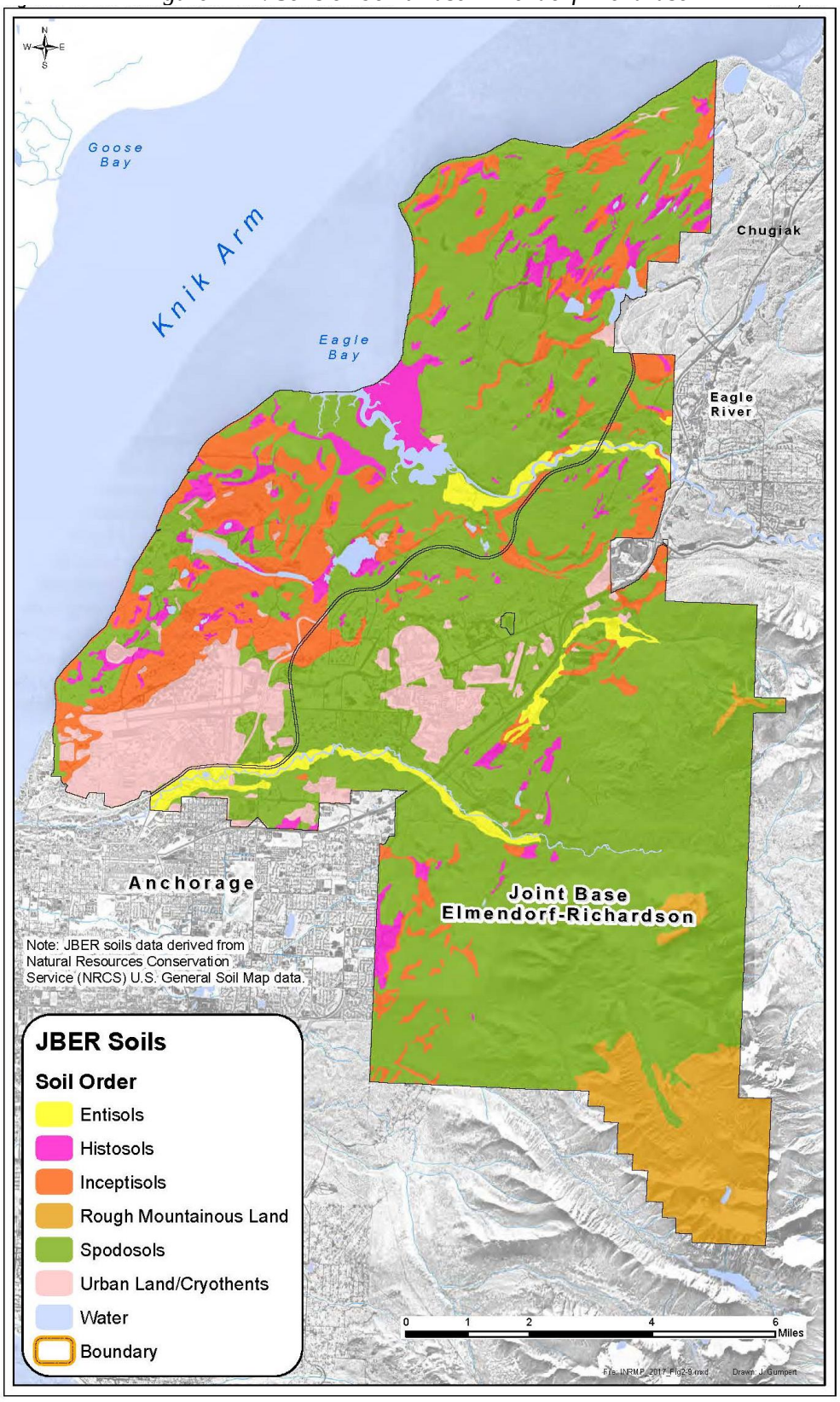
Inceptisols are mineral soils characterized by the loss of iron and some bases, but also retain some weatherable materials.

- Cryepts are found at high altitudes or latitudes that support mostly conifer or mixed conifer forests.
- Aquepts are soils that, unless artificially drained, usually have water at or near the surface for part of the year. Many of these types of soils formed under forest vegetation but can support almost any type of vegetation.

Spodosols are mineral soils characterized by the accumulation of organic matter (but less than in Histosols) and aluminum, with or without iron.

- Cryods are found at high altitudes or latitudes and mainly support coniferous forests.
- Aquods are characterized by a shallow and fluctuating water table capable of supporting small trees, shrubs and moss.
- Orthods are relatively freely drained mineral soils with a moderate accumulation of organic carbon and mainly support forest vegetation.

Figure 2-14: Soils on Joint Base Elmendorf-Richardson



2.2.4 Hydrology

Most JBER streams flow from headwaters in the Chugach Mountains traversing JBER westerly to the Knik Arm of Cook Inlet (saltwater).

Major rainfall flood events in Upper Cook Inlet that have historically caused flooding of Ship Creek and Eagle River occur during August-October rainy periods (Papineau and Holloway 2011). Significant changes to the stream course and structure have been incurred to Ship Creek as a result of major storms.

Watersheds

Watersheds of JBER at the USGS Hydrologic Unit Codes (HUC) 12 level include Ship Creek (headwaters), Ship Creek (outlet), lower Eagle River, Chester Creek, North Fork Campbell Creek, Fire Creek, Knik Arm (north and south), and Snowhawk Creek (Figure 2-15).

Ship Creek Headwaters Watershed (HUC 12: 190204010402)

Ship Creek is a fourth order stream that empties into the Knik Arm. From its headwaters in the Chugach Mountains east of JBER, Ship Creek flows through the installation for 13.3 miles, draining approximately 52,989 acres. At the HUC 12 level, the Ship Creek Headwaters and the Ship Creek Outlet are separated into two distinct watersheds. The Ship Creek Headwaters Watershed drains about 30,411 acres, including about 3,903 acres within JBER. As Ship Creek enters JBER, it initially flows through a three-mile canyon of whitewater beginning at an elevation of 1,100 feet above sea level. It then enters its Ship Creek Outlet Watershed. Hydrologic storage in small, but frequent depressions in valleys, high within the watershed are significant to upper headwater storage, water resource recharge including to streams and groundwater, and management of flooding in the spring.

Land use within the Ship Creek Headwaters includes very limited development. Natural training areas located in the Chugach Mountains, including portions of Snowhawk Trail, high altitude training ranges and landing zones, portions of Arctic Valley Road and Site Summit lie within this watershed. Drainage from the headwaters is relatively undisturbed.

Ship Creek Outlet Watershed (HUC 12: 190204010401)

The Ship Creek Outlet Watershed drains about 22,579 acres, with JBER lands comprising approximately 19,945 acres within the watershed. Upon entering the Ship Creek Outlet Watershed from the Ship Creek Headwaters Watershed, at an elevation of approximately 500 feet, Ship Creek continues across the forested coastal plain to the western boundary of JBER at 50 feet elevation. Before exiting JBER, the channel flows over two sheet pile dams which act as effective barriers to anadromous fish passage. After flowing past the William Jack Hernandez Sport Fish Hatchery, Ship Creek exits JBER's border and the channel is approximately 20 feet wide, 2 feet deep, with an average 3 percent fall over a rocky/gravelly bottom. After leaving JBER, Ship Creek continues through heavily developed portions of Anchorage to its final outfall directly into the Knik Arm of Cook Inlet, a tidal water.

Average stream flow is 144 cubic feet per second, but this varies greatly over the year with highs in spring and lows in late winter. Due to the porous nature of the gravel substrate, portions of the channel show no surface flow during winter low flow periods. The creek loses water over some stretches and gains water over others, with most of this gain taking place on lower stretches before leaving the installation. Flooding has occurred three times in recent years. All flooding events resulted in extensive damage to channelization structures along the former Eagleglen golf course as well as at Moose Run Golf Course. Flooding normally occurs in early June in years when rapid snowmelt combines with late spring or early summer rains, and in

September, the wettest month of the year. In the late 1980s, a 50-year flood event occurred in September. Another major flooding event in September 2012, reportedly a 500-year flood event. This flood caused extreme erosion along Ship Creek, particularly near bridge abutments. In 2012, the abutment for Moose Run Golf Course washed away, resulting in the bridge collapsing into the river. Major events such as these typically result in significant changes to the stream course, especially at turns and where impediments obstruct the surge in flow.

The upper dam on Ship Creek forms a 2.8 acre reservoir, which provides the majority of the potable water for JBER and a portion of the water for the Municipality of Anchorage. JBER and Anchorage have separate water treatment plants and delivery systems. JBER also has several backup water wells fed by a shallow aquifer along Ship Creek just north of Moose Crossing Housing. Additional information regarding Ship Creek and Ship Creek Dam can be found in Chronology of Water Use and Water Rights on Ship Creek (Quirk 1997).

The Ship Creek floodplain upstream of the Glenn Highway has received minimal disturbance in past years. However, a golf course constructed in 1997, the Creek Course, has reduced the riparian vegetation associated with the creek. Protecting the integrity of the course has created desires to stabilize and modify streambanks. More importantly, the drinking water dam, constructed in 1952, continues to severely affect the creek's hydrology and stream dynamics.

The portion of Ship Creek on JBER west of the Glenn Highway has been more severely impacted. The creek bottom from Cottonwood Park to the decommissioned Central Heat and Power Plant has been channelized, and the north (river right) bank has been stabilized to prevent erosion. The power plant received water for operation from a nearby low dam and intake pond. The decommissioned JBER-R hatchery had several water wells that were drilled in the shallow aquifer near Ship Creek. The wells were used to supply fresh water for the raceways. A bridge carried a steam line across Ship Creek about a half mile downstream from the JBER-R hatchery. The majority of Ship Creek between the decommissioned JBER-R hatchery and the Eagleglen Fitness Park is in its undisturbed natural condition. Historically, however, portions of the bank have been reinforced with rip-rap, asphalt and concrete slabs, creosote boards, and in some stretches, gravel filled drums, which reappear on the banks periodically. The stream is dammed at the former coldwater intake pipe for the Elmendorf power plant (de-commissioned and removed in 2005).

McVeigh Creek (Gunnery Creek) flows through the Ship Creek Outlet Watershed. Military infrastructure includes the Small Arms Complex, live fire ranges and safety fan, several training areas, as well as the main cantonment and residential area of JBER.

Lower Eagle River Watershed (HUC 12: 19020410306)

Eagle River is a fifth-order stream that flows northwest 8.2 miles through JBER. At the HUC 12 level, Eagle River is split into an Upper and Lower watershed. JBER contains about 14,330 acres of the 27,873 acre Lower Eagle River Watershed. Snow and ice melting from Eagle Glacier (at the headwaters of the Upper Eagle River Watershed) is a major source of flow during the summer months. River flow reaches its peak of more than 2,500 cubic feet per second during July and August. Periods of heavy rainfall or rapid melting from the glacier can generate water flow in excess of 10,300 cubic feet per second (NOAA 2014). Notably, during the major flooding event in September 2012, an abutment supporting military modular "Bailey Bridge" was severely compromised and required emergency replacement.

Upstream of JBER, Eagle River passes through the community of Eagle River. From there the river flows into the northwestern portion of JBER and through Eagle River Flats tidal marsh before it empties into the

Knik Arm of Cook Inlet. In winter, Eagle River is a clear stream with good water quality. During spring–summer, however, there are significant levels of suspended sediment from runoff and glacial melt. Overall sediment loads, however, are fairly low in comparison with other glacially fed streams in Alaska (CH2M Hill 1994).

Notably, the Eagle River Flats impact area is within this drainage as Eagle River transitions into tidal influences of Knik Arm. Currently, winter mortar/artillery firing takes place in this impact area. White phosphorous residue remediation activities have taken place in the Eagle River Flats. The EOD range and munitions storage are also located within the Lower Eagle River Watershed.

Clunie Creek and Otter Creek are also within the Lower Eagle River Watershed. Clunie Creek drains Clunie Lake and other small ponds among the moraines northeast of Eagle River Flats. While Clunie Creek does not have a permanent surface water connection to Eagle River, it effectively drains into Eagle River via groundwater, subsurface flow, and overland sheet flow, after the main stream channel dissipates approximately 1.3 miles prior to reaching Eagle River Flats.

Otter Lake, an important recreational lake south of Eagle River Impact Area, is a tributary drainage of Eagle River. Otter Lake is primarily fed by springs from the same aquifer as Upper Sixmile Lake. It is a natural lake that was historically enhanced to increase its size. Otter Creek departs the lake through an outfall constructed in winter of 2016-2017, which removed fish passage barriers. The water level control structure that previously provided outfall for Otter Lake was removed and the earthen berm completed to close off the old outlet. Otter Creek continues to the north through Eagle River Flats flowing into Eagle River. A section of Otter Creek was dammed by beaver (*Castor canadensis*) for several decades, which severely limited anadromous fish from making it further up the creek towards the lake. Natural deterioration of the beaver dam, restoration and construction of a portion of the stream channel at the lake outlet, and replacement of a culvert under Otter Lake Road restored anadromy to this system. Return of adult salmon to Otter Lake was first recorded in 2015.

Although not connected to Eagle River by surface flow, Lake Kiowa, Gwen, Thompson and Waldon Lakes are also within the Lower Eagle River watershed.

Chester Creek Watershed (HUC 12: 190204010806)

The Chester Creek Watershed is JBER's third largest watershed, encompassing 19,513 total acres, 8,133 acres of which are within JBER. Chester Creek, a third-order stream, is located south of the Glenn Highway on JBER and the fourth longest with almost 7.0 miles of main channel flowing within the installation boundary. Chester Creek originates on the western face of the Chugach Mountains, flows west, and leaves JBER entering the Muldoon neighborhood. Chester Creek continues through the Municipality of Anchorage to its outfall into the Knik Arm of Cook Inlet. Hydrologic storage in small, but frequent depressions in headwater valleys, high within the watershed are significant to upper headwater storage, water resource recharge including to streams and groundwater, and management of flooding in the spring. Frequent drainages have been found along the hillside where groundwater seeps emerge from the hillside and then run down the hill toward the creek. Hillsides may be vulnerable to erosion in these areas.

The Davis Range and most of Bulldog Trail are within the Chester Creek watershed. There are a number of heavily used training assets in this area, including the Infantry Squad Battle Course, Urban Assault Course, Shoot House, Convoy Live Fire Loop, and numerous helicopter landing zones. Although it is a shallow creek, it usually has a constant flow of water.

North Fork Campbell Creek Watershed (HUC 12: 190204010603)

The North Fork Campbell Creek watershed is approximately 18,288 total acres, of which about 1,578 acres are within JBER. Approximately one mile of North Fork of Campbell Creek, a third-order stream, flows through the very southern portion of JBER. This creek is located just north of the Stuckagain Heights subdivision outside the border. Campbell Creek is an important anadromous stream in the Anchorage Bowl, and discharges directly into the Knik Arm of Cook Inlet.

Snowhawk Creek Watershed (HUC 12: 190204010403)

Snowhawk Creek, a third-order stream with a base flow averaging six cubic feet per second, flows northwest through Snowhawk Valley for approximately 6 miles until its confluence with Ship Creek at the Ship Creek Outlet Watershed boundary. It drains approximately 6,803 acres of alpine and subalpine lands in the Chugach Mountains, including 6,558 acres within JBER's installation boundary. Several alpine drainages feed into Snowhawk Creek from the peaks and ridges surrounding the valley. Hydrologic storage in small, but frequent depressions in high-altitude valleys are significant to upper headwater storage, water resource recharge including to streams and groundwater, and management of flooding in the spring. Tanaina Lake is located at the head of the south fork of Snowhawk Valley, but does not have a surface water connection to the headwaters of Snowhawk Creek, as was observed during field reconnaissance in July 2016 and August 2017.

In July 2019, Airmen from 673d CES/CEN Geobase and biologists from 673d CES/CEIEC conducted a survey of the left and right bank Ordinary High Water Mark (OHWM) and thalweg to evaluate the extent of the streambed of the South Fork of Snowhawk Creek, toward Tanaina Lake in accordance with the definition of a "Water of the U.S." in the Clean Water Act (33 CFR Part 328.4c) and other federal regulatory guidance. The findings are included in the Alpine Training Support Final Report (Johnson & Schoofs, in development). The limits of the defined bed and bank are located approximately 1.32 miles upstream along the stream course, from the confluence of the north and south forks of Snowhawk Creek; or 1.40 miles along the valley bottom, northwest of Tanaina Lake (-149.567, 61.159). The upper reaches of the south fork begin as seasonal drainages then intermittent channels before the headwater stream becomes perennial 1.06 miles from the confluence. At the northern fork, however, the headwater stream is persistent from the eastern terminus of the valley and continuous through most of the north fork valley. Snowhawk Valley contains military training features including several landing zones, the Geronimo Drop Zone, and the Snowhawk Cabin.

Fire Creek Watershed (HUC 12: 190204010804)

Fire Creek is a third-order stream that drains 10,835 total acres, of which 191 acres are within JBER on the extreme northern end. Fire Creek drains into Fire Lake which lies within the Municipality of Anchorage. None of the Fire Creek streambed is within the JBER boundary.

Knik Arm – Frontal Cook Inlet (HUC 12: 190204010808)

The Knik Arm – Frontal Cook Inlet watershed includes Knik arm, and areas of land that sheet flow directly into the Knik Arm. On JBER, two distinct areas sheet flow into Knik Arm and have been designated as Knik Arm North and Knik Arm South.

Knik Arm North drains about 9,572 acres, with about 8,563 acres within JBER. It abuts the Lower Eagle River and Fire Creek watersheds to the south. It includes minor drainages between Fire Creek and Eagle River and a section of the Eagle River Flats, all which flow directly into the Knik Arm. Portions of this watershed are used heavily for military training. The area includes the Infantry Platoon Battle Course,

Arctic Warrior Maneuver Corridor and Bivouac Site, Malemute Drop Zone, and Multi-Purpose Training Range.

Knik Arm South drains about 10,151 acres, with about 9,701 acres within the installation. It includes many smaller drainages, such as Sixmile Creek. Sixmile Creek is a first-order stream located in western JBER and flows into the Knik Arm of Cook Inlet. It lies within a historic channel of Eagle River, but not within the existing Eagle River Watershed, and consists of one mile of creek channel and two miles of man-made lakes, all originating from springs on the southern side of Upper Sixmile Lake. Average flow of the system is three cubic feet per second and varies no more than 0.5 cubic feet per second between winter and summer (Rothe, *et al.* 1983). The stream averages five feet wide and 10 inches deep, with an average three percent grade over a rocky/gravelly bottom. A portion of the stream channel flows through a bog and has a substrate of peat and silt in this area.

Another drainage within Knik Arm South is EOD Creek, a first-order stream that drains approximately 1500 acres. EOD Creek consists of 0.44 mi of stream channel, originating from seeps in a bog wetland area. The summer flow rate has been estimated at approximately 0.75 cubic feet per second. The stream substrate alternates between silt, gravel, and organic peat deposits.

Green Lake and its outflow, Moonshine Creek, drain into Knik Arm south of the Sixmile Creek drainage. Moonshine drains approximately 696 acres. Cherry Hill Ditch, which is a storm drainage system that receives flow from developed portions of the JBER-E cantonment area (2,912 acres), including the flightline. It has a maximum flow of three cubic feet per second after heavy rains, but is normally less than one cubic foot per second. Flow is year round, but minimal during winter.

Knik Arm South contains kettle formations within the Elmendorf moraine, between Sixmile Lake and the Elmendorf Flightline. These kettle formations consist of depressional ponds and lakes (e.g. Fish, Triangle, Spring and Hillberg lakes) and other low lying wetlands, typically containing peat deposits. These types of depressions are typically surrounded by uplands and may have no distinguishable inlet or outlet, however they are still a component of the watershed. Kettles are fed either by groundwater or by surface water in the form of sheet flow and are important for water storage, filtration, and groundwater recharge.

Knik Arm South contains development such as numerous maintained roads, hiking trails, cross-country ski trails, snowmobile trails, and a floatplane landing strip on Lower Sixmile Lake. This area supports a high degree of recreational use, including boating, fishing, moose hunting, bird watching, and snowmobiling.

Freshwater Lakes and Ponds

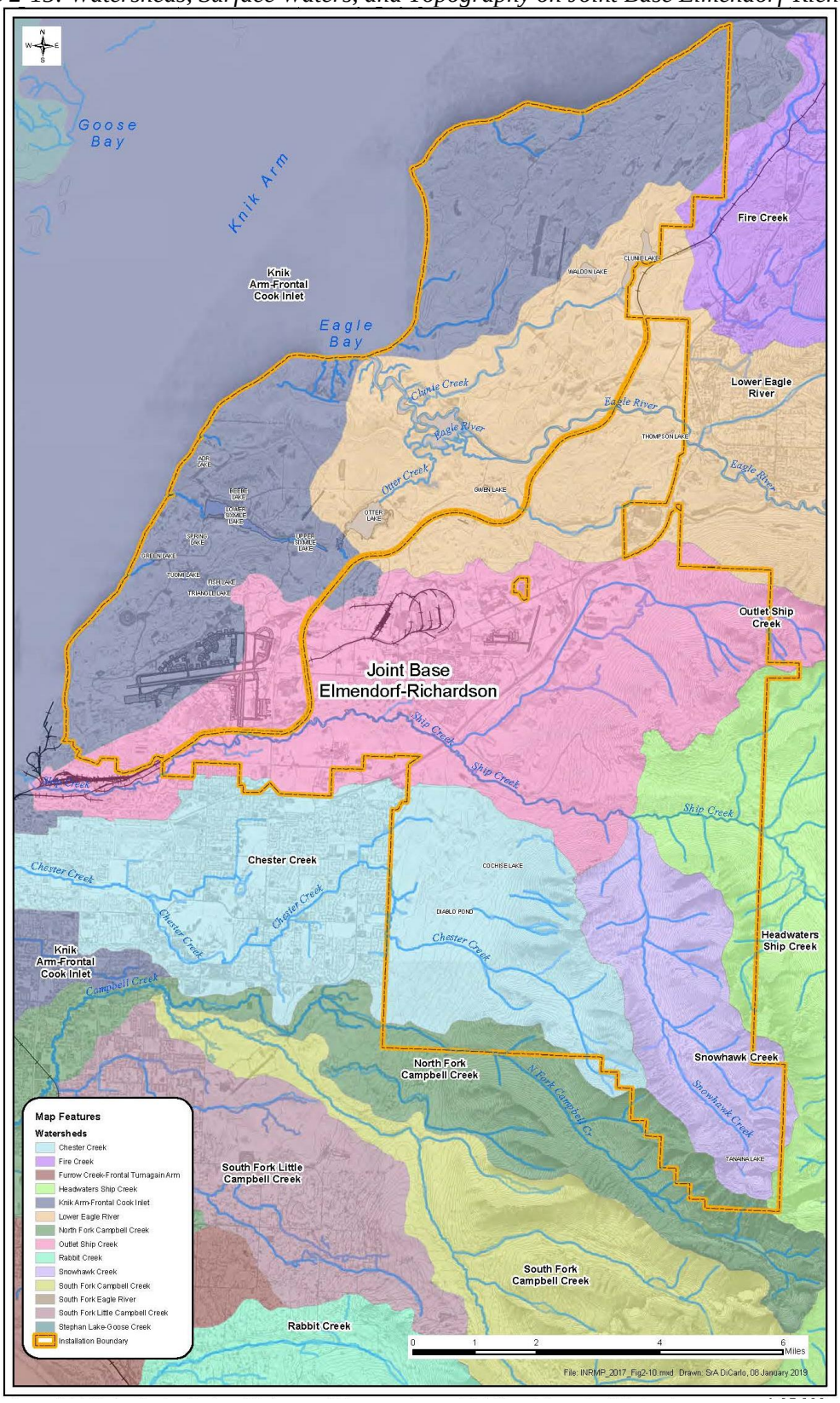
On JBER, there are 35 natural and man-made lakes and ponds, of one acre or larger in size, with the largest (Otter Lake) being 145 acres in surface area. The total acreage of JBER lakes and ponds of one acre or larger in size is 628.2 acres. Sixteen of these lakes and ponds are managed for their wildlife or recreational value. There are numerous ponds on the installation less than one acre and others that are only seasonally flooded. They provide varying amounts of wildlife habitat but are not actively managed. Table 2-7 lists larger lakes and ponds (named lakes and ponds of 2 acres or more) occurring on JBER and Figure 2-15 shows lakes and ponds occurring on JBER.

Table 2-7: Larger Lakes and Ponds on Joint Base Elmendorf-Richardson

Lake/Pond	Acres*	Lake/Pond	Acres*
ADR (EOD) Pond	2.9	Lake Kiowa	2.0
Chain Pond	2.4	Lower Sixmile Lake	122.2
Clunie Lake	114.0	LZ 27 Pond	5.5
Cochise Lake	2.2	McVeigh Marsh	9.5
Dishno Pond	4.2	Otter Lake	145.7
Eagleglen Pond	3.4	Oval (Beebe) Lake	7.3
Fish Lake	4.0	Spring Lake	9.6
Former Cooling Pond	6.0	Tanaina Lake	19.4
Fossil Pond	6.1	Thompson Lake	6.7
Grady Pond	4.5	Triangle Lake	3.8
Green Lake	19.6	Upper Sixmile Lake	27.8
Gwen Lake	9.7	Waldon Lake	39.6
Hillberg (Tuomi) Lake	11.0	Web Pond	5.0

** GeoBase GIS 2016*

Figure 2-15: Watersheds, Surface Waters, and Topography on Joint Base Elmendorf-Richardson



Salt Water

The Knik Arm of the Cook Inlet borders JBER to the west and north for approximately 20 miles. Water is generally shallow and murky, and tides in this area are extreme, with high and low tide differentials reaching over 36 feet. This creates a tidal zone with minimal vegetation, with exception of the Eagle River Flats (ERF).

Eagle Bay is located where Eagle River empties into Knik Arm. Tidal activity in Eagle Bay has created an estuarine salt marsh encompassing ERF. Numerous ponds dot the marsh. Many of these are shallow mudflat ponds, less than six inches deep that often dry up during summer. Others are more permanent with depths over 20 inches. These deeper ponds often are fed by freshwater streams and springs.

In 1994, a comprehensive evaluation of ERF was conducted to address water quality of these ponds (CH2M Hill 1994). The salinity level varied from 1 to 46 parts per thousand. Salinity in most ponds was below 10 parts per thousand. Tidal flooding of ERF infuses ponds with saltwater and sediments from Eagle Bay. Elevation determines frequency of floods, varying from mean sea level to 18 feet above mean sea level. Flooding may occur daily during high tides in areas less than 12 feet above mean sea level. In areas 12-13 feet above mean sea level, flooding occurs only with the highest tide each month, and in areas above 13 feet, flooding occurs only during extremely high tides. Several ponds were drained in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements to remove white phosphorous.

Coastal Zone Modeling

Exposure to sea level rise (SLR) and storm surges (SS) was assessed using a Department of Defense (DoD) site specific scenario database. Details on the development and use of this database are described in Hall et al. (2016). Extreme water level scenarios were based on regional frequency analysis estimates of 20-year and 100-year storm surges. Coastal flooding projections were modeled for RCP 4.5 and RCP 8.5 emission scenarios in 2035 and 2065 in accordance with the DoD scenario database. SLR inundation estimates the new permanent coastline for each scenario and timeframe; SS inundation estimates short term flooding associated with an extreme water level event that is expected to recede after the storm.

The land surface in southern Alaska is moving faster than global sea level is presently changing (Freymueller, 2010). Tectonic uplift and some glacial isostatic adjustment means land is rising 2-4 times faster than sea level rise. Coastal uplift of the local landmass, predicted to be about 2.3 to 3.6 feet (0.7 to 1.1 meters), will counterbalance much of the effect of rising seas, predicted to be 1.3 to 6.6 feet (0.4 to 2 meters). Even if sea level change occurs at the higher end of the estimated range, marshlands will likely keep up with sea levels as they capture sediment and grow vertically. Therefore, loss of coastal area due to SLR inundation is not projected.

Error! Reference source not found.summarizes projected coastal inundation in acres for each scenario. Projections for a 20-yr SS, which have a 5% probability of occurring any given year, estimate possible inundation of between 380 acres (0.5% of the instillation area) for the RCP 4.5 scenario in 2065 to 495 acres (0.7% of the installation area) for the RCP 8.5 scenario in 2035. Projections for a 100-yr SS, which have a 1% probability of occurring any given year, estimate possible inundation up to 1409 acres (1.9% of the installation area) for the RCP 8.5 scenario in 2035. The spatial extent of coastal flooding is shown in a series of maps in Appendix C (CSU-CEMML 2019).

Table 2-8: Projected SLR and SS inundation.

Climate Scenario		2035		2065	
		Projected inundation (acres)	Percent of installation area inundated	Projected inundation (acres)	Percent of installation area inundated
RCP 4.5	SLR	N/A	N/A	N/A	N/A
	20-yr SS	407.4	0.6%	380.4	0.5%
	100-yr SS	784.7	1.1%	581.7	0.8%
RCP 8.5	SLR	N/A	N/A	N/A	N/A
	20-yr SS	495.2	0.7%	380.4	0.5%
	100-yr SS	1408.5	1.9%	581.7	0.8%

(CSU-CEMML 2019)

Sub-Surface Water

Two freshwater aquifers underlie most of JBER. These aquifers flow west from the Chugach Mountains to the Cook Inlet and are recharged by ground water originating from precipitation in the mountains. The two aquifers lie in different soil strata and are separated by a 60-200-foot layer of impermeable Bootlegger Cove Clay (CH2M Hill 1994).

The upper, unconfined aquifer lies in a 30-100-foot deep layer of well-bedded and well-sorted gravel near the surface. This aquifer usually can be accessed at depths of less than 50 feet (CH2M Hill 1994). There seems to be no interconnection between the two aquifers. Shallow aquifer ground water movement follows, for the most part, that of the surface topography. Flow is to the northwest along the northern limb of the moraine and to the southeast along the southern limb. The ground water divide coincides with the crest of the moraine. This aquifer is not used for drinking water.

The lower, confined aquifer lies in a 100- to 200-foot layer of sand and gravel. Impermeable clay above produces artesian conditions and protects the lower aquifer against seepage and pollutants from the surface; thus, water quality of this artesian aquifer is excellent. It is estimated that 75 million gallons of water originating from the mountains recharges the aquifer each day. This aquifer usually can be accessed at 200-400 feet below the surface. Wells drilled into the aquifer can produce up to 1,500 gallons of water per minute (CH2M Hill 1994). JBER does not use this aquifer for its main source of drinking water, but as standby drinking water supply when surface water supplies cannot meet demand. The Municipality of Anchorage, bordering JBER, uses water from this aquifer for various services, including industrial, commercial, domestic, and public supply.

2.3 Ecosystems and the Biotic Environment

2.3.1 Ecosystem Classification

According to the *Unified Ecoregions of Alaska* (Nowacki et. al 2001) JBER lies within the Cook Inlet Basin, an ecological province of the Coastal Trough Humid Taiga (Bailey 1995, Gallant et al. 1995). A portion of JBER also lies in the Chugach-Kenai Mountains, an ecological province of the Pacific Mountain System (Bailey 1995, Gallant et al. 1995). The Coastal Trough Humid Taiga (Tayga) includes a broad range of vegetation types, but notably dominant are the needleleaf (*Picea glauca, P. mariana*), broadleaf (*Betula papyrifera, Populus balsamifera*), and mixed forests. The Pacific Coastal Mountain region includes alpine slopes which range from barren to occupied by dwarf or low scrub to tall scrub in lower alpine and upper subalpine reaches. Subalpine forests are occupied by krumholtz white spruce (*Picea glauca*) and mountain hemlock (*Tsuga mertensiana*) in the upper subalpine regions and then paper birch (*Betula papyrifera*), cottonwood (*Populus balsamifera*) and tall shrubs including alder (*Alnus viridis*) and willows (*Salix spp.*) lower subalpine and lowlands.

More specifically, five physiographic zones of vegetation and plant habitat are found on JBER.

1. Coastal Halophytic Zone: Shoreline and intertidal flats along Cook Inlet.
2. Lowland Interior Forest Zone: Lowland boreal forest found to 1,500 feet elevation. Mesic to dry forest types include paper birch (*Betula papyrifera*) forest, white spruce (*Picea glauca*), quaking aspen *(Populus tremuloides*), balsam poplar or cottonwood (*Populus balsamifera*), black cottonwood (*Populus trichocarpa*) and mixed birch-spruce forest. Wetlands include black spruce (*Picea mariana*) and treeless bogs with graminoid forbs. Alder (*Alnus spp*.) is the dominant shrub community.
3. Subalpine Zone: Intermittent forest, shrub, and meadow habitats from approximately 1,500 to 2,500 feet elevation. Mesic to dry sites include white spruce, white spruce-paper birch, balsam poplar, and mountain hemlock (*Tsuga mertensiana*). Forests are interspersed with alder shrub and grass forb meadows. Treeless bogs are occasionally present in this zone.
4. Alpine Zone: A mountain landscape habitat above treeline. Low shrubs and dwarf shrubs occupy wet and mesic to dry habitats. The latter include mesic to dry vegetated sites, such as rock talus and block fields. Wetter habitats include late-melting snowfields and snow beds.
5. Artificially Cleared or Disturbed Area Zone: Includes cantonment areas and airfields, roadsides, rights-of-way, borrow pits, pipelines, moose mitigation areas, small arms ranges, firing points, landing zones, and other human-modified areas.

The ecotypes present on JBER are described in the Ecological Land Survey for Fort Richardson, Alaska (Jorgenson 2003) and in the Ecological Land Classification and Mapping for Elmendorf Air Force Base, Alaska (Pullman et al. 2003). While the study focused on the Richardson Training Areas, the ecotypes have been extended and mapped for all regions of JBER. Vegetation classification, within each ecosystem, is based on the Alaska Vegetation Classification System (Viereck 1992).

2.3.2 Vegetation

Historic Vegetative Cover

The most extensive type of vegetation in the area is old growth birch-white spruce, closed, mixed forest that originated after fires burned the area in the mid-1700s. These old forests represent the last vestige of what was once the dominant vegetation in the Anchorage area before historic contact. The second most abundant vegetation type is the young birch-white spruce, closed, mixed forest, which developed as a result of forest fires in the old-growth stand during 1895 through 1935. Homesteaders clearing their land could have been responsible for many of the fires at that time (Daugherty and Saleeby 1998).

Historic vegetation and ecological surveys have been conducted throughout JBER. Prior to joint-basing, floristic surveys were conducted in the Richardson Training Areas (Lichvar 1997, Walker 1997) and in natural areas on Elmendorf (Tande 1983; Lipkin and Tande 2001). Ecological surveys were conducted by Walker (1997), CH2MHill (1992), and Jorgenson (2003).

Current Vegetative Cover

Natural vegetation in the region is a transition between the Pacific Coast, western hemlock (*Tsuga heterophylla*) and Sitka spruce (*Picea sitchensis*) forest, neither of which are represented in the Cook Inlet Basin, but where interior boreal forests of white spruce, paper birch, and aspen are prevalent. Vegetation reflects the transitional nature of the climate between maritime and continental. This maritime climatic influence has resulted in a lower incidence of natural fire than found in spruce-hardwood forests of interior Alaska (Gabriel and Tande 1983). Species associations of JBER forests are similar to those of the Interior but are less modified by fire due to less lightning strikes and the wetter maritime climate of the area.

JBER maintains a comprehensive vegetative inventory that is updated annually with species occurrences observed during field surveys for all relevant natural resource projects, including but not limited to wetland delineations, long term vegetation monitoring inventories, lake and stream habitat surveys, etc. In 2016, a total of 816 individual vascular plant taxa across 85 families were included in the updated JBER Vascular Plant List. Additionally, there are more than 80 mosses and nearly 80 lichens and liverworts catalogued on JBER, mostly from work done in alpine studies (Walker 1997). A comprehensive plant list is included in Appendix E.

Seventy-eight ecotypes have been identified on JBER. The top five ecotypes, by order of dominance, are Upland Rocky Moist Mixed Forest, Upland Rocky Moist Broadleaf Forest, Alpine Rocky Dry Dwarf Scrub, Lowland Gravelly Moist Mixed Forest, and Alpine Rocky Moist Dwarf Scrub. Vegetation of the Upland Rocky Moist Mixed Forest ecotype is closed quaking aspen-spruce, which covers about 22 percent of JBER or about 16,410 acres. Vegetation of the Upland Rocky Moist Broadleaf Forest ecotype is closed paper birch, which covers about 14 percent of JBER or about 9,974 acres. Vegetation of the Alpine Rocky Dry Dwarf Scrub ecotype is dry as-lichen tundra, which covers about six percent of JBER or about 4,584 acres. Vegetation of the Lowland Gravelly Moist Mixed Forest ecotype is closed quaking aspen-spruce, which covers about six percent of JBER or about 4,597 acres. Vegetation of the Alpine Rocky Moist Dwarf Scrub ecotype is cassiope tundra, which covers about four percent of JBER or about 3,174 acres. Ecotypes and associated vegetation descriptions, percent cover, and acreages occurring on JBER are listed in Appendix E and shown in Figure 2-16. A JBER plant species list is in Appendix E.

The BLM retains vegetative rights on much of JBER forest lands under various Public Land Orders. Any management activity involving forest management or removal of vegetation on those lands must be

coordinated through BLM; with revenues deposited in to the U.S. Treasury General Fund, except under the terms for sale of personal use firewood, according to the Memorandum of Agreement (2018).

The vegetative descriptions included below are derived from Jorgenson (2003), except where otherwise noted. All nomenclature is derived from Flora of North America as used on the USDA Plants Database website (USDA, NRCS. 2017)

Forest: Forest systems on JBER include both open (25-60% total forest cover) and closed (>60% total forest cover) broadleaf, needleleaf, and mixed forest that occur in both dry and moist habitat throughout the installation. Broadleaf forest occurs in varying proportions of paper birch (*Betula papyrifera, B. neoalaskana*), balsam poplar (or cottonwood) (*Populus balsamifera*), black cottonwood (*P. trichocarpa*), and quaking aspen (*P. tremuloides*). Needleleaf forest occurs where white spruce (*Picea glauca*), black spruce (*P. mariana*), or mountain hemlock (*Tsuga mertensiana*) are dominant. While white spruce occurs in upland and dry sites, black spruce is found in both wetlands and in moist upland areas. Both black and white spruce form mixed assemblages with broadleaf forest species in mixed forests. Between approximately 500 and 650m elevation, needleleaf forest habitat comprised of mountain hemlock and occasional white spruce in *krumholtz* (dwarfed, windswept) formations occur. The most common forest type found on JBER is Open Spruce-Paper Birch, comprising more than 25% of the total vegetated area on JBER. Needleleaf, broadleaf, and mixed forests are found throughout JBER, except within the estuarine Eagle River mudflats and at elevations above the treeline (approximately 650m above mean sea level).

Shrub: Shrub scrub habitat is described as dominated by tall shrubs (greater than 1.5m), low shrubs (0.2-1.5m tall), and dwarf shrubs (less than 0.2m tall). Shrub dominated habitats commonly occur in moist upland to wet sites and are typically dominated by alder (*Alnus spp.*) and willow (*Salix spp.*) species. Dwarf shrubs predominate alpine habitat since their low profile form is specifically adapted to harsh, windy climates. Dwarf shrubs common in the alpine tundra include dryas (*Dryas octopetala*), cassiope (*Cassiope tetragona, C. stellariana*), dwarf birch (*Betula nana*), dwarf willow (*Salix arctica*), and crowberry (*Empetrum nigrum*). Lowland bogs and other wetlands may also be dominated by wetland adapted dwarf and low shrubs including blueberry (*Vaccinium uligonosum*), sweet gale (*Myrica gale*), willow (*S. bebbiana, S. scouleriana, S. planifolia, S. pulchra*).

Herbaceous: Herbaceous meadows are dominated by vegetative assemblages of sedges, grasses, and/or non-grass and non-woody forbs, lacking trees or shrubs. Most upland herbaceous dominated habitat is human modified and further described below. Naturally occurring herbaceous habitat is often associated with wetlands and other moist uplands, where high soil moisture may discourage establishment of trees that are not specifically adapted to wet soil conditions. Canada bluejoint grass (*Calamagrostis canadensis*) occurs commonly throughout all habitat types on JBER, but is most abundant in moist uplands and wetland areas. Upland graminoid habitat, most commonly occurring as disturbed or human modified habitat, are dominated by grass species such as foxtail barley (*Hordeum jubatum*), other grasses (*Poa spp.*), rye (*Elymus spp.*), and fescue (*Festuca spp.*) as well as bluejoint grass. Mixed herb habitats occurring in subalpine and lower elevation habitats are typically dominated by fireweed (*Chamerion angustifolium*), wild geranium (*Geranium erianthum*), burnet (*Sanguisorba canadensis*), valerian (*Valeriana sitchensis*), and bunchberry (*Cornus canadensis*), along with other associated grasses and sedges noted previously.

Aquatic sites in the littoral zone or throughout shallow lakes (5-10m deep) may be habitat for aquatic herbs such as pond lily (*Nuphar sp.*), smartweed or pond weed (*Potomogeton spp.*), and mare's tail (*Hippuris tetraphylla*). Lakes that are subject to recreation, other water craft or float plane activity may be vulnerable to the introduction of the highly invasive *Elodea spp.*

Partially vegetated habitats, with less than 30% but more than 5% total vegetative cover occur frequently in alpine areas, where exposed rock occurs frequently between patches of vegetation typically including an assemblage of dwarf shrubs and other alpine grasses as herbs such as geranium, sweet grass (*Hierochloe alpina*), gentian (*Gentiana spp.*), and lutkea (*Luetkea pectinata*). Partially vegetated habitats may be vulnerable to erosive forces, especially if naturally or anthropogenically disturbed.

The most common naturally occurring herbaceous habitats found on JBER are halophytic (salt tolerant) grass, sedge, and herb wet meadows and marshes associated with freshwater to brackish estuarine habitat, such as those which occur throughout the Eagle River Flats. These habitats are commonly dominated by arrowgrass (*Triglochin maritima*), Lyngbye's sedge (*Carex lyngbyei*), alkali grass (*Puccinnelia nutkaensis*), bulrush (*Scirpus paludosus, S. validus*), goose tongue (*Plantago maritima*), among many others. The species assemblages are specifically adapted to a range of salinity driven by salt water influence from the tidal waters of Knik Arm.

Unvegetated Barrens (Exposed & Mudflats): Naturally occurring barrens include habitats with exposed rock outcrops or mudflats- which are comprised of less than 5% total vegetative coverage and occur, respectively, in alpine areas and estuarine areas including the Eagle River Flats. Alpine barrens may occur on exposed slopes or ridgelines and are considered highly erodible by wind, water, and other disturbance since little vegetation is able to establish to hold soil and broken rock in place. Mudflats in the Eagle River estuary can be extremely dynamic, being comprised of highly erosive silt loam deposits which are inundated by tidal wash multiple times daily, inhibiting the establishment of vegetation. Barrens may also occur in riverine systems including along riparian shorelines and in abandoned river channels such as along Ship Creek.

Human Modified Forest, Shrub, and Herbaceous: While comprised of similar species found in the vegetative classes above, human modified vegetation, excluding turfed and landscaped areas, occurs typically in areas that have been cleared, thinned, or otherwise manipulated to facilitate training exercises and other mission dependent operations on JBER.

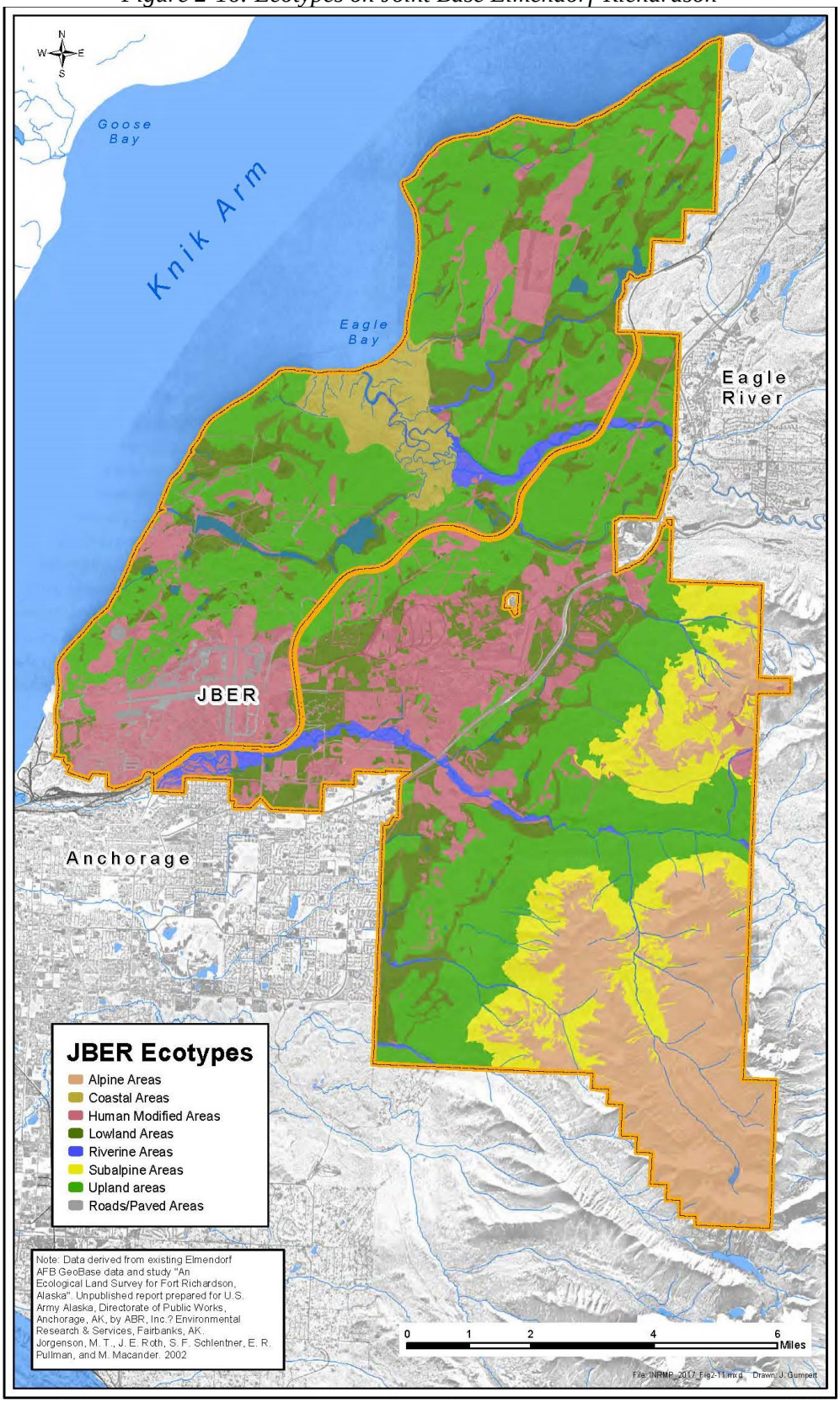
Partially vegetated (5-30%) areas occur in and around gravel pits, landing zones, firing points, and firing ranges. Firing ranges and drop zones are cleared of woody vegetation and frequently subject to prescribed burns to maintain low abundance of grasses which may pose wildland fire hazards during live fire exercises. Forest habitat may be thinned into bivouacs to facilitate orienteering and other training operations. Forest and shrub habitat may also be altered to encourage wildlife habitat, especially for grouse, ptarmigan, and moose. Human modified shrub habitat may be successional regrowth after clearing and prior use as rangeland, on its way through the natural restoration process or maintained purposefully for wildlife habitat.

Human modified habitats are most vulnerable to the introduction of invasive weeds including but not limited to reed canary grass (*Phalaris arundinacea*), bird vetch (*Vicia cracca*), thistle (*Cirsium canadensis*), orange and yellow hawkweed (*Hieracium spp.*), and European bird cherry (*Prunus padus*). Invasive weeds are monitored through recurring surveys conducted by Integrated Training Area Management (ITAM), 673d CES/CEIEC Natural Resources, as well as, 773d CES/CEIOE Pest Management. Invasive weed management control activities include both mechanical and chemical control means, as necessary.

Turf and Landscaped Areas

There are about 11,000 acres of developed land in the cantonment areas that may be managed as turf or landscaped areas. These include housing areas, golf courses, around the runway, etc. Outside these areas, turf and landscape maintenance occurs as required. Section 7.7, Land Management, includes discussion of turf and urban forest management.

Figure 2-16: Ecotypes on Joint Base Elmendorf-Richardson



2.3.3 Fish and Wildlife

Most species indigenous to Southcentral Alaska can be found on JBER (Appendix F).

Invertebrates

Abundance and diversity of benthic macroinvertebrates are indicators of stream health as they are particularly sensitive to physical, chemical and biological conditions. Benthic macroinvertebrates were collected in JBER streams as part of a 2018 alpine assessment project, a stream and lake habitat assessment conducted in 2015-2017 (Schoofs and Zonneville 2016; Schoofs *et al*. 2017; Schoofs *et al*. 2018), as well as a survey of Ship Creek conducted in 2000 as part of a *Ship Creek Restoration Strategy Plan* (Montgomery Watson 2001). Benthic macroinvertebrates collected were identified to genus, where possible, and can be found in Appendix F.

During an alpine biodiversity study conducted in 1993 and 1994 (Walker 1997), insect pollinators were sampled to provide data for the interpretation of fossilized pollen records found during the study. Twenty-two species of beetles were collected; many of which, were not previously recorded in the Chugach Mountains (Walker 1997). A few of the ground beetles observed were formerly only known to Arctic tundra ecosystems.

A survey of butterflies was conducted within certain Fort Richardson training areas in order to document species diversity. Butterflies were collected and identified during summers of 2002 and 2003 and compared to species collected in Chugach State Park (Besh and Peirce 2004). A total of 15 genera and 17 species of butterflies were identified during the survey (Besh and Peirce 2004). The survey was completed opportunistically in conjunction with a larger vegetation survey and therefore not a comprehensive baseline survey.

Fish

Pacific Salmon

According to the ADF&G anadromous waters catalog (AWC), all five Pacific salmon (*Oncorhynchus* spp.) species found in North America return to JBER waterbodies to spawn. The table below depicts which waterbodies Pacific salmon utilize on JBER as identified in the AWC.

Table 2-9: Salmon Species in JBER Waters

JBER Waterbody	Chinook	Sockeye	Coho	Chum	Pink
Campbell Creek	X	X	X		
Chester Creek		X	X		
Eagle River	X	X	X	X	X
EOD Creek			X		
Jerry's Creek			X	X	
Otter Creek		X	X	X	
Otter Lake		X	X		
Ship Creek	X		X	X	X
Sixmile Creek	X	X	X	X	X
Sixmile Lakes	X	X	X	X	X

Ship Creek has enhanced runs of Chinook (*Oncorhynchus tshawytscha*) and coho (*Oncorhynchus kisutch*) salmon, with natural returns of chum (*Oncorhynchus keta*), pink salmon (*Oncorhynchus gorbuscha*) and small numbers of sockeye (*Oncorhynchus nerka*). Ship Creek is the only anadromous creek on JBER that runs through developed lands on base, and as a result, soil erosion is a continuous problem. The dam at the William Jack Hernandez Sport Fish Hatchery, just below where the stream continues off JBER property, prevents most (but not all) salmon from moving upstream. Small numbers of Chinook and coho salmon have historically passed this dam. A second concrete dam, located at the ADF&G hatchery on JBER-R, was removed in January 2015 to prevent public safety issues caused by ice damming. ADF&G fishery enhancement programs of coho and Chinook salmon have resulted in increased numbers of fish returns to lower Ship Creek. Upstream of the Moose Run Golf Course, fish are limited to small rainbow trout, Dolly Varden, and slimy sculpin. Upstream activities in the Chugach State Park and JBER-Richardson are critical to the health of this ecosystem. Discussions concerning possible removal/modification of dams have taken place. However, removal/modification may generate human-wildlife conflicts, mission risks (BASH), and facility maintenance risks. The issue was resolved in 2009 with an agreement that by providing land for the expansion of the ADF&G fish hatchery on JBER, the Air Force would not be required to allow salmon escapement above the existing dam.

Jerry's Creek is a small tributary of Ship Creek extending approximately 0.6 miles through the Eagleglen Fitness Park. Jerry's Creek flows into Ship Creek downstream of the JBER-Elmendorf dams and the ADF&G William Jack Hernandez Sport Fish Hatchery collection weir. During the fall of 2014, it was discovered that coho salmon use a Jerry's Creek to spawn. There is no other information regarding how long these salmon have been utilizing the small side channel. Small runs of coho and chum have been observed during spawner surveys conducted since 2016. Rearing juvenile coho salmon have also been documented during a stream habitat assessment conducted in 2015 (Schoofs and Zonneville 2016).

The Sixmile system includes Upper and Lower Sixmile lakes, and Sixmile Creek and is managed as one system. This anadromous system flows into Knik Arm, supporting natural runs of sockeye, pink, chum, and coho salmon, as well as Dolly Varden. Rearing juvenile Chinook salmon have been documented in the early 2000s, but not within the past 10 years. It also supports three-spine stickleback and stocked populations of rainbow trout. Sixmile Lake is stocked by ADF&G for recreational lake anglers.

Sockeye and coho salmon, as well as other salmon species, have been enumerated annually at the Sixmile Creek fish weir since 1988. In 1998, the weir location was moved to the outlet of Lower Sixmile Lake. Stream walks along Sixmile Creek are conducted to enumerate pink and chum salmon. Salmon smolt from the Sixmile Lake system have been monitored periodically since 2003 and annually since 2012, using a fyke net weir at the outlet of Lower Sixmile Lake. The coho run is small, with typically less than 200 fish annually. Sockeye begin returning in late July and are present through the end of October, with the other species returning between July and September. Since the beginning of weir operation in 1988, documented adult sockeye escapement has ranged between 317 and 4,768, with a 10-year (2010-2019) average of 1,806.

EOD Creek, north of Sixmile Creek, has a very small population of coho salmon, but the extent and viability remains low due to poor available habitat and a culvert identified by ADF&G as a barrier to fish passage. Coho salmon smolt were observed in EOD Creekduring a wildlife survey in 1983 (Rothe *et al.* 1983). Coho salmon smolt were also observed during a 2015 sampling effort (Schoofs and Zonneville 2016).

Eagle River supports all five Pacific salmon species found in North America. Chinook salmon are the first and least abundant salmon species to return to Eagle River each year. The beginning of the Chinook run is relatively unknown; however, the run is usually completed by the first part of July. Sockeye are the second species to return, with run timing from early July until the end of August. Chum and pink salmon run timing

begins at the end of July, with the pink run complete by the end of August and the chum run ending in the first part of September. Coho salmon return to Eagle River around the end of July with the end of their run relatively unknown. The approximate run timings are estimated using fish wheel and sonar project data and are subject to annual variability. The true abundance of salmon for Eagle River is not known.

Otter Creek connects Otter Lake to Eagle River and Knik Arm. Juvenile salmonids appear to use much of this creek as a rearing area, to include the tidally influenced reaches. There is evidence of juvenile coho presence in the lake as early as 1978 and spawning sockeye in 1982 despite the presence of a spillway. Beginning in 2010, JBER and ADF&G initiated development of an Otter Lake/Creek restoration project. The project was designed to rotenone Otter Lake/Creek waters to remove all northern pike (an invasive species to Southcentral Alaska), remove obstructions to salmon passage, enhance spawning habitat, and reintroduce salmon into the system. Baseline data was collected in 2011-2012. In 2015, before the lake was treated with rotenone, several adult coho salmon were spotted in the lake. Sockeye, coho and chum salmon have been observed spawning within Otter Creek. Since the rotenone and restoration effort, adult coho and sockeye have been documented reaching and spawning in Otter Lake. Juvenile coho have also been documented rearing in both the lake and creek.

USAG-AK partnered with the U.S. Geological Survey in 2003 and 2004 to survey water quality and fisheries habitat in upper Chester Creek. A total of 877 fish representing four species were captured during the study. Of this total, 54% were Dolly Varden, 35% were slimy sculpin, 10% were rearing coho salmon, and 2% were rainbow trout. Additional foot surveys of the creek found 80 adult coho salmon spawning in the upper reaches. 2015 and 2016 stream surveys conducted by CSU-CEMML documented 390 fish within the surveyed reaches. Of this total, 67% were Dolly Varden, 23% were coho salmon, 10% were slimy sculpin, and less than 1% were rainbow trout (Schoofs and Zonneville, 2016; Schoofs *et al*., 2017)

JBER personnel have periodically conducted annual stream walk surveys of adult coho salmon in South Fork Chester Creek on JBER lands to determine timing and relative abundance, including delineation of important spawning areas along the stream. During the summer of 2007, stream walks on the South Fork Chester Creek were conducted in tandem with the collection of brown bear hair samples for the brown bear population estimation component of the brown bear telemetry project. In the summers of 2014 and 2015, JBER investigated the number of out-migrating smolts from lower section of the South Fork Chester Creek. During the 2016 stream walks, eight sockeye were observed in Chester Creek for the first time.

North Fork Campbell Creek is closed to salmon fishing on JBER. Four species of salmon (Chinook, coho, pink, and sockeye), adults and smolts, as well as Dolly Varden, have been recorded within the JBER boundary. JBER personnel have periodically conducted annual stream walk surveys along North Fork Campbell Creek on JBER to determine timing and abundance of spawning salmon, including delineation of important spawning areas along the stream. Surveys started at the footbridge on Bulldog Trail and proceeded upstream for approximately 100 yards past the last observed salmon and downstream to the installation boundary. ADF&G monitors the trend in salmon populations on North Fork Campbell Creek.

Trout and Char

Rainbow trout are found in 12 JBER lakes, either as naturally occurring populations or as the result of stocking programs. Most stocked fish are believed to be caught during their first summer in the lakes, but those that survive can reach substantial size after several years. The JBER record for rainbow trout is 11 pounds 4 ounces. The Sixmile Lake system has a trout fishery; however, non-fertile triploid rainbows are stocked in Upper Sixmile Lake. There are stocking records for lake trout in Clunie Lake from 1999-2001, but current presence is unknown. Arctic char are also stocked in many JBER lakes. A small population of

rainbow and Dolly Varden (*Salvelinus malma*) are present in Ship Creek. Rainbow trout and Dolly Varden are also found in Eagle River and its tributaries and in Campbell and Chester creeks.

Prior to joint basing, both EAFB and FRA had fish hatcheries located on Ship Creek and were operated through the joint efforts of ADF&G and both installations. These hatcheries produced fish for stocking lakes in the Anchorage Bowl area, including the two installations. The hatcheries were originally designed to use heated water from each installation's power plant. Both power plants were decommissioned between 2002 and 2005. The new hatchery, the William Jack Hernandez Sport Fish Hatchery, which replaced the Elmendorf Hatchery, was up and running in 2011. The Sport Fish hatchery stocks base lakes at no cost to JBER through an agreement with ADF&G. Subject to the terms of the lease agreement and JBER mission requirements, JBER will continue to lease the land at the hatchery site to ADF&G.

Ship Creek Fish Passage

There is a growing public awareness of the importance of watersheds at both a local and national level, and a desire to remove dams and/or restore fish passage to local streams. One stream identified as a potential candidate for enhancing fish passage is Ship Creek. ADF&G has stated that restoring fish passage in Ship Creek is not tied to creating or maintaining the existing recreational fishery, but improving fish passage could potentially develop new and additional angling opportunities on base. In 2007 ADF&G completed a feasibility study investigating the two spillway dams on EAFB and FRA. The 3WG/CC provided a letter to ADF&G arguing this action was not in the best interest of the Air Force nor public safety. The issue was addressed in 2009 when an agreement was signed by EAFB, BLM, and ADF&G. In fall 2013 and spring 2014, the Alaska Sport Fishing Association suggested to JBER leadership that the Ship Creek dams be removed. JBER reiterated that removal of Ship Creek dams, particularly the two-tiered dam near the new ADF&G fish hatchery would present unacceptable bird aircraft strike and wildlife conflict hazard risks.

Landlocked Salmon

Landlocked Chinook and coho salmon are regularly stocked by ADF&G in many of the JBER lakes. Stocking records are archived and available to the public on ADF&G's Sport Fish website. Fish survival may occur beyond the first winter, but survival levels are not well documented.

Other Fish

The three-spine stickleback (*Gasterosteus aculeatus*) is common in most JBER lakes and streams, which are a major source of food for rainbow trout as well as grebes, loons, and other fish-eating birds. Slimy sculpin (*Cottus cognatus*) and nine-spine stickleback (*Pungitius pungitius*) also occur in JBER lakes and streams. The occasional Dolly Varden (*Salvelinus malma*) is also found in the Sixmile Lake system (Rothe *et al* 1983). Dolly Varden have also been found in Ship Creek and Eagle River, Chester Creek, Campbell Creek and their tributaries. Historically, Arctic grayling (*Thymallus arcticus*) fry were stocked in Sixmile Lake; however, survival of the species was unsuccessful.

Surveys of the tidally influenced portions of Eagle River and its tributaries within ERF have documented all five species of Pacific salmon as well as the following fish and macroinvertebrate species: rainbow trout (*Oncorhynchus mykiss*); Dolly Varden (*Salvenlinus malma*); threespine stickleback (*Gasterosteus aculeatus*); slimy sculpin (*Cottus cognatus*); starry flounder (*Platichthys stellatus*); ninespine stickleback (*Pungitius pungitius*); Pacific staghorn sculpin (*Leptocottus armatus*); saffron cod (*Eleginus gracilis*); eulachon (*Thaleichthys pacificus*); snailfish (*Careproctus spp*.); longfin smelt *(Spirinchus thaleichthys*); walleye pollock (*Theragra chalcogramma*); snake prickleback (*Lumpenus sagitta*); Pacific herring (*Clupea pallasii*); Bering cisco (*Coregonus laurettae*); and polychaete worms and sand shrimp (*Crangon spp*.).

Reptiles and Amphibians

The wood frog (*Rana sylvatica*) is the only amphibian species occurring on JBER. The wood frog inhabits a variety of habitats including mixed forests, open meadows, muskeg, tundra, and even landscaped spaces in urban and suburban areas (ADFG, 2008). Wood frogs are highly terrestrial, however, only found in water during breeding and early development. Breeding, productivity, and abnormality surveys have been conducted from 2013-2015 and in 2017 on 56 water bodies through a cooperative agreement with Alaska Pacific University. The surveys have indicated that wood frogs have been detected in approximately two-thirds of all water bodies sampled across JBER (APU, 2014). Study results of wood frog distribution, productivity and abnormality results are provided in the References.

Birds

Loons and Grebes

Red-necked Grebes (*Podiceps grisegena*) are the most common grebe known to breed on JBER lakes. Horned Grebes (*Podiceps auritus*) are a species of special concern that can be seen as migrants. Two species of loons, Common (*Gavia immer*) and Pacific (*Gavia pacifica*), successfully nest on six lakes (Otter, Clunie, Green, Upper Sixmile, Lower Sixmile, and Oval lakes). Typically five pair of Common and one pair of Pacific Loons uses these lakes. Red-throated Loons (*Gavia stellata*) are a species of special concern that have been reported to be migrants.

Ducks

Mallard (*Anas platyrhynchos*) and Ring-necked (*Aythya collaris*) ducks are common nesting species on JBER. Nesting occurs primarily on the Sixmile Lake system. Some Mallards spend the winter on JBER in open water seeps, ponds and streamlets associated with Ship Creek and the ADF&G hatchery. Breeding populations of American Wigeon (*Anas americana*), Pintail (*Anas acuta*), Barrow's Goldeneye (*Bucephala islandica*), and Green-winged Teal (*Anas crecca*) have been recorded in less numbers by trained citizen scientists.

Geese and Swans

Canada Geese (*Branta canadensis*) were once common on JBER-Elmendorf, particularly during the spring and fall migration seasons. Recently, fewer Canada Geese are being seen and rarely are nesting pairs located, a result of an aggressive BASH program. Snow Geese (*Chen caerulescens*), Cackling Geese (*Branta hutchisonii*), and Lesser White-fronted Geese (*Anser eryhropus*) are uncommon, but seen occasionally. Trumpeter Swans (*Cygnus buccinator*) began nesting at Otter Lake in 2002 and at Sixmile Lake in 2009. Tundra Swans (*Cygnus columbianus*) migrate through the area and occasionally stage on ERF, Otter and Upper and Lower Sixmile Lakes.

Shorebirds

Shorebirds are most abundant near Lower and Upper Sixmile lakes. The most abundant species include Greater Yellowlegs (*Tringa melanoleuca*), Lesser Yellowlegs (*Tringa flavipes*) and Wilson's Snipe (*Gallinago delicata*). The Lesser Yellowlegs and Solitary Sandpipers (*Tringa solitaria*) are species of special concern that nest on JBER. Whimbrels (*Numenius phaeopus*) and Hudsonian Godwits (*Limosa haemastica*) are regional birds of conservation concern but are not known to nest on JBER. Spotted Sandpipers (*Artitus macularia*) and Semi-palmated Plovers (*Charadrius semipalmatus*) are common. Sandhill Cranes (*Grus canadensis*) nest on ERF and have been seen with more regularity in JBER bogs and fens.

Gulls and Terns

Gulls and terns include Mew Gulls (*Larus canis*), Herring Gulls (*Larus argentatus*), Bonaparte's Gulls (*Larus philidelpia*), and Arctic Terns (*Sterna paradisaea*). The latter three species are common nesters on JBER. Gulls are commonly found along the saltwater shoreline in the summer, as well as the hatcheries, airfield, and golf courses. Herring Gulls frequently travel during summer nesting periods between the Municipal landfill near Eagle River east of JBER to the mouth of Ship Creek or nesting areas in the industrial zone along Ship Creek. That path takes them over the southern end of runway 16/34 making them a serious BASH risk. See Section 7.12, Bird/Wildlife Aircraft Strike Hazard (BASH) for more information.

Eagles and Ospreys

Bald Eagles (*Haliaeetus leucocephalus*) are year-round residents of JBER, with the highest numbers and visibility occurring between May and October. The eagles make heavy use of lakes during summer, feeding on fish, and the Ship Creek drainage in the winter, feeding on ducks. Seventeen pairs nested on or adjacent to JBER in 2019. Golden Eagles (*Aguila chrysaetos*) are sighted in the alpine and subalpine zones of JBER, with one nest located in Snowhawk Valley. Figure 7-5 shows known Bald Eagle and Golden Eagle nest locations. Ospreys (*Pandion haliaetus*) are uncommon, but a pair has nested on JBER communication towers in recent years, including 2019.

Hawks and Falcons

Hawks nesting on JBER include the Northern Harrier (*Circus cynaeus*), Red-tailed Hawk (*Buteo jamaicensis*), Sharp-shinned Hawk (*Accipiter striatus*), Merlin (*Falco columbarius*), and Northern Goshawk (*Accipiter gentilus*). Rough-legged Hawks (*Buteo lagopus*) are seen commonly in migration. Peregrine Falcons (*Falco peregrinus*) and Gyrfalcons (*Falco rusticolus*) are infrequent migrants on JBER.

Owls

Owl surveys conducted on JBER typically detect Great Horned, Northern Saw-whet (*Aegolius acadicus*), and Boreal Owls (*Aegolius funereus*). Boreal Owls are recorded more often on JBER-Richardson. Great Gray Owl (*Strix nebulosa*) sightings occur from time to time, however, in 2017 a nesting pair was confirmed on JBER-Richardson. Short-eared Owls (*Asio flammeus*) are frequently observed during migration periods, especially near airfields and drop zones.

Grouse and Ptarmigan

Spruce Grouse (*Canachites canadensis*) are common nesters and remain in good numbers despite heavy mortality of mature spruce trees, an important winter food source. Ruffed Grouse (*Bonasa umbellus*) have been documented on JBER but not in substantial number. The species was introduced to Southcentral Alaska in the late 1990s. Willow Ptarmigan (*Lagopus lagopus*) are residents of the alpine and subalpine on JBER and are winter visitors to lowland shrub habitat.

Passerines and Other Birds

About 40 species of passerines and neo-tropical birds are common nesters on JBER. Common nesting passerines in forest habitat include the Swainson's Thrush (*Cathorus ustulatus*), American Robin (*Turdus migratorius*), Yellow-rumped Warbler (*Dendroica coronata*), Dark-eyed Junco (*Junco hyemalis*), Alder Flycatcher (*Empidonax alnorum*), and Ruby-crowned Kinglets (*Regulus calendula*). In more open shrub and developed habitats, American Robins, Dark-eyed Juncos, Lincoln's Sparrows (*Melospiza lincolnii*), and Common Redpolls (*Carduelis flammea*) are the most common nesters. Townsend's Warblers (*Dendroica townsendi*) are commonly heard on JBER's mountain slopes. The Blackpoll Warbler

(*Dendroica striata*), Olive-sided Flycatcher (*Contopus cooperi*), and Rusty Blackbird (*Euphagus carolinus*) are species of special concern known to breed on JBER wetlands.

Winter residents on JBER include Common Ravens (*Corvus corax*), Steller's Jay (*Cyanocitta stelleri*), Boreal and Black-capped Chickadees (*Poecile hudsonica/atricapillus*), Black-billed Magpies (*Pica hudsonia*), Gray Jays (*Perisorius canadensis*), Bohemian Waxwings (*Bombycilla garrulous*), and Common Redpolls.

Mammals

Small Mammals

A small mammal survey was conducted as part of the 1982-1983 Natural Resources Inventory (Rothe *et al.* 1983). Cook and Seaton (1995) prepared a Checklist of the Mammals of Fort Richardson, Alaska, which included both confirmed and suspected species. A 2001 survey (Peirce 2003) added to the knowledge of JBER species.

Small mammals found on JBER include the snowshoe hare (*Lepus americanus*), porcupine (*Erethizon dorsatum*), arctic ground squirrel (*Spermophilus parryi*), hoary marmot (*Marmota caligata*), collared pika (*Ochotona collaris*), red squirrel (*Tamiasciurus hudsonicus*), northern redback vole (*Myodes rutilus*), meadow vole (*Mictrotus pennsylvanicus*), tundra vole (*Microtus oeconomus*), meadow jumping mouse (*Zapus hudsonicus*), house mouse (*Mus musculus*; non-native), common shrew (*Sorex cinereus*), tundra shrew (*Sorex tundrensis*), montane shrew (*Sorex monticolus*), pygmy shrew (*Sorex hoyi*), northern water shrew (*Sorex palustris*), little brown bat (*Myotis lucifugus*), and northern flying squirrel (*Glaucomys brinus*).

Small mammal monitoring is part of the broader Long-term Ecological Monitoring management framework, which was implemented beginning in 2014. Target species include: *Sorex tundrensis, S. monticolus, S. cinereus, Myodes rutilus, Microtus oeconomous, M. miurus* and *M. pennsylvanicus*. A Collared pika survey was also conducted in 2013 and 2014 as part of the Long-Term Ecological Monitoring (LTEM) project to identify pika habitat within the alpine areas of JBER (Dial, *et. al.*, 2014). Beginning in 2018, JBER Natural Resources collaborated with ADF&G and incorporated surveying collared pika on JBER as part of a larger ADF&G study aimed to fill in the information gaps of species presence, abundance, and reproduction across Southcentral and interior Alaska.

Furbearers

Furbearers found on JBER include the beaver (*Castor canadensis*), river otter (*Lontra canadensis*), muskrat (*Ondatra zibithica*), ermine or short-tailed weasel (*Mustela erminea*), red fox (*Vulpes vulpes*), coyote (*Canis latrans*), gray wolf (*Canis lupus*), lynx (*Lynx canadensis*), mink (*Mustela vison*), marten (*Martes americana*) and wolverine (*Gulo gulo*). Red fox are relatively common, including in cantonment areas.. Beavers are found in most water bodies on the installation. Muskrats and river otter are occasionally sighted in the Sixmile Lake system, Otter Lake, Hillberg Lake, Green Lake, Eagle River and Ship Creek ponds. Marten and wolverines are more common near the Chugach Mountains.

Wolves

A wolf study conducted during 1998-1999 indicated the installations were home to two distinct wolf packs. The Ship Creek pack occupied the southern portion of JBER; however, they were occasionally observed north of the Glenn Highway. The Elmendorf pack occupied the northern portion of JBER and ranged as far north and west as Palmer Hay Flats State Game Refuge (40 miles north of JBER) and the Point Mackenzie area on the western shore of Cook Inlet. In 2010, aggressive behavior by wolves towards humans prompted

ADF&G to conduct a removal program. Ten wolves from the Ship Creek pack were removed. Since the removal effort in 2010, no wolf work (surveys, collaring, etc.) has occurred in 14C, including JBER. Given the history of wolves in 14C and on JBER, there is renewed interest by ADF&G to launch a wolf collaring project. See section 7.1.3 for a more detailed description of this project.

Bears

JBER was estimated to be home to 35-40 black bears, not including cubs of the year (Bostick 1997, Kleckner 2001) and a minimum of 15 brown bears (*Ursus arctos*) (Farley *et al.* 2008). Black bears, generally having smaller home ranges, have low fluctuations in numbers through the year and thus their numbers (on JBER) are more stable than other animals, such as wolverines, that have huge home ranges. Brown bear numbers are highest during mid- to late summer when salmon runs attract them from inland areas (Farley *et al.* 2008). Numbers of both species are likely lowest in the fall, prior to denning when some bears move to higher elevations to take advantage of berries. Brown bears den primarily at higher elevations, but one sow has previously been recorded denning within 1.0 kilometer of the JBER-Elmendorf airfield, where she birthed two cubs. The status of bear abundance and distribution on JBER is currently unknown.

Marine Mammals

Cook Inlet beluga whales (CIBW) (*Delphinapterus leucas)* are most prevalent in Eagle Bay adjacent to JBER during the early spring (April), and fall-early winter (Aug-December) but are present for at least a portion of every month (with the notable exception of February). Cook Inlet beluga whales have been sighted within ERF as far as 4.2 km (river distance) up Eagle River. Harbor seals (*Phoca vitulina*) are also commonly seen in Eagle Bay during the summer and fall salmon runs. Harbor porpoise (*Phocoena phocoena*) are rarely seen but are frequently detected acoustically in Eagle Bay and Eagle River. Harbor porpoise appear to be the most prevalent in Eagle Bay during the early spring (March) and fall-early winter (Aug-December). Like the beluga, they appear to be present in Eagle Bay for at least a portion of each month with the exception of February. Steller sea lions (*Eumetopias jubatus*), fin whales (*Balaenoptera physalus*) and orca or killer whales (*Orcinus orca*) are uncommon in upper Cook Inlet and may make extremely rare forays into Knik Arm.

These species are all protected under the Marine Mammal Protection Act (MMPA). Cook Inlet beluga whales, fin whales, and Steller sea lions (Western distinct population segment) are also protected under the Endangered Species Act (ESA). The Cook Inlet population of beluga whale was listed as endangered under ESA in 2008 and critical habitat for the distinct population segment was designated in 2011.

Moose

Moose are the largest member of the deer family and are one of the most visible wildlife species on JBER. Because of their size and frequency with which they wander through housing areas, moose are often the first major wildlife species newly-arrived personnel are likely to see. The number of moose found on JBER varies seasonally, as does their spatial distribution across the installation. Moose surveys are difficult within 14C. Survey limitations include a limited seasonal sampling window, needed snow cover, and congested air space. Very often, especially in recent years, a lack of snow during the sampling window has limited the ability to conduct surveys. However, there has been no indication from either harvest or roadkill numbers, that the moose population has changed significantly. Anecdotally, it seems that moose survival has been good during recent mild winters.

Dall Sheep

Dall sheep (*Ovis dalli*) are known to occur in alpine and mountainous terrain on JBER. Observations of Dall sheep on JBER have occurred during several surveys in the Snowhawk Valley alpine area. The status of sheep abundance, distribution, and utilization on JBER is currently unknown.

2.3.4 Threatened and Endangered Species and Species of Concern

Flora Species of Concern

Floristic inventories on JBER have identified no occurrences of currently listed threatened or endangered plant species or species that have been proposed as candidates for listing. The University of Alaska – Alaska Center for Conservation Science (formerly the Alaska Natural Heritage Program) monitors and maintains the state list of plant species of significance or species of conservation concern.

The State of Alaska had historically listed species as rare or uncommon, but have since determined, with additional research, that they are stable in other regions, which make up the primary extent of their range. Historically listed species such as Northern bugle weed (*Lycopus unifloris*), bog adder's-mouth (*Malaxis paludosa*), sea saltwort (*Salicornia maritime*), pod grass (*Scheuchzeria palustris*), saltmarsh bulrush (*Scirpus maritimus*), and the pink fleshy dandelion (*Taraxacum carneocoloratum*) are considered uncommon to JBER, but not rare in areas they are more commonly found.

In 2016, a Strategic Environmental Research and Development Program (SERDP) funded project designed to identify species that could likely become conservation reliant as a result of climate change began on JBER with a focus on one uncommon, but not necessarily rare species. *Douglasia alaskana* is an uncommon high-elevation plant species that is found across an elevational gradient in the Chugach Mountains in Southcentral Alaska. As a high-elevation uncommon sessile species in a state experiencing rapid climate change, *D. alaskana* and similar species may be vulnerable to climate change, and thus may become conservation reliant on JBER or other DoD lands in the future. Only two populations were documented historically, but several have been located during project related reconnaissance between 2016 and 2018. The SERDP project was ongoing from 2016 through 2017, but ended without resolution in 2018 due to logistical difficulties. JBER will continue to monitor the occurrence of *D. alaskana* and other uncommon species with climate sensitivities. Known occurrences of such species are catalogued in GIS.

Of those plant species currently noted by the State, there are three which may occur in wetlands and two others which may occur in upland habitats within the Alaska Range Transition, within which JBER lies. Species which are not known within the coastal portion of the Alaska Range Transition are not included in the table below, however, any new occurrence on JBER should be documented and cross referenced with the State list. None of these species have been identified on JBER during past surveys, however, JBER is host to potentially suitable habitat. Threatened and endangered species surveys on JBER have been conducted in conjunction with other surveys since 1995.

Table 2-10: Potential Species of Special Concern (Alaska)

Common Name	Scientific Name	Conservation Status*	Current distribution	Alaska Distribution	Vegetation type
Hudson Bay sedge	*Carex heleonastes*	G4, S3, BLM Watch	Brooks Range, Seward Peninsula, Tanana-Kuskokwim lowlands,	Arctic Tundra, Bering tundra, Intermontane Boreal, Alaska Range Transition	Black spruce muskeg, bulrush-sedge wet meadow, Dryas.

			Alaska Range, Cook Inlet Basin, etc.		
Sessile-leaved scurvygrass	*Cochlearia sessilifolia*	S2Q, G1G2Q; BLM Watch, USFS Sensitive	Chugach- St. Elias Mts., Gulf of Alaska coast, Kodiak Isl.	Coastal rainforests; Estuarine	Fine gravel, mud, sand; below high tide.
Porsild's saxifrage	*Saxifraga nelsoniana*	S3, G4, BLM watch	Alaska Range, Chugach-St. Elias Mts., boundary ranges, etc.	Bering taiga, Intermontane-Boreal, Alaska Range transition, Coastal Mtn. transition,	Rock outcrops, rocky seeps, streambanks.
Lemmon's rockcress	*Arabis lemmonii*	S1S2, G5; BLM Watchlist	Alaska Range Transition, Coastal Rainforest	Alaska Range, Chugach-St.Elias Mts.	Mountain slopes, alpine saddles, crumbling cliffs, glacial moraine.
Triangle-lobe moonwort	*Botrychium ascendens*	S2S3 G3; BLM Sensitive	Aleutian Meadows, Alaska Range Transition, Coast Mountains Transition	Alaska Range, Peninsula, Gulf of Alaska Coast	Beaches, beach ridges, beach meadows, riparian meadows, mountain slopes.

** List of Conservation Status definitions: http://accs.uaa.alaska.edu/conservation-rank-definitions/*

Protected Fauna Species and Species of Concern

Threatened, endangered, and candidate species identified by USFWS (2010a) or NOAA-NMFS (2010) suspected or recorded in the Upper Cook Inlet are listed in Table 2-11. Guidelines for management of these species are in Section 7.4, Management of Threatened and Endangered Species, Species of Concern and Habitats.

Table 2-11: Threatened, Endangered, and Candidate Species Identified by USFWS or NOAA-NMFS Suspected or Recorded in the Upper Cook Inlet Project Area

Common Name	Scientific Name	ESA Status	Location Description
Beluga Whale (Cook Inlet Distinct Population Segment)	*Delphinapterus leucas*	Endangered	Occupies Cook Inlet waters and waters of North Gulf of Alaska (NMFS 2008a).
Steller Sea Lion* (Western Alaska Distinct Population Segment)	*Eumetopias jubatus*	Endangered	Includes sea lions born on rookeries west of Cape Suckling (144 W. Longitude) (Muto *et al*., 2017) Close proximity to JBER is highly unlikely.
Fin Whale (Alaska stock)*	*Balaenoptera physalus*	Endangered	Northeast Pacific (NOAA 2016) Close proximity to JBER is highly unlikely.
Chinook Salmon*: Lower Columbia River Puget Sound	*Onchorhynchus tshawytsha*	Threatened Threatened Threatened	These stocks range throughout the North Pacific. However, the specific occurrence

Common Name	Scientific Name	ESA Status	Location Description
Snake River (spring/summer) Snake River (fall) Upper Columbia River (spring) Upper Willamette River		Threatened Endangered Threatened	of listed salmonids within close proximity to JBER is highly unlikely (NMFS 2011).
Steelhead*: Lower Columbia River Middle Columbia River Snake River Basin Upper Columbia River Upper Willamette River	*Onchorhynchus mykiss*	 Threatened Threatened Threatened Endangered Threatened	These stocks range throughout the North Pacific. However, the specific occurrence of listed salmonids within close proximity to JBER is highly unlikely (NMFS 2011).

** May potentially move on or within close proximity to JBER but occur so infrequently that projects are expected to have no effect on them (USFWS 2010a, NMFS 2010).*

Cook Inlet Beluga Whale

The beluga whale is a small (adult female length up to 11.6 ft and adult male length up to 13.6 ft) (Burns and Seaman, 1986), toothed whale in the family *Monodontidae*, a family it shares with only the narwhal (*Monodon monoceros*). Belugas are also known as ‘‘white whales’’ because of the white coloration of adults. The beluga whale is a northern hemisphere species, ranging primarily over the Arctic Ocean and some adjoining seas where they inhabit fjords, estuaries, and shallow water in Arctic and subarctic oceans. A detailed description of the biology of the CIBW can be found in the Recovery Plan (NMFS 2016).

Five distinct stocks of beluga whales are currently recognized in Alaska: Beaufort Sea, eastern Chukchi Sea, eastern Bering Sea, Bristol Bay, and Cook Inlet. The Cook Inlet population is numerically the smallest and is genetically and geographically isolated from the stocks; this distinct population of beluga whales does not migrate outside the waters of Cook Inlet. Systematic surveys of beluga whales in Cook Inlet documented a decline in abundance of nearly 50 percent between 1994 and 1998, from an estimate of 653 whales to 347 whales. This decline was mostly attributed to subsistence harvest (through 1998); however, even with restrictions on harvest, the population declined by 0.4 percent per year from 1999 to 2016. Annual surveys flown from 1994 to 2012 and biennial surveys flown in 2014 and 2018, indicate this population is not recovering. Over the most recent 10-year time period (2008-2018), the estimated trend in abundance is approximately -2.3%/year (estimated range between -4.1% to -0.6%), which is declining faster than the previous estimate of -0.5%/year (estimated range between -2.5% and +1.5%).

After receiving several petitions to list the Cook Inlet beluga whale population as endangered under the ESA, the NMFS completed a Status Review of the CIBW in November 2006. In this review NMFS reaffirmed that the beluga whale of Cook Inlet is a distinct population segment and determined it is in danger of extinction throughout its range. NMFS proposed listing the CIBW as endangered under the ESA (72 FR 19854, April 20, 2007) and the CIBW were listed as endangered (73 FR 62919. October 22, 2008), which took effect on 22 December 2008. On December 2, 2009, NMFS proposed critical habitat (74 FR 63080) for the CIBW distinct population segment, which became final (76 FR 20180) and took effect on 11 May 2011. Two areas are designated as critical habitat, comprising 3,013 square miles of marine waters. Figure 2-17 shows the CIBW critical habitat area in the vicinity of JBER. Per requirements under the ESA, a CIBW recovery plan was finalized in 2017 (82 FR 1325). This recovery plan addresses potential threats and identifies goals, criteria for down- and de-listing, and actions aimed at recovery of the species.

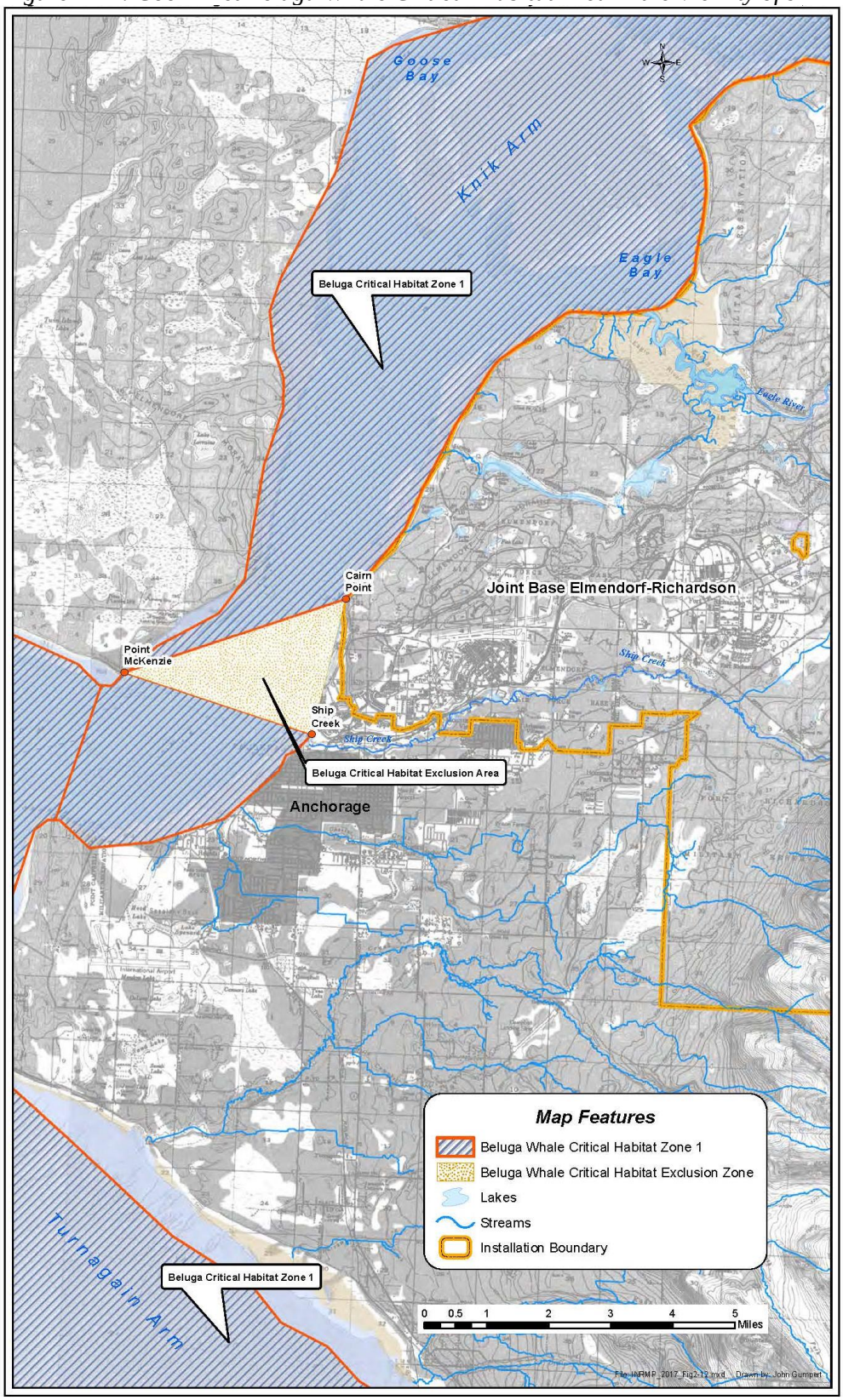
Species Protected by Marine Mammal Protection Act

Impacts to marine mammals are regulated under the MMPA. The MMPA prohibits the unauthorized take of marine mammals. Take is defined under the MMPA as, "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." Harassment was further defined in the 1994 amendments to the MMPA, which provided for two levels thereof: Level A (potential injury), and Level B (potential disturbance). The National Defense Authorization Act of fiscal year 2004 (Public Law 108-136) amended the definition of harassment for military readiness activities. (Military readiness activities, as defined in Public Law 107-314, Section 315(f), include all training and operations related to combat, and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat.) The amended definition of harassment for military readiness activities is any act that:

> *Injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment).*
>
> *Disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including but not limited to, migration, surfacing, nursing breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered (Level B harassment) (16 USC 1362[18][B]).*

Section 101(a)(5) of the MMPA directs the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of marine mammals by U.S. citizens who engage in a specified activity (exclusive of commercial fishing) within a specified geographic region. These incidental takes may be allowed if NMFS determines the taking will have a negligible impact on the species or stock, and the taking will not have an unmitigable adverse impact on the availability of such species or stock for subsistence purposes.

Figure 2-17: Cook Inlet Beluga Whale Critical Habitat Area in the Vicinity of JBER



Marine mammal species that have been documented near JBER are the CIBW (endangered), Steller sea lion (*Eumetopias jubatus*) (western population endangered), killer whale (*Orcinus orca*), fin whale (*Balaenoptera physalus*) (endangered), gray whale (*Eschrichtius robustus*), humpback whale (*Megaptera novaeangliae*) (endangered), harbor porpoise (*Phocoena phocoena*), and harbor seal (*Phoca vitulina*) (Table 2-12). Of these species, only the CIBW, and harbor seal are commonly observed near JBER and the harbor porpoise, although rarely observed visually, is frequently detected acoustically in Eagle Bay and Eagle River. Forays into Knik Arm by Steller sea lion, killer whale, humpback whale, gray whale, and fin whale are considered extremely rare and thus these species will not be discussed further in this document.

Primary local stressors for these marine mammal species are considered to be the same as for the CIBW. Management goals and conservation measures for the CIBW are expected to provide adequate protection for these species as well, with the exception that high frequency cetaceans (i.e., harbor porpoise) are known to be more sensitive to in-water noise than mid-frequency cetaceans (i.e., belugas). In addition, special consideration should be given to projects generating in-air noise around Eagle River and Eagle Bay during spring to-fall, due to the amphibious hearing capabilities of the harbor seal.

Table 2-12: Upper Cook Inlet Species Protected by the Marine Mammal Protection Species Protected by the Marine Mammal Protection Act Observed in Knik Arm

Species	Occurrence in Knik Arm	Notes
Cook Inlet beluga whale (*Delphinapterus leucas)*	Frequent	Belugas have been detected in Knik Arm year-round (JBER unpublished data, Shelden *et al.* 2018) but are most frequently detected in Eagle Bay from August- November.
Fin Whale (*Balaenoptera physalus)*	Rare/ Unlikely	In June 2016, a male fin whale (62 feet) live-stranded north of Eagle Bay, where it subsequently died (JBER unpublished data)
Gray Whale (*Eschrichtius robustus)*	Rare/ Unlikely	A live gray whale was observed in Eagle Bay by a team from NMFS in September of 2017. The whale was not observed again after that day (Pers. Comm. Migura in text 7 Sept 2017).
Harbor Porpoise (*Phocoena phocoena)*	Frequent	Multiple harbor porpoise detections (visual or acoustic) per year have occurred in Eagle Bay since 2012. Harbor porpoise have been detected acoustically in Eagle Bay in every month with the exception of February (JBER unpublished data)
Harbor Seal (*Phoca vitulina)*	Frequent	Harbor seals have been observed in Eagle Bay from May- October but are most frequently observed in August and September (JBER unpublished data).
Humpback Whale (*Megaptera novaeangliae)*	Rare/ Unlikely	In September 2017, a male humpback whale (approximately 25-30 feet) was observed floating dead in Eagle Bay (JBER unpublished data). The cause, time, and place of death are unknown. A necropsy was conducted in September 2017.
Killer Whale (*Orcinus orca)*	Rare	Observations from 1975 to 2002 indicate that killer whales were occasionally observed in Knik Arm; however, killer whale were relatively common in lower Cook Inlet (Shelden *et al.* 2003). In June 2015, a possible killer whale-was observed on two consecutive days travelling north up Knik Arm from the Port of Anchorage (Pers. Comm. Mahoney in email, 10 June 2015).

Steller Sea Lion (*Eumetopias jubatus)*	Rare	In October 2009, a single Steller sea lion was observed transiting in Eagle Bay. In June 2011, a single Steller sea lion was observed just north of the Port of Anchorage (JBER unpublished data).

Harbor Porpoise

Harbor porpoise are small toothed whales attaining a maximum size of about 1.8 meters in length and 90 kg in weight (Leatherwood *et al*, 1982). They are a cryptic species, often travelling alone or in small groups (up to 10 porpoise) and presenting a low profile when surfacing (Leatherwood *et al*, 1982; Shelden *et al.*, 2014). These natural history traits, when coupled with the turbid, often rough water in Knik Arm, make this species difficult to visually detect.

Harbor porpoise are found primarily in coastal waters, < 100 m (328 ft) deep (Hobbs and Waite, 2010) where they feed on cephalopods and relatively small (100-250 mm (3.9-13.7 in) in length), non-spiny, schooling fish such as herring, mackerel, and pollock (Leatherwood *et al*, 1982; Gaskin *et al*, 1974). Smith and Read (1992) reported that harbor porpoise calves consume euphausiids in the Bay of Fundy, Canada. In Knik Arm, they likely feed on saffron cod, pollock, longfin smelt, eulachon, and juvenile salmon. Given the findings of Smith and Read (1992), it is also likely that they feed on small shrimp (Crangon spp). Across their range, foraging typically occurs in waters < 200 m (656 ft) deep (Shelden *et al.* 2014). Harbor porpoise sightings in the upper inlet appear to peak during ice-free months when there is an abundance of pelagic smelt (Shelden *et al.* 2014).

In Alaska waters, three stocks of harbor porpoise are currently recognized for management purposes: Southeast Alaska, Gulf of Alaska (GOA), and Bering Sea (Allen and Angliss 2015). No studies have been undertaken in Alaska waters to differentiate the stocks (Shelden *et al.* 2014). Porpoise found in Cook Inlet are included in the GOA stock, which is distributed from Cape Suckling to Unimak Pass, and was estimated at 31,046 animals (Allen and Angliss 2015), an increase from a 2000 population estimate of 21,451 harbor porpoises in the GOA (Ferrero *et al.*, 2000). Abundance estimates for Cook Inlet harbor porpoise have ranged from 136 porpoise in 1991(Dahlheim *et al.* 2000) to 428 porpoise in 1993 (Agler *et al.* 1995) to 249 porpoise (uncorrected) in 1998 (Hobbs and Wait 2010). It is likely that all abundance estimates underrepresent the actual population for a variety of reasons, including effort, survey area, and survey design (Shelden *et al*. 2014).

Harbor porpoise are occasionally sighted and have been detected acoustically in both Eagle River and Eagle Bay, Knik Arm. Only single harbor porpoises have been observed in this area, but it is possible that animals were missed due to their cryptic nature and the turbidity of the water. Porpoise are known to travel in small groups of up to 10 animals elsewhere across their range (Leatherwood *et al*, 1982); but in Knik Arm, group sizes are small (1-5 animals) (Shelden *et al.* 2014).

A detailed description of harbor porpoise presence on JBER (Eagle River) and waters adjacent to JBER is in Appendix I.

Harbor Seal

Harbor seals are widely distributed in both the Atlantic and Pacific Oceans. This species is associated closely with coastal waters, although is sometimes found in rivers and lakes (Kinkhart and Pitcher 1994). Their range in Alaska extends along the coast from British Columbia north to Kuskokwim Bay, and west throughout the Aleutian Islands. Most harbor seals are associated closely with coastal waters, although occasional observations up to 50 miles (81 km) offshore have been made. Harbor seals do not appear to

make long migrations like some species of marine mammals. However, some long distance movements of seals tagged in Alaska have been recorded (Angliss and Allen 2009) and considerable local movements occur (Kinkhart and Pitcher 1994). Local movements are generally associated with such factors as tides, weather, season, food availability, and reproduction (Angliss and Allen 2009).

Although primarily aquatic, harbor seals also utilize terrestrial environments for rest, thermal regulation, social interaction, molting, predator avoidance, and to give birth. Seals are more likely to be hauled out during the pupping, breeding, and molting periods, and haul out less frequently during late fall and winter (Boveng *et al.*, 2012). Harbor seals prefer to haul out on tidally exposed habitats including reefs, offshore rocks and islets, mud and sand bars, sand and gravel beaches, and floating and shorefast ice (Bigg 1981; Pitcher and Calkins 1979). Montgomery *et al* (2007) found that harbor seals in central and lower Cook Inlet hauled out on sites with rocky substrate near deep water and available prey, while avoiding areas with high anthropogenic disturbance.

Harbor seals within Cook Inlet are managed by NMFS as part of the Cook Inlet/Shelikof stock, although little is known about these seals in upper Cook Inlet. The NMFS abundance estimate for this stock is 22,900 seals (Allen and Angliss 2015). The population trend for this stock is currently unknown. Their summer distribution in Cook Inlet is primarily along coastal waters; while the overwintering areas include lower Cook Inlet and the Gulf of Alaska (Boveng *et al.* 2007). The Cook Inlet/Shelikof stock is distributed from Anchorage to lower Cook Inlet during summer; and from lower Cook Inlet, through Shelikof Strait, to Unimak Pass during winter (Boveng *et al.* 2012). Large numbers of seals concentrate at river mouths and embayments of lower Cook Inlet, especially Fox River, Kachemak Bay; and several haul outs in Kamishak Bay (Rugh *et al.* 2005a; Boveng *et al.* 2012). Montgomery *et al.* (2007) recorded more than 200 harbor seal haul outs in Lower Cook Inlet.

Harbor seals are commonly observed at the mouth of Eagle River; and occasionally observed in Eagle River, as far upstream as Bravo Bridge and (at high tide) in Otter Creek. No more than four harbor seals have been observed in Eagle Bay or Eagle River at any given time.

A detailed description of harbor seal use on JBER and waters adjacent to JBER in Appendix I.

Protected Avian Species

JBER recognizes avian Species of Special Concern as many species are among the continent's most rapidly declining avifauna. Many of these declining species commonly breed on and migrate through military lands in Alaska and warrant the greatest conservation need.

The Bald Eagle, a former federally listed threatened species in the contiguous 48 United States, is common locally and Golden Eagles are sighted in alpine and subalpine zones of JBER. Section 2.3.3 discusses these species in more detail. All avian species listed below are protected under the Migratory Bird Treaty Act (MBTA). Eagles also receive protection under both federal (Bald and Golden Eagle Protection Act) and State law. The de-listed species, American Peregrine Falcon (1999) and Arctic Peregrine Falcon (1994), may pass through the JBER area during migrations.

Species of Special Concern

ADF&G addresses the species of greatest conservation need (SGCN) for the State in the 2015 Wildlife Action Plan. JBER works with ADF&G to assess which wildlife species JBER should consider prioritizing as installation SGCN. Table 2-13 presents a summary of avian species from the Birds of Conservation Concern list (USFWS 2019) and the Alaska Wildlife Action Plan (2015). These species are considered local breeders on JBER and/or within the Upper Cook inlet eco-region. Table 2-14 presents a summary of additional species found on JBER identified in the Alaska Wildlife Action Plan (2015).

Table 2-13: Avian Species of Special Concern Recognized for Joint Base Elmendorf-Richardson

Common name	Scientific name	JBER Status	Designating Agencies
Alder Flycatcher	*Empidonax alnorum*	Breeding	SGCN
Aleutian Tern	*Onychoprion aleuticus*	Migrant	USFWS, SGCN
American Golden Plover	*Pluvialis dominica*	Migrant	USFWS, SGCN
American Peregrine Falcon	*Falco peregrinus anatum*	Migrant	USFWS, SGCN
American Pipit	*Anthus rubescens*	Breeding	SGCN
American Three-toed Woodpecker	*Picoides dorsalis*	Resident	SGCN
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	Migrant	USFWS, SGCN
Arctic Tern	*Sterna paradiaea*	Breeding	USFWS, SGCN
Bald Eagle	*Haliaeetus leucocephalus*	Resident	USFWS, SGCN
Bank Swallow	*Riparia riparia*	Breeding	SGCN
Belted Kingfisher	*Megaceryle alcyon*	Breeding	SGCN
Black-backed Woodpecker	*Picoides arcticus*	Breeding	SGCN
Black-bellied Plover	*Pluvialis squatarola*	Migrant	SGCN
Black-capped Chickadee	*Poecile atricapillus*	Resident	SGCN
Black-legged Kittiwake	*Rissa tridactyla*	Breeding	SGCN
Bohemian Waxwing	*Bombycilla garrulous*	Resident	SGCN
Boreal Chickadee	*Poecile hudsonicus*	Resident	SGCN
Boreal Owl	*Aegolius funereus*	Breeding	SGCN
Brown Creeper	*Certhia americana alascensis*	Resident	SGCN
Common Raven	*Corvus corax kamtschaticus*	Resident	SGCN
Common Redpoll	*Acanthis flammea*	Resident	SGCN
Dark-eyed Junco	*Junco hyemalis*	Breeding	SGCN
Dunlin	*Calidris alpine pacifica*	Breeding	SGCN
Dusky Canada Goose	*Branta canadensis occidentalis*	Breeding	SGCN
Fork-tailed Storm Petrel	*Oceanodroma furcate furcata*	Migrant	SGCN
Fox Sparrow	*Passerella iliaca*	Breeding	SGCN
Glaucous-winged Gull	*Larus glaucescens*	Breeding	SGCN
Golden Eagle	*Aguila chrysaetos*	Breeding	USFWS, SGCN
Golden-crowned Kinglet	*Regulus satrapa*	Breeding	SGCN
Golden-crowned Sparrow	*Zonotrichia atricapilla*	Breeding	SGCN
Gray Jay	*Perisoreus Canadensis*	Resident	SGCN
Great Gray Owl	*Strix nebulosi*	Breeding	SGCN
Greater White-fronted Goose	*Anser albifrons frontalis*	Migrant	SGCN
Gyrfalcon	*Falco rusticolus*	Breeding	SGCN
Herring Gull	*Larus smithsonianus*	Breeding	SGCN
Horned Grebe	*Podiceps auritus*	Breeding	USFWS
Horned Lark	*Eremophila alpestris arcticola*	Breeding	SGCN

Hudsonian Godwit	*Limosa haemastica*	Migrant	USFWS, SGCN
Lapland Longspur	*Calcarius lapponicus alascensis*	Breeding	SGCN
Lesser Yellowlegs	*Tringa flavipes*	Breeding	USFWS, SGCN
Lincoln's Sparrow	*Melospiza lincolnii*	Breeding	SGCN
Long-billed Dowitcher	*Limnodromus scolopaceus*	Migrant	SGCN
Long-tailed Duck	*Clangula hyemalis*	Breeding	SGCN
Mew Gull	*Larus canus brachyrhynchus*	Breeding	SGCN
Northern Harrier	*Circus cyaneus*	Breeding	SGCN
Northern Hawk Owl	*Surnia ulula*	Breeding	SGCN
Northern Shrike	*Lanius excubitor*	Breeding	SGCN
Olive-sided Flycatcher	*Contopus cooperi*	Breeding	USFWS, SGCN
Orange-crowned Warbler	*Oreothlypis celata*	Breeding	SGCN
Pacific Black Brant	*Branta bernicula nigricans*	Migrant	SGCN
Pacific Golden Plover	*Pluvialis fulva*	Migrant	USFWS, SGCN
Pectoral Sandpiper	*Calidris melanotos*	Migrant	SGCN
Pelagic Cormorant	*Phalacrocorax pelagicus*	Migrant	SGCN
Pine Grosbeak	*Pinicola enucleator*	Resident	SGCN
Pine Siskin	*Spinus pinus*	Resident	SGCN
Red-necked Phalarope	*Phalaropus fulicarius*	Breeding	SGCN
Red-throated Loon	*Gavia stellata*	Breeding	USFWS, SGCN
Rough-legged Hawk	*Buteo lagopus*	Breeding	SGCN
Ruby-crowned Kinglet	*Regulus calendula grinnelli*	Breeding	SGCN
Rufous Hummingbird	*Selasphorus rufus*	Breeding	USFWS
Rusty Blackbird	*Euphagus carolinus*	Breeding	USFWS, SGCN
Sandhill Crane	*Grus canadensis*	Breeding	SGCN
Savannah Sparrow	*Passerculus sandwichensis*	Breeding	SGCN
Semipalmated Sandpiper	*Calidris pusilla*	Breeding	SGCN
Short-billed Dowitcher	*Limnodromus griseus*	Breeding	USFWS, SGCN
Short-eared Owl	*Asio flammeus flammeus*	Breeding	SGCN
Snow Bunting	*Plectrophenax nivalis nivalis*	Breeding	SGCN
Solitary Sandpiper	*Tringa solitaria*	Breeding	USFWS, SGCN
Song Sparrow	*Melospiza melodi*	Breeding	SGCN
Spotted Sandpiper	*Actitus macularius*	Breeding	SGCN
Steller's Eider	*Polysticta stelleri*	Migrant	SGCN
Steller's Jay	*Cyanocitta stelleri*	Resident	SGCN
Surfbird	*Calidris virgata*	Breeding	SGCN
Townsend's Warbler	*Setophaga townsendi*	Breeding	SGCN
Tree Swallow	*Tachycineta bicolor*	Breeding	SGCN
Trumpeter Swan	*Cygnus buccinator*	Breeding	SGCN
Varied Thrush	*Ixoreus naevius*	Breeding	USFWS, SGCN
Wandering Tattler	*Tringa incana*	Breeding	USFWS, SGCN
Western Sandpiper	*Calidris mauri*	Migrant	SGCN

Western Wood-Pewee	*Contopus sordidulus*	Breeding	SGCN
Whimbrel	*Numenius phaeopus hudsonicus*	Migrant	SGCN
White-crowned Sparrow	*Zonotrichia leucophrya*	Breeding	SGCN
White-winged Crossbill	*Loxia leucoptera*	Resident	SGCN
White-winged Scoter	*Melanitta deglandi*	Breeding	SGCN
Wilson's Warbler	*Cardellina pusilla pileolata*	Breeding	SGCN

Table 2-14: Alaska Wildlife Action Plan Species of Greatest Conservation Need Recognized for Joint Base Elmendorf-Richardson

Species Common Name	**Species Scientific Name**	**Stewardship Species**	**Sentinel Species**	**Culturally Important**	**Economically Important**	**Ecologically Important**
Freshwater Invertebrates	*Ephemeroptera, Odonata, Plecoptera, Trichoptera, Cladocera*					X
Terrestrial Invertebrates	*Hymenoptera, Diptera, Odonata, Lepidoptera, Arachnida*				X	X
Pink Salmon	*Oncorhynchus gorbuscha*			X	X	X
Chum Salmon	*Oncorhynchus keta*			X	X	
Coho Salmon	*Oncorhynchus kisutch*	X		X	X	
Sockeye Salmon	*Oncorhynchus nerka*	X		X	X	
Chinook Salmon	*Oncorhynchus tshawytscha*	X		X	X	
Rainbow Trout	*Oncorhynchus mykiss*			X		
Longfin Smelt	*Spirinchus thaleichthys*			X		X
Eulachon	*Thaleichthys pacificus*			X		X
Pacific Herring	*Clupea pallasii*			X		X
Saffron Cod	*Eleginus gracilis*			X		
Ninespine Stickleback	*Pungitius pungitius*					X
Alaska Blackfish	*Dallia pectoralis*	X		X		
Bering Cisco	*Coregonus laurettae*			X		
Northern Pike	*Esox Lucius*			X		X
Dolly Varden	*Salvelinus malma*	X		X		
Wood Frog	*Lithobates sylvaticus*		X			
Arctic Ground Squirrel	*Urocitellus parryii*					X
Red Squirrel	*Tamiasciurus hudsonicus*					X
Northern Flying Squirrel	*Glaucomys sabriuns*					X
Northern Red-backed Vole	*Myodes rutilus*					X
Long-tailed Vole	*Microtus longicaudus*					X
Singing Vole	*Microtus miurus*	X				X
Tundra Vole	*Microtus oeconomus*	X				X
Meadow Vole	*Microtus pennsylvanicus*					X
Meadow Jumping Mouse	*Zapus hudsonius*					X
Snowshoe Hare	*Lepus americanus*			X		X
Collared Pika	*Ochotona collaris*	X				X
Common Shrew	*Sorex cinereus*	X				
Dusky (montane) Shrew	*Sorex monticolus*		X			
American Watershew	*Sorex palustris*		X			
Tundra Shrew	*Sorex tundrensis*		X			
Little Brown Bat	*Myotis lucifugus*		X			

Harbor Porpoise	*Phocoena phocoena*					X
Beluga (Cook Inlet DPS)	*Delphinapterus leucas*	X		X		

2.3.5 Wetlands and Floodplains

The National Wetland Inventory (NWI) is managed by the U.S. Fish and Wildlife Service, updates to maps are only made with consideration regulatory actions, including but not limited to Final Jurisdictional Determinations made by the U.S. Army Corps of Engineers. Where final jurisdictional determinations are lacking, the regulatory standard is the NWI.

Floodplain data is typically derived from Federal Emergency Management Agency (FEMA) – Flood Insurance Rate Maps (FIRM) published, most recently in the region, 25 September 2009. Military installations lie within a zone that the National Flood Insurance Program (NFIP) excludes from its mapping effort due to the ineligibility of federal lands to make claims against the NFIP, who produce the maps. Floodplain boundaries depicted in the geospatial data on file for JBER's "floodplain" are not derived from a complete data source, may be incomplete, inaccurate, or not shown at all, so caution must be used when referring to map resources for floodplains on JBER.

JBER's wetlands are diverse and widespread throughout the sloped, depressional, flat, riverine and estuarine systems on base. These classifications describe the hydrogeomorphic (HGM) position of wetlands in the environment and reflect their placement and function within the watershed (Brinson 2003). These wetlands are further classified by their dominant vegetation including aquatic, emergent, shrub-carr, and forested wetlands. JBER has a total of 7,418.71 acres of wetlands, which accounts for approximately 10% of JBER's land base. Table 2-15 list the hydrogeomorphic (HGM) classes of wetlands inventoried on JBER. Figure 2-18 depicts the wetlands on JBER. Wetland functions, including hydrologic function, habitat function, species function, and public value functions, are measured using a Wetland Functional Assessment (WFA) Methodology derived from the Anchorage Wetland Functional Assessment method. Floodplain functions are highly integrated with wetland functions, as many wetlands are directly associated with streams and lakes and, even when not directly connected via surface water, do serve the same basic functions across the landscape as if they were. The JBER-WFA has been completed and is updated adaptively in coordination with the USACE.

Table 2-15: JBER Wetlands by Hydrogeomorphic (HGM) Position

HGM Wetland Type	Total Acres	Percent of Total Wetland Area
Depressional	2997.69	40.41%
Estuarine	2133.72	28.76%
Flat	1357.30	18.30%
Lacustrine	98.18	1.32%
Riverine	325.78	4.39%
Slope	299.89	4.04%
Open Water (excluding lakes)	174.54	2.35%
Upland (mapped as wetland)	31.61	0.43%
Total Wetlands on JBER	**7421.24**	**100.00%**

GEOBASE 2019

Wetlands are typically characterized based on parameters defined by the U.S. Army Corps of Engineers in the Corps of Engineers Wetlands Delineation Manual (USACE 1987) and in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region V 2.0 (USACE 2007).

Wetlands, waters of the U.S., and uplands (non-wetlands), as referenced herein, are defined as:

> *Wetlands: "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR Part 328.3[b]). Wetlands are a subset of "waters of the U.S." Note that the "wetlands" definition does not include unvegetated areas such as streams and ponds.*
>
> *As described in the 1987 USACE Wetlands Delineation Manual and in the 2007 Regional Supplement to the Corps of Engineers Wetland Delineation Manual, Alaska Region (USACE 2007), wetlands must possess the following three characteristics: 1) a vegetation community dominated by plant species that are typically adapted for life in saturated soils, 2) inundation or saturation of the soil during the growing season, and 3) soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions.*
>
> *Waters of the U.S.: Waters of the U.S. include other waterbodies regulated by the USACE, including navigable waters, lakes, ponds, and streams, in addition to wetlands.*
>
> *Uplands: Non-water and non-wetland areas are called uplands.*

Wetland vegetation is described, by species, relative to their affinity to wetlands. The U.S. Army Corps of Engineers maintains a list of wetland plants and their assigned indicator statuses. An indicator status reflects the likelihood that a particular plant occurs in a wetland or upland. The five indicator statuses are: Obligate (OBL) plants that always occur in standing water or in saturated soils; Facultative Wet (FACW) plants that nearly always occur in areas of prolonged flooding or require standing water or saturated soils but may, on rare occasions, occur in non-wetlands; Facultative (FAC) plants that occur in a variety of habitats, including wetland and mesic to xeric non-wetland habitats but commonly occur in standing water or saturated soils; Facultative Upland (FACU) plants that typically occur in xeric or mesic non-wetland habitats but may frequently occur in standing water or saturated soils; and Upland (UPL) plants that rarely occur in water or saturated soils. A list of species designations, by state, can be found at https://wetland-plants.usace.army.mil. The hydrologic and soil characteristics specific to wetlands are also described in the delineation manual and regional supplement. Wetland descriptions below will refer to hydrology and hydric soil indicators detailed in these resources.

It must be noted, however, that not all the wetlands in these areas have been specifically delineated, none of the data collected has been submitted to the Corps of Engineers for review, and a request for a Jurisdictional Determination on these wetlands has not been made. Data collected between 2013 and 2016 does include some specific delineation data from wetlands and drainages near Geronimo Drop Zone where an access route is being constructed for wildland firefighting purposes. Other wetlands were observed during the growing season and physical characteristics were documented, but the areal extent of those areas was not measured, for lack of time and resources in the field. Wetlands shown in the maps provided are part of the JBER Wetland Inventory and are not to be considered field delineations of the wetland boundaries.

Impacts to wetlands, including discharge of fill, are regulated by Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. Regulation is managed by the U.S. Army Corps of Engineers. Wetlands are defined by measuring their hydric affinity of the vegetation, soil, and hydrologic properties according to the Corps of Engineers Wetland Delineation Manual (USACE 1987) and the Alaska Regional Supplement (USACE 2007). Jurisdictional wetlands are regulated by the Corps of Engineers and the Environmental Protection Agency. All wetlands on JBER are potentially jurisdictional and must be verified by the Corps prior to incurring any impacts, in order to complete an evaluation of purpose and need, assessment of practicable alternatives, and, if necessary, assess compensatory or other mitigation requirements.

Wetland delineations and jurisdictional determinations are valid for up to five years. If impacts to a wetland are proposed for a site where no valid delineation exists, then a new delineation and jurisdictional determination may be required by the Corps. JBER completed an extensive wetland inventory in 2012 and completes subsequent updates annually. This inventory is not the equivalent to a wetland delineation or jurisdictional determination, and may not be all inclusive. The mapped polygons represent, with reasonable confidence, the general perimeter of the likely wetland resource and are valid for planning purposes only. Unmapped wetlands may still exist on JBER. Additionally, some areas mapped as wetlands may not meet all required criteria in the field and therefore would be considered upland, and not regulated as a wetland. Only a field delineation and confirmation from the Corps may be considered definitive rule on the jurisdictionality of a wetland. Any new wetlands, challenged sites, or delineated boundaries are updated annually in the appropriate GIS layer in coordination with GeoBase.

Table 2-16: JBER Wetlands by Vegetation Type

Wetland Vegetation	Total Acres	Percent Total Wetland Area
Emergent	2324.69	31.34%
Forested	2126.70	28.67%
Open Water (excluding lakes)	174.81	2.36%
Scrub-Shrub	2760.93	37.22%
Upland (mapped as wetland)	31.61	0.43%
Total	**7,418.71**	**100.00%**

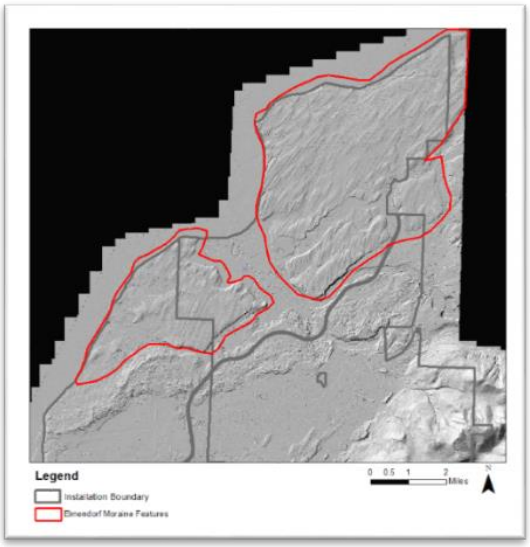
GEOBASE 2019

The information included below is intended to provide and ecological description of wetlands found on JBER, specifically in the Elmendorf Moraine kettle area, the Eagle River Flats, and in alpine areas of South Post. The details included were collected during field reconnaissance that occurred between 2013 and 2019.

Elmendorf Moraine Kettle Wetlands

The southern edge of the geological feature known as the Elmendorf Moraine and other associated ground moraine, an undulating, long series of ridges, runs east-west across JBER, roughly parallel to Knik Arm; and spans both sides of the Knik Arm, and up into the Matanuska Valley. This system of ridges marks the terminus of the last glacial advance in this area.

Many kettles on the moraine contain ponds and lakes while others contain bog (peat) deposits. These types of depressions are typically surrounded by uplands and may have no distinguishable inlet or outlet and thus are fed either by groundwater or by surface water in the form of sheet flow. The water balance in the basin is achieved via groundwater recharge or basin overflow.



Within the Elmendorf Moraine, which stretches from the main cantonment area on JBER north, beyond the installation boundary, and from the foothills of the Chugach Mountain to the bluffs above Cook Inlet, there are over 3,025 acres of depressional wetlands and waterways that lack a clear surface water connection to the Knik Arm of Cook Inlet, a tidal water. Wetland types include freshwater (palustrine) emergent, scrub-shrub, and forested wetlands ranging in size from 0.03 acres to over 30 acres including small lakes or ponds. Spring Lake (9.6 acres), Hillberg Lake (10.9 acres), Triangle (3.8 acres), and Fish Lake (4.0 acres) are all present within the Elmendorf Moraine and lack clear surface water connections to Cook Inlet, or its tributaries.

Most kettles are groundwater fed, have significant accumulations of peat, and have an abundance of sphagnum moss throughout the wetland area- whether emergent, scrub-shrub, or forested. Otherwise, dominant vegetation in these kettles varies by wetland class. Emergent wetlands are dominated by sedges and grasses including *Calamagrostis canadensis, Carex aquatilis, C. lyngbyei, C. rostrata, Poa palustris, P. arctica,* and *Comarum palustre*. Scrub-shrub wetlands may be dominated by dwarf shrubs such as *Vaccinium vitis-idaea, Chamaedaphne calyculata, Betula glandulosa, Myrica gale*, and *Rhododendron tomentosum* or by tall shrubs such as *Alnus viridis* or *Salix pulchra*. In areas were shallow open water persists, vegetation such as *Alisma triviale, Sparganium sp., Comarum palustre*, and *Carex spp*. were common. Forested systems were dominated by *Betula papyrifera* (*neoalaskana*) and *Picea mariana*- which persist in a stunted growth form in sphagnum dominated bogs and on floating mats.

Hydrologically, the water table is typically high, near the ground surface. Most kettles are at least shallowly inundated at their lowest point for most of the growing season. Floating mats have formed around the edges on most of the open waterbodies, most prominently in the Fish-Triangle Lake complex, where the two waterbodies are actually hydrologically connected below the surface of a dense floating mat. In smaller kettle ponds, floating mats may have formed over the majority of the surface area. Surrounding the kettle are typically steep banks where hydrologic features meeting wetland criteria are often clearly defined 12-16 inches above the edge terrain. Primary and secondary hydrologic characteristics, defined by the Corps of Engineers (1987, 2007) found in Elmendorf Moraine kettles include surface water (A1), high water table (A2), saturation (A3), water marks (A4), water stained leaves (B9), drainage patterns (B10), geomorphic position (D2), and microtopographic relief (D4), among others.

In the Elmendorf Moraine, undulating hills of Deception-Estelle-Kitchatna complexes are common (NRCS 2016). These soils are comprised of silt, sandy silt, and silt loam over coarse gravel that are typically well drained. Most of the wetland complexes occurring in the low lying areas between undulating Deception-Estelle-Kitchatna complexes are classified as having Salmatof Peat soils. Salmatof peat soils are very poorly drained and are typically comprised of 60 inches or more of organic peat over parent material (NRCS 2016). Hydric soil conditions common in kettles include having a thick organic layer such as a Histosol with at

least 16" of an organic layer beginning near the soil surface or histic epipedon with 8-16" of organics in the upper portion of the soil profile.

Functionally, depressional kettles serve to retain and filter stormwater runoff and serve as wildlife habitat. Most of these kettles are also considered important components in groundwater recharge. Vegetated wetlands help to remove pollutants, including chemicals and sediment from stormwater and prevent release into rivers and streams. The value of this function depends on the amount of development around the depression. While there is not always direct connectivity between depressional kettles and larger open bodies of water such as lakes and streams, the capacity of kettles across the landscape can be important to overall hydrologic function within the watershed. The small size of many of these wetlands limits their overall impact, individually.

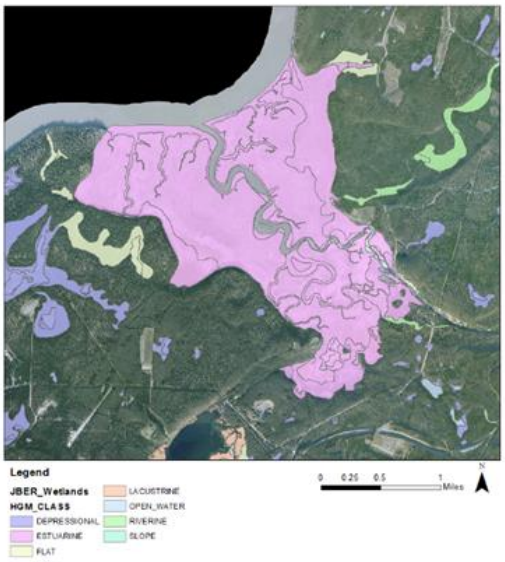
Due to the extreme variability of topography in the Elmendorf Moraine, the vegetative structure of kettle wetlands can be very diverse, lending for higher quality plant and wildlife habitat. Wetlands with vegetative floating mats, particularly around the edge of waterbodies populated by fish and tadpoles, serve as erosion buffers and protect the waterbody. Stocked and native fish including Rainbow trout, landlocked salmon, and three spine stickleback live and breed in lakes and ponds deeper than six feet. Systems with open water also provide bird nesting and feeding habitat. Although kettle ponds are small in size they are important breeding habitat for a variety of waterfowl, wood frogs, waterbirds and passerines. Forested, scrub-shrub, and emergent systems are important to many migratory song birds as well as boreal wetland birds. Lack of connectivity to anadromous streams or tidal waters limits the value of isolated depressions to anadromous fish or to Cook Inlet beluga whale.

The public value of wetlands in the Elmendorf Moraine are limited to accessibility for those who are able to access these areas of the installation. Typically only DoD identification card holders and their guests are eligible to access Elmendorf. Lakes with a stocked or native fishery are frequently visited by active duty personnel, DoD civilians, and veterans as well as their family members and guests. There are also several birding groups that frequently visit, including a few who contribute to the monitoring of resident and migrating bird activity in kettle lakes and ponds.

Because these systems occur as small, closed depressions, connectivity in accordance with the federal definition of a jurisdictional water of the U.S. (WOUS), requires consideration of both surface and subsurface connections (significant nexus) across the landscape. Traditional Navigable Waters (TNW) are defined as "all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide (33 C.F.R. 329. Water of the U.S. are defined in 33 C.F.R. Part 328. There have been many challenges to the definition of TNWs requiring resolution by the U.S. Supreme Court, resulting in refinement of what constitutes a jurisdictional wetland.

Eagle River Flats Wetlands

The Eagle River Flats (ERF) are comprised of 2,092 acres of estuarine emergent meadows, fringed by estuarine shrub-carr wetlands and palustrine forest. ERF includes more than 95% of the total estuarine wetlands on JBER. Eagle River is the predominant waterbody flowing through the ERF, however Otter Creek flows through the ERF until its confluence with Eagle River. Clunie Creek is also hydrologically connected to Eagle River through reemergence of an underground spring on the eastern edge of the ERF. Clunie Creek leaves Clunie Lake at the southern tip of the lake and proceeds southwest toward ERF. South of Artillery Road, however, the creek dissipates into the ground and loses all stream bed and bank morphology. It reemerges at a small pond at the edge of ERF. Comprehensive sampling of wetlands in the ERF is not feasible due to hazards of unexploded ordnance (UXO) present throughout the area. Access is



limited to routes through the flats that have already been cleared by munitions experts. Four sample points were assessed by JBER Natural Resources in the estuarine emergent wetlands within ERF during the growing season 2016. Other assessments of the presence, type, condition, and function of the ERF wetlands has been conducted using aerial imagery (particularly images taken in 2009, 2012, and 2015) and with the assistance of other remote sensing and GIS resources. The general condition of the flats is saturated or inundated at variable depths with tall, dense, herbaceous vegetation present throughout. Exposed mudflats are more prevalent in the zones most affected by the tidal flood and along the cut banks of Eagle River and Otter Creek. Additionally, microtopographical depressions approximately 2-6 m across occur throughout the ERF where craters were left behind during the period when year-round firing was allowed. Due to the potential hazard of UXO, closer investigation of the vegetative assemblage between the impact depressions and other surrounding areas has not been made. Aerial imagery clearly shows variability in the hydrology throughout the ground surface, where craters may be inundated while surrounding areas do not necessarily have open standing water.

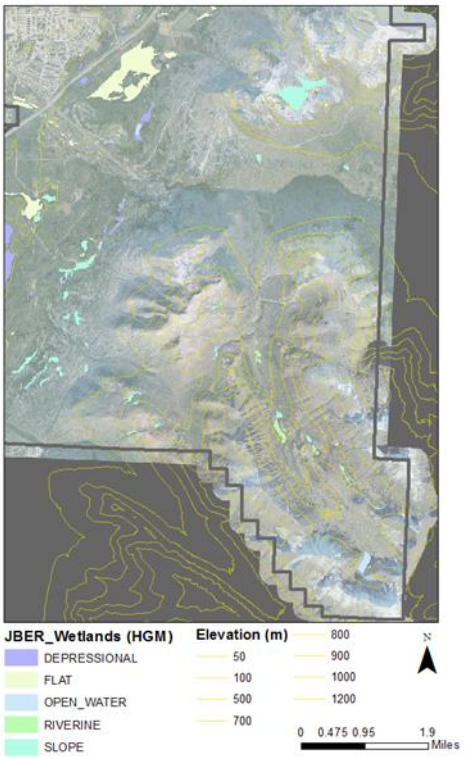
The ERF is wholly comprised of wetlands, except on the outermost edges, where the topography increases sharply uphill. Adjacent uplands are described as closed mixed spruce-birch forest. Slopes are steep but well vegetated. Emergent wetlands are typically dominated by various sedges (*Carex utriculata, C. lyngbyei, C. limosa, C. aquatilis*), dunegrass (*Leymus mollis*), arrowgrass (*Triglochin maritima*), meadow barley (*Hordeum brachyantherum*-), bulrush (*Bulboschoenus maritimus* syn. *Schoenoplectus maritimus*), vetch (*Vicia americana*), cinquefoil (*Potentilla sp.*), and sea milkwort (*Lysimachia maritima*). Soils in these estuarine wetlands are not able to be sampled due to risk of encountering unexploded ordnance, however, it can be inferred that the soils are predominantly comprised of frequently deposited silt, as is clearly visible at the ground surface in the slope profiles along the riverine troughs of Eagle River and other tributaries. There are some peat deposits mapped along the edges of the ERF, near forested hillslopes. Hydrologically, ERF wetlands are permanently saturated and often inundated, depending on tidal influx (daily), as well as seasonal factors; particularly spring break up when sediment and soils are frozen.

The ERF comprise 95% of the total estuarine wetlands on JBER and nearly 28% of all wetlands on JBER. Based on the relative and total size of these wetlands, the value of the ERF is high for both hydrologic integrity within the watershed as well as species diversity and wildlife habitat within the ERF. There is considerable value in the hydrologic integrity of the ERF wetlands in their abundant capacity to aid in storage of stormwater as well as removal and storage of sediments and other components prior to discharge into Eagle Bay. Wetlands in the Eagle River Flats are either directly or indirectly involved in providing habitat for and/or contributing to the health of habitat for spawning, rearing, and the out-migration of anadromous salmon, on which federally endangered Cook Inlet beluga whales (Delphinapterus leucas) are dependent. While anadromous fish are not known to spawn in the flats directly, waterways do serve as corridors to upstream spawning areas. The estuary is also important waterbird nesting, feeding, and rearing habitat. The estuary also serves as an important migratory waterfowl and waterbird staging area. The public value of ERF wetlands is extremely limited because of unexploded ordnance hazards that prohibit access

to this area by the public. There are some vantage points, such as from Bravo Bridge, where the public could look out over the flats.

Alpine Wetlands

Wetlands occurring in the Chugach Mountain region of JBER are quite diverse (Johnson, *et al.* 2017). Wetlands in this area occur along rivers, streams, and lakes, at headwaters, in alpine swales associated with melting snowbeds, and in other shallow depressions in valleys and saddles. Wetland areas are smaller and form fewer large complexes than wetlands in flatter, lower elevations. The hydrogeomorphology of these various wetlands contribute to how water is stored as well as how it moves through upper montane reaches of the watershed. Walker, *et al.* (1997) describes alpine regions on JBER using the following elevation classes: Subalpine (501 m to 600 m), Lower Alpine (601 m to 950 m), Middle Alpine (951 m to 1550 m), and Upper Alpine (above 1550 m). Wetlands may occur at any of these elevations and may take on several different forms. There are approximately 57.2 acres of wetlands mapped at elevations above 600m (MSL) inventoried by remote sensing throughout training areas 427, 428, and 431 (excluding wetlands and open water in former training areas south of Tanaina Lake). Remote sensing for wetlands in alpine areas can be difficult, due to limited field data available to corroborate hydrology and vegetation indicators which may appear on infrared and other high resolution aerial imagery.



Closed Tall Willow Scrub and Alder Scrub Swamps fall into the "Scrub-Shrub" wetland type and have been observed throughout low-gradient stream reaches in the Chester and Snowhawk Valleys, including Geronimo Drop Zone and along the stream channel for both North and South forks of Snowhawk Creek as well as after their confluence. These areas were dominated by various willow and alder species (*Salix barclayii, S. alaxensis*, *Salix planifolia*, *Salix spp., Alnus viridis*, *Alnus spp*.). Scrub is distinguished by height. Tall scrub includes shrubs to 1.5m or 5ft in height. Similar species may occur to Tall shrub stature-up to 3m. These scrub dominated wetlands extend well above the tall shrub zone in Snowhawk Valley. Research conducted by Alaska Pacific University (APU 2015) indicates that changing climatic conditions may be driving the presence of typically taller willow and alder species occurrences at elevations they have not previously been abundant. There are approximately 25 acres of scrub dominated riverine wetlands currently mapped in the Snowhawk Valley. Field observations in 2016 suggest that the total area is much larger, particularly along low-gradient stream reaches, therefore the total area of these wetlands is unknown.

Alpine Depressions and Swales typically fall into the "Scrub-Shrub" wetland type, but are comprised of dwarf shrubs not more than about 8 inches in height. Common dominants included: *Harrimanella stellariana, Empetrum nigrum, Calamagrostis canadensis, Festuca altaica, Juncus mertensianus, Carex microchaeta, Luzula sp*., and *Luetkea pectinata.* The abundance or absence of mosses vs. lichens were common indicators of moisture at a given site, regardless of whether hydric conditions were fully met.

Wet Sedge-Herb Meadow Tundra, which fall into the "Emergent" wetland type, occur commonly in headwater reaches of the North and South forks of Snowhawk Creek as well as in depressional swales.

These areas were dominated by various *Carex* spp., *Calamagrostis* sp., *Sanguisorba canadensis*, *Oxyria digyna*, *Juncus mertensianus*, *Eriophorum* sp., and *Petasites frigidus*. Shallow drainages move slowly in the upper valley and saturation is relatively broad across the headwater channels. The soils contain low abundance of organic material; comprised mostly of fine gravel overlain coarse gravel. Headwaters are clear and very low in silt. Slow melting snowbeds are present in the North fork valley, but are less abundant in the South fork of Snowhawk Creek. The connectivity between the South fork headwaters of Snowhawk Creek and Tanaina Lake were investigated in 2019 by 673d CES/CEIEC Biologists and 673d CES/CEN GeoBase. The ordinary high water mark (OHWM) and thalweg of the stream were surveyed in the field and the perennial, ephemeral, and non-stream reaches of the mapped watercourse were remapped. Section 2.2.4 includes additional information on the remapping of this stream.

Alpine wetland functions of are primarily to the benefit of the hydrologic integrity of the watershed downstream. Wetlands occurring in drainages on steep slopes and that are relatively small limit the total capacity for these wetlands to store stormwater runoff. However, the presence of dense vegetation, especially on low-gradient valley bottoms, allows for improvement of water quality and reduction in flow velocity as snowmelt and stormwater makes its way toward Chester, Snowhawk, or Ship Creek, all anadromous streams that discharges into the Knik Arm of Cook Inlet, a tidal water. Stream sampling in 2015-2016 in Chester Creek headwaters and in 2015 and 2018 on Snowhawk Creek indicate the water quality in these headwaters is clear, cold, with some fine sediments high dissolved oxygen, and low conductivity (Schoofs and Zonneville 2016, Schoofs et al. 2017, Johnson and Schoofs, forthcoming). The cumulative area and volume of these wetlands is minor compared to the total extent of wetlands throughout the rest of the watershed, however, they do serve to hold snowmelt, surface water, and even ground water in place. Collection is often long enough for ground frost to thaw where it can recharge ground water through highly permeable soils or slowly be released through dense, low vegetation that hold sediments in place. Depressional wetlands, including shallow swales, can serve to regulate hydrological processes by minimizing the total volume and velocity of water input to higher order creeks; stabilizing aquatic systems throughout the watershed and improving the quality of fish habitat downstream.

Waters are too shallow and often lie above significant elevational gradients to serve as fish habitat; however, there is a possibility of aquatic invertebrates occupying these upper reaches, providing food to birds and contributing to food sources and nutrient transport as they and/or their organic contributions make their way downstream. Fish were not observed in the upper headwaters of Snowhawk or Chester Creeks, however; Dolly Varden (*Salvelinus malma*) and coho salmon (*Oncorhynchus kisutch*) were found in middle reaches; below the subalpine zone (Schoofs and Zonneville 2016). These wetlands serve to filter sediments from runoff as water flows toward associated waters, providing valuable protection to water quality downstream where anadromous salmonids spawn and rear. Forested habitat along the Chugach Mountains also serves as resting and foraging habitat for migratory songbirds (Hogan and Tande, 1983) as well as for nesting and rearing habitat for boreal birds, who depend on wetlands for food.

Climatic factors may be particularly influential to wetland functions in higher elevation headwaters in the future, as higher elevations have been found to experience more intensive changes in temperature and precipitation. This may result in an added impact on the quality of hydrologic processes in the upper headwaters of local watersheds.

Problematic Alpine Depressions and Swales

Wetlands currently shown in the National Wetland Inventory within Snowhawk Creek drainage are typical of mapped wetlands in the Chugach Mountains, which are limited primarily to riverine scrub-shrub wetlands associated with the seeps and drainages associated with Snowhawk Creeks. Depression and swale

landforms which may meet wetland criteria, but are not mapped, occur associated with snowbeds, on benches or plateaus or in the bottom of broad "U" shaped valleys. These specific types of landforms were identified by the Natural Resources Conservation Service and U.S. Army Corps of Engineers in early 2000s as having potential to meet the definition of a "wetland", but most likely under problematic circumstances.

The 2007 Alaska Regional Supplement identifies specific "test" criteria for evaluating such landforms (USACE 2007). Additionally, specific soil and hydrology protocols have be defined by the USACE for use in situations where soils may lack wetland indicators in specific situations. These problematic protocols were used to evaluate the field conditions of nine mapped wetlands and twenty "depressions and swales" in 2018-2019 in conjunction with the Alpine Training Support project. Preliminary findings indicate that many of the depressions and swales, clearly associated with late-melting snowbeds, do, and in-fact meet wetland criteria in accordance with the "test" criteria for such landforms. Additionally, an argument can be made in several other situations where other problematic situations may apply, even if the specific criteria for swales isn't met.

Delineations were conducted in 2013-2015 along a proposed route through Training Area 425 up the hillside, north of Chester Creek, and then around the south side of Rufus Ridge. In this area, wetlands were found associated with drainage tributaries of Chester Creek. Other shallow drainages with wetland features are likely along relatively shallow gradients, but lie in heavily forested areas which are very difficult to map using only aerial resources. Some of the mapped wetland areas investigated failed to meet hydrology and soil indicators, despite having wetland vegetation and geomorphology. For these reasons, among others, the wetland inventory is typically valuable for planning purposes only, and should not replace the need for a field delineation. Additional efforts to better understand alpine wetlands began in 2015 with a preliminary summary of wetland characterizations included in Johnson et al. 2017; preceding an intensive study of alpine wetlands in 2018-2019.

Wetlands associated with drainages and streams typically showed clear indicators of hydrology, including saturation or inundation within the upper 12 inches of the soil. This was typical with riparian wetlands even in areas where soil depth is very shallow over large rocks. Here water could be observed running toward the streams, under the wetland surface. Drainage patterns near drainages and streams were also clear indicators of wetland hydrology, even in intermittent reaches that dried up later in the growing season.

In depressions and swales, however, hydrology indicators were less prevalent. Early in the season, snow and ice in the shallow soil layers serve as a restrictive layer holding water at the surface of concave basins during and even after snow in the basin has melted. This occurs for a period of time when alpine dwarf shrubs are prolifically growing, even under snow cover, being adapted specifically to maximizing productivity during a very short growing season (Korner 2003). Additional meltwater often feeds these basins well into the growing season, until the soils thaw and water quickly drains out. Observing saturation or inundation in these situations may be problematic if site visits occur well into to the growing season.

Soil features observed commonly failed to meet specific required criteria, since significant accumulation of organic material or mottling was typically lacking. Alpine soils are typically poorly developed, due in part to the limited productivity of small, predominantly evergreen dwarf shrubs as well as limited microbial activity to breakdown organics and subsequently accumulate in the soil (Korner 2003). Iron reduction is the result of microbial and physical processes which can both be inhibited in cold, acidic soils. The hue of alpine soils were typically in the 7.5YR- 10YR range with moderately low chroma and value (such as 3/2). Soil profiles are typically very shallow over large rocks and gravel.

Limited organic accumulation and poorly developed soils are among the problematic situations that the Corps of Engineers identify as issues that may mask a site meeting wetland criteria. A chemical dye (alpha,

alpha dipyridyl) test may be necessary to determine if reduced conditions do in fact exist is areas where other hydric soil indicators are absent. The soil must, however, be naturally saturated at the time of testing.

Geomorphic position and microtopographic relief were among the most common secondary indicators of hydrology present in depressions and swales. The landform must be shaped conducive to accumulating water in order for any of the problematic conditions to be reasonably applied. Hummocking, a feature derived from a plant response to frequent flooding and not to be confused with frost boiling, was frequently observed around headwaters. Vegetation matting, soil cracking, and sediment lines were also observed on occasion in drained basins. Consistent among nearly all of the depressions and swales observed was the presence of persistent snowbeds either by direct observation or visible on aerial imagery through May and even well into June. The presence of snowbeds this far into the growing season indicates a persistent source of water into the basin. Areas prone to late season thawing may be most able to maintain hydric conditions long enough to exhibit wetland characteristics, even in problematic situations.

The final report of observations is due in early 2020 and will be submitted for review by the U.S. Army Corps of Engineers for consideration. If depression and swale landforms consistently meet the problematic criteria, then further delineation of these landforms will be necessary in the event of land disturbing activities in the region.

Stream Channel Modeling

Modeling of stream channel overflow (or flood modeling) was conducted for JBER to examine the extent of flooding along the Eagle River and Ship Creek associated with climate projections. Flood modeling did not consider flooding of independent surface bodies, stormwater systems, or surface ponding. Flood modeling was conducted using local watershed characteristics and the design storms generated from climate projection data (**Error! Reference source not found.** and **Error! Reference source not found.**). The projected design storms do not represent extreme weather events (e.g., hurricanes, extraordinary storm fronts).

Inundation projections were influenced by two variable inputs: (1) variation in total precipitation between design storms and (2) variation between the daily distributions of precipitation over the three-day period. Within the hydrologic model, projected land cover type intersected with soils and depth to water table dictates the friction, infiltration rate, and run off rate.

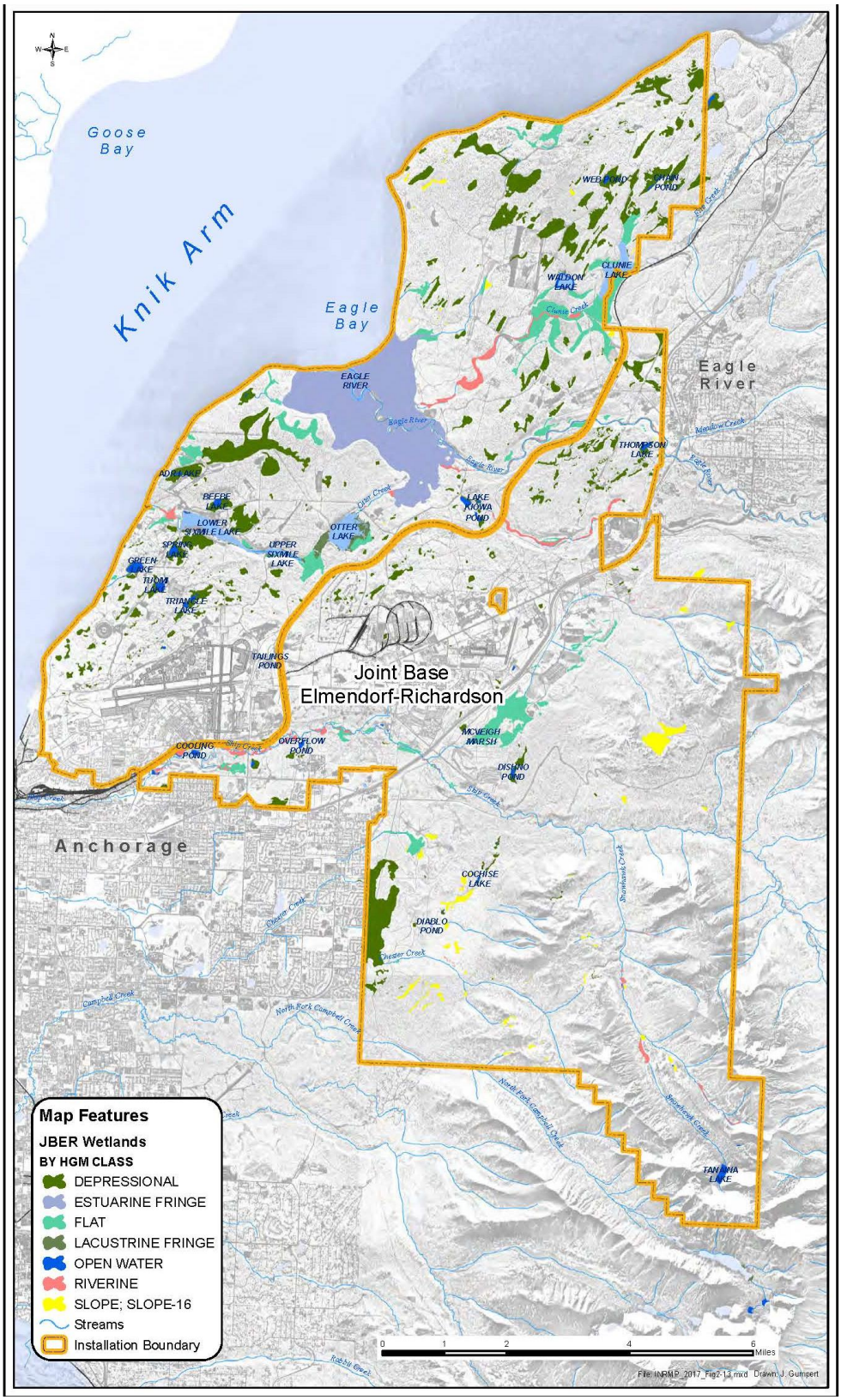
Flooding is projected to slightly decrease compared to baseline under the RCP 4.5 scenario in 2030 (Table 2-17). Stream channel overflow associated with the baseline design storm was estimated to inundate approximately 722 acres along the Eagle River and Ship Creek. Under the RCP 4.5 emission scenario, inundation is projected to slightly decrease in 2030 and then increase by 54 acres in 2050. Under the RCP 8.5 emission scenario, inundation is projected to increase to 766 acres in 2030 and then to 854 in 2050. The spatial extent of projected flooding is depicted in a series of maps included in the CSU-CEMML 2019 report.

Table 2-17: Projected inundation from stream channel overflow.

	Baseline	RCP 4.5		RCP 8.5	
	2000	2030	2050	2030	2050
Projected inundation (acres)	722	697	776	766	854
Change in inundation area from baseline (acres)		-25	54	44	132
Percent change from baseline		-3%	7%	6%	18%

(CSU-CEMML 2019)

Figure 2-18: Wetlands on Joint Base Elmendorf-Richardson



2.3.6 Other Natural Resource Information

Old Growth Forests

Old growth forests on JBER provide excellent wildlife and military training areas unlike those found elsewhere in the country. Maintaining such forests benefits many species of wildlife and provides for a sustainable level of biodiversity, ecosystem functionality, and watershed protection. Multiple age classes mean that these stands provide habitat for flora and fauna that may be sensitive to disturbed environments, in addition to supporting military training.

Carbon Storage

In 2017-2018, a total forest carbon inventory for JBER was quantified across all major forested types using lidar-assisted models combined with field sampling (Dial et al. 2018). The total carbon stock retained in JBER's 41,954 acres of forested area is equal to approximately 2.69 (±0.12) million Carbon tonnes (mtC); equivalent to 64.01 mtC per acre (Dial et al. 2018).

Table 2-18: JBER Carbon Sequestration Summary. From Dial et al. 2018

Carbon Pool	Quantity Carbon (mtC)	Mean Density Carbon (mtC $acre^{-1}$)	% of total
Soil	$1.85 \pm 0.09 \times 10^6$	44.33	69%
Live Trees	$5.88 \pm 0.73 \times 10^5$	14.01	22%
Litter	$8.28 \pm 1.01 \times 10^4$	1.97	3%
Downed/Dead Wood	$8.19 \pm 2.03 \times 10^4$	1.95	3%
Understory	$5.85 \pm 1.07 \times 10^4$	1.39	2%
Standing Dead Wood	$2.75 \pm 2.15 \times 10^4$	0.66	1%

Trends analyzed in this study indicate that from 2004 to 2017, an increase in standing tree carbon yielded approximately 16% more carbon in that time period ($5.31 \pm 0.59 \times 10^5$ mtC) resulting in annual sequestration of CO_2 on the order of 0.55 $mtCO_2\ acre^{-1}\ yr^{-1}$. Forward trends forecast an increase of approximately 17% additional carbon stored by the year 2030 (Dial et al. 2018).

The total carbon storage achieved in any one pool over time is dependent on a variety of natural and anthropogenic factors including climate, fire, land use, and management strategies. Removal of downed woody debris for management of forest habitat and prevention of wildland fire through JBER's personal use woodcutting program reduces the amount of downed and standing dead wood. Forest fires, which are rare on JBER, could dramatically reduce the amount of soil organic carbon, the largest pool. Climate factors may increase the growth rates of trees during longer, warmer, and wetter growing seasons; but these conditions may also exacerbate outbreaks of pests, such as spruce beetles, which may remove live carbon in exchange for dead carbon. Reforestation activities by natural recruitment or through concerted planting efforts may also affect carbon sequestration. Dial et al. (2018) and Dial et al. (2015) document the frequent conversion of forest to shrubland, and subsequent succession of shrublands and along low lying habitats along palustrine edges, to forest lands. The types of woody material sequestering carbon are different and such transitions over time result in changes to carbon sequestration patterns, by vegetation type, as was described in Dial et al. (2018). Encroachment of shrubs into low alpine regions (Dial et al. 2015, 2018; Rinas et al. 2016) may increase carbon sequestration in low alpine non-forested habitat as well.

EOD Creek Natural Area

The munitions and Explosive Ordinance Disposal (EOD) areas to the south and ERF marsh to the east effectively isolate the EOD Creek area composed of approximately 1,200 acres. Only one road enters the area, and it is not suitable for large vehicles. Currently, only authorized personnel, such as work parties and munitions personnel, are allowed in this area, with exception of a small number of moose hunters during the September season. The only known isolated occurrence of low-elevation mountain hemlock on JBER is found in this unit. The 1982 Resource Inventory made the following comments concerning this area:

> *This area presently supports a unique, 200-250-year-old, old-growth mixed forest which is probably the least disturbed piece of forest land left in the Anchorage area. It is perhaps the last vestige of this vegetation type which covered much of the Anchorage area prior to arrival and subsequent disturbance by white men.*

In addition to the unique nature of the forest community, the EOD Creek Natural Area has numerous wetlands and two streams, EOD and Sixmile creeks, which constitute the southern boundary. The area is an important travel corridor for brown bears and wolves in summer and is close to wolf denning and rendezvous areas on JBER. Black and brown bears and Bald Eagles heavily use its anadromous streams and saltwater shoreline. Motorized access should be restricted to work vehicles only, with the possible exception of fall moose hunters, whose time frames and numbers are limited enough to cause little impact.

Ship Creek Riparian Zone

Ship Creek and its riparian habitat run through both undeveloped and developed lands on JBER. Ship Creek is an anadromous stream, and because of its location and importance in maintaining drinking water quality, it is of highest priority. It is also a wildlife travel corridor connecting JBER and Arctic Valley and is heavily used by bears in summer and wolves in winter. Recreational facilities include Cottonwood Park, Eagleglen Fitness Park, and Moose Run golf course. Current management concerns include water quality, soil and bank erosion in the golf course area, protection of wildlife habitat areas, and invasive plant introductions and spread. European bird cherry has been surveyed along portions of the Ship Creek corridor and treatment began in the Eagleglen area in 2016. Reed canarygrass has also been documented in Eagleglen. Additional surveys along Ship Creek are needed.

Sixmile Lake System

The Sixmile Lake system is another biological and recreational resource on JBER. It is an anadromous system supporting four of the five salmon species for spawning and rearing habitat. A Watchable Wildlife salmon spawning area is at the outlet of Lower Sixmile Lake. It is a very productive system biologically and is managed as a trout fishery. It is also home to beavers, swans, loons, grebes, and numerous other types of wildlife and waterfowl. Bald Eagles and Osprey are regularly seen here. Recreation lodges and chalets dot the shores of Lower Sixmile Lake, with canoeing and boating (electric motor only), being popular activities during summer. The restriction to only electric motors prevents hydrocarbon contamination and large wakes, reducing impacts to salmon spawning areas and harassment of nesting birds. Ice fishing and snowmachining on the ice are popular in winter.

Current management concerns include fuel leakage and spills from floatplanes, impacts on nesting waterbirds by boaters, influences of an abundant beaver population on trees and structures, and an unknown level of summer salmon poaching. Training activities in this system include winter oil spill management near the Green Lake Chalet. Erosion concerns from recreators accessing the shoreline for fishing is also a matter of concern. Invasive species management is a matter of concern, particularly at Lower Sixmile Lake.

There is a stand of orange hawkweed near the floatplane base which has received ongoing treatment since 2015. Additionally, the risk for introduction of Elodea sp. in float plane waters is high. eDNA markers for early detection of elodea were developed in 2015-16 (ERDC 2017). To date, no occurrence of elodea has been documented. Annual surveys are being conducted using both eDNA markers and visual surveys.

Green Lake/Moonshine Creek System

Historically, Green Lake existed at a lower level than present day levels. In the 1970s, a dam was added to increase size, which inhibited transitional fish to Moonshine Creek. Moonshine Creek may have been anadromous before the 1964 earthquake, but the connection is now lost. A feasibility evaluation of Moonshine Creek's potential of modification was conducted during the summer of 2019. Moonshine Creek is a small, shallow creek that has an approximate 50 ft section where the creek is subterranean. At the Green Lake outlet, the creek is mostly covered in floating and emergent plants with only an intermittent defined channel for the first few hundred feet. During a stream survey conducted in 2015 (Schoofs, 2015) only three-spine stickleback were documented during the sampling effort. It is recommend that this creek not be considered to be a restoration project. It would take a large amount of resources to channelize, deepen and widen the creek for it to become passible for the potential of becoming an anadromous salmon creek.

Alpine Areas

Alpine areas are important components to the overall ecology of Alaska. Alpine ecosystems are very sensitive to disturbance, susceptible to damage, and slow to recover. The alpine tundra consists of dwarf shrubs with mosses and lichens dominating. JBER's alpine training areas are classified as having medium to high erosion risk (Jorgenson *et al.* 2004). JBER alpine training areas are used for light military training activities.

A report on alpine biodiversity was completed by Walker *et al.* in 1997. They found three general alpine areas: high elevation zone above 1550 meter with little vegetation; middle alpine zone from 1550 to 950-700 meters (depending on aspect) that is strongly affected by the combination of topography, wind, and snow; and a transitional, low alpine zone from 950-700 meters to the open spruce forests at lower elevations. The low alpine zone supports scattered trees mixed with forb meadows and shrub lands. Focal species that occur in alpine habitats include collared pika, Golden Eagle, and Dall sheep (Johnson et al. 2017). Wetland systems unique to alpine and headwater regions are described in Section 2.3.5.

Eagle River Flats

ERF and its associated tidal wetlands are important for both military training and natural resources conservation. Glacially-fed Eagle River flows through the flats before discharging into Eagle Bay of Knik Arm in Upper Cook Inlet. ERF has been used since the 1940's as an impact area. Because ERF is off-limits, no development has occurred, preserving much of the ecosystem.

ERF has been characterized into seven major physiographic zones and 15 vegetation classes (representing 67 species of vascular plants) (Racine and Brouillette 1995). Physiographic zones include: Coastal (littoral coastline of ERF along Eagle Bay), Riverine (Eagle River and banks), Mudflat/Tidal Gully (silt- covered mudflats directly bordering Eagle River and along the coast), Interior Lowland (well vegetated, low embayment occupying southern 30% of ERF), Sedge Meadow (narrow band of continuous sedge meadow between mudflats along river and pond/marsh), Pond/Marsh (area of lower elevation along the middle and outer edges of ERF, characterized by permanently inundated ponds and associated marshes) and Border (abrupt upland border of ERF) (Racine and Brouillette 1995).

A complex interaction of physical forces acts on ERF, including those exerted by a high tidal range, glaciofluvial influences from Eagle River, sedimentation from turbid waters of Knik Arm and Eagle River, and the subarctic coastal climate of south-central Alaska (Lawson *et al.*1996). Anthropogenic influences on ERF include military training, both historic (Army artillery impact area since 1949) and current (winter firing of artillery into flats), as well as activities associated with remediation of white phosphorus residues.

The combination of these forces and influences presents a complex and dynamic environment to organisms living within and around ERF. Despite this challenging physical environment, this area supports a variety of birds (approximately 68 species), mammals, fish, and macro invertebrates (approximately 30 species of benthic macro invertebrates) (Racine *et al.* 1993) and is a staging area for spring and fall migrations of thousands of waterfowl.

In 1980, the presence of an unusually large number of waterfowl carcasses was observed on the flats. Concern over these mysterious deaths led to the 1987 formation of an interagency task force1 charged with finding the cause of the mortality and recommending options for remediation (CH2M Hill 1997). Investigations conducted in subsequent years identified exposure to white phosphorus particles deposited in ERF sediments following detonation of smoke-producing artillery ammunition as the cause of the increased waterfowl mortality (Racine *et al.* 1992). The primary route of exposure for dabbling ducks and swans was thought to be ingestion of the dense, water-insoluble particles while feeding in contaminated shallow ponds. In 1990, the Army stopped use of white phosphorus rounds during training in wetlands nationwide as a result of these findings.

In 1994, FRA was placed on Environmental Protection Agency's National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; as amended by the Superfund Amendments and Reauthorization Act of 1986) program, and ERF was given the identifier "Operable Unit C". Operable Unit C includes ERF and an associated gravel pad where historic destruction of military ordinance was conducted (Open Burn/ Open Demolition Pad). A comprehensive remedial investigation completed in 1996 concluded that the primary chemical of concern in the unit was white phosphorus and recommended that remedial action concentrate on hot ponds and be driven by waterfowl mortality (CH2M Hill 1997).

The resulting Record of Decision for Operable Unit C (accepted by Environmental Protection Agency and the Army in 1998) outlined short-term and long-term waterfowl mortality objectives and identified the chosen remedial treatment as the temporary draining of pond water in white phosphorus-contaminated ponds (hot ponds) to allow sediment drying and consequent white phosphorus sublimation and oxidation. Remedial action began in the spring of 1999 and has resulted in the successful remediation of all previously identified hot ponds (over 56 acres) with exception of a few, more recently discovered pools that were treated in 2006. Estimated bird mortality on ERF decreased significantly during that time period.

In addition to monitoring waterfowl mortality on ERF, much work has been done to identify possible movement of white phosphorus into Eagle River and Knik Arm. White phosphorus particles are persistent in saturated, low oxygen sediment like that found in ERF (Racine *et al.* 1992) and may be re-suspended and potentially transported by tidal activity. Although trace amounts of white phosphorus have been detected in tidal gully sediments (but not water), all sediment and water samples from Eagle River and Knik Arm have been white phosphorus-free (CH2M Hill 1997; Bigl *et al.* 2011).

2.4 Mission Impacts on Natural Resources

2.4.1 Natural Resource Constraints to Mission and Mission Planning

There are inherent physical and biotic components of the JBER landscape that may present training constraints. Most limitations involve wetlands protected by executive order, federal and State laws, and Army and Air Force policies, but also include limitations resulting from species at risk, MBTA vegetation clearing guidelines, MMPA of 1972 as amended, (16 USC 1361 et seq.) and ESA regulations, (PL 95-632, 16 USC 1531 et seq.), National Bald Eagle guidelines (May 2007), special interest areas, outdoor recreation, cultural resources, Superfund clean-up, and regulatory and legal requirements of individual agreements or NEPA related mitigation. JBER has been successful in de-conflicting potential constraints by ensuring advanced planning and maintaining an open dialogue between mission planners, natural resources staff and outside regulatory agencies.

Bird and Wildlife Aircraft Strike Hazard (BASH)

The 3WG/SE BASH program is codified in 3WGI 91-212 and is used in conjunction with AFPAM 91-212, Bird Aircraft Strike Hazard Management Techniques to manage and minimize BASH risks. Species of BASH concern within the aerial dome include large bodied birds e.g., ducks, geese, raptors, cranes, swans, gulls and ravens and densely flocking birds e.g., Bohemian waxwings. Mammals that pose an airfield risk, include: moose, bears, canids, microtines that attract raptors to the airfield; and beavers that create attractive waterfowl habitat. Grasshoppers and caterpillars also create a BASH risk by attracting gulls, corvids and other passerines to the airfield. Anthropogenic effects, such as food waste and dumpster management, also contribute to BASH risk. See Section 7.12, Bird/Wildlife Aircraft Strike Hazard (BASH).

Wildlife Risks to Human Safety and Health

Wildlife conflict issues are common on JBER. Wildlife can be found in close proximity to large numbers of people, facilities, and developments. Wildlife-human conflicts are likely to increase as development continues and remaining pockets of vegetation are cleared. Species that pose risks to personnel safety and equipment losses (e.g. moose, black and brown bear, and wolves) are a primary concern to the JBER mission. Their aggressive offensive or defensive actions can cause human injury or death, as well as, vehicle collisions. Additional species that pose a human/pet health risk including risk to facility integrity are beaver, swallows, and small canids (both wild and feral). The management of wildlife conflict issues, while mentioned elsewhere in this document, is generally described in Section 7.1.3, Wildlife Management.

Living with Wildlife in Anchorage Memorandum of Understanding

Recognizing the unique nature of human-wildlife conflicts in the Anchorage area, ADFG initiated a planning program for the Anchorage area in 1996 called *Living with Wildlife in Anchorage*. Two of the stated goals of this program were to "Minimize opportunities for conflicts between wildlife and people" and "Foster a sense of stewardship for wildlife and their habitats among the public, non-governmental organizations, and local governmental agencies."

JBER, when separate as EAFB and FRA, was a member of this planning group and became a signatory to the 2000 *Memorandum of Understanding Regarding a Comprehensive Wildlife Management Plan, Living with Wildlife in Anchorage: A Cooperative Planning Effort for Anchorage, Alaska* (FWS70181-9-K235). Other key signatories included ADFG, the Municipality of Anchorage, USFWS, and other land and natural resource management agencies.

2.4.2 Land Use

JBER is comprised of 73,041 acres of land. Land use distribution is divided into two general terms; human-modified – approximately 14,000 acres, and unimproved grounds approximately 59,000 acres (673 CES GeoBase 2019).

Human-Modified Land

Human-modified lands include areas occupied by buildings and other permanent structures as well as lawns and landscape plantings on which maintenance activities are annually planned and performed. Specific areas on JBER include the cantonment areas, parade grounds, drill fields, athletic areas, golf courses, cemeteries, and housing areas. The main facilities on JBER are the airfields, which are each made up of two runways with associated taxiways and parking aprons. JBER cantonment areas have various services and administration buildings, dormitory and housing for military personnel, industrial and recreation facilities, medical and dental facilities, churches, schools, libraries, crafts shop, newspaper, theater, golf courses, Base Exchange, and Commissary. The joint military mall, installation hospital, Veterans Administration hospital, and privatized family housing units expanded into previously forested ecosystems in the cantonment area.

Outside of the cantonment areas, JBER human-modified lands include open fields around the flight line, munitions areas, antenna fields, a munitions storage area, an EOD range, small arms ranges, large ranges, artillery and mortar firing points, landing zones, drop zones, Mad Bull (Combat Engineer) Training Center, and various communication facilities. The U.S. Army Alaska Range and Training Land Program Development Plan outline the range development requirements for Army training lands on JBER. The INRMP does not conflict with the range development plan; rather, it complements the siting of new range facilities by providing information that minimizes impact to natural resources.

Major ranges on JBER include the following:

- Mad Bull Training Center
- Explosive Ordnance Disposal
- Munitions Storage Area
- Mahon Range
- Fieldfire Range
- Statler-Newton Small Arms Range for .38 and .45 caliber pistols
- Oates-McGee Range for M-60 firing at 500 to 1,000 feet
- Grezelka Range for M-16 and M-60 training and qualification
- Zero Range
- Record Range for M-16 qualification
- Pendeau Range for M-16 and M-14 training
- Grenade Range
- Shoot House Range
- Off-Duty Range
- 40 mm Range
- Davis Range Complex (1,333 acres) for live fire training, including a squad battle course, a defensive trench system, bridge, ambush and defensive sites, and several live fire courses
- Biathlon Range (692 acres) used for training in Arctic combat, which has three ski trails and an arms range for firing M16 and 22 caliber rifles

- Aerial Target Range for training in engagement techniques for aerial targets
- Demolition Range
- McLaughlin Range Complex (692 acres) used for live fire training of the LAW AT4 and Mark 19
- Infantry Platoon Battle Course (1,668 acres), where a dismounted infantry platoon can conduct mission-oriented training exercises

These ranges include two demolition ranges (Demo II and Demo III, listed as a single range) that are similar to non-dudded impact areas. They also include nine mortar firing points (listed as a single range) located throughout the northern training area, and nine artillery firing points (listed as a single range), also throughout the northern training area. The list of ranges includes a skeet and trap range that is used primarily for recreation.

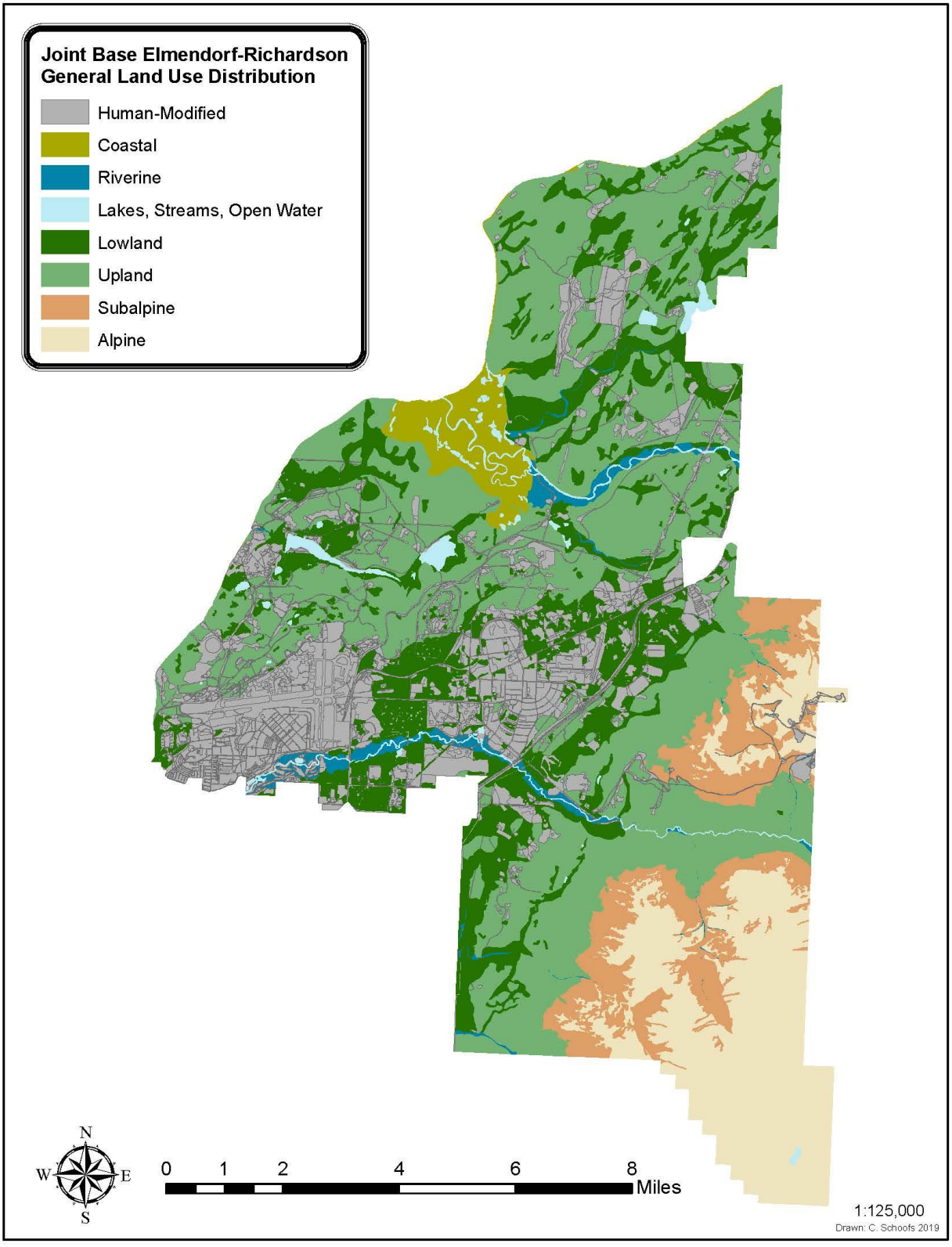
Other notable range facilities on JBER in this category include:

- Malamute Drop Zone (587 acres), which supports strategic airborne operations and can support company-size operations; Other drop zones include: Bowling Alley, Geronimo, and Neibar Drop Zones,
- Landing Zones (about 25) for helicopter assaults; and
- The Squad Obstacle Training Course, which consists of rope bridges and cliff rappelling sites.

Unimproved Grounds

Unimproved grounds are the coastal, riverine, open water, lowland, upland, subalpine, and alpine areas where natural vegetation is allowed to grow unimpeded by maintenance activities. JBER's unimproved grounds are comprised of maneuver areas and impact areas. Eagle River Flats Impact Area is used for mortar and artillery firing from approximately 27 active firing points, of which includes 9 mortar firing points and 18 artillery firing points.

Figure 2-19: Land Use Distribution on Joint Base Elmendorf-Richardson



Military Land Uses

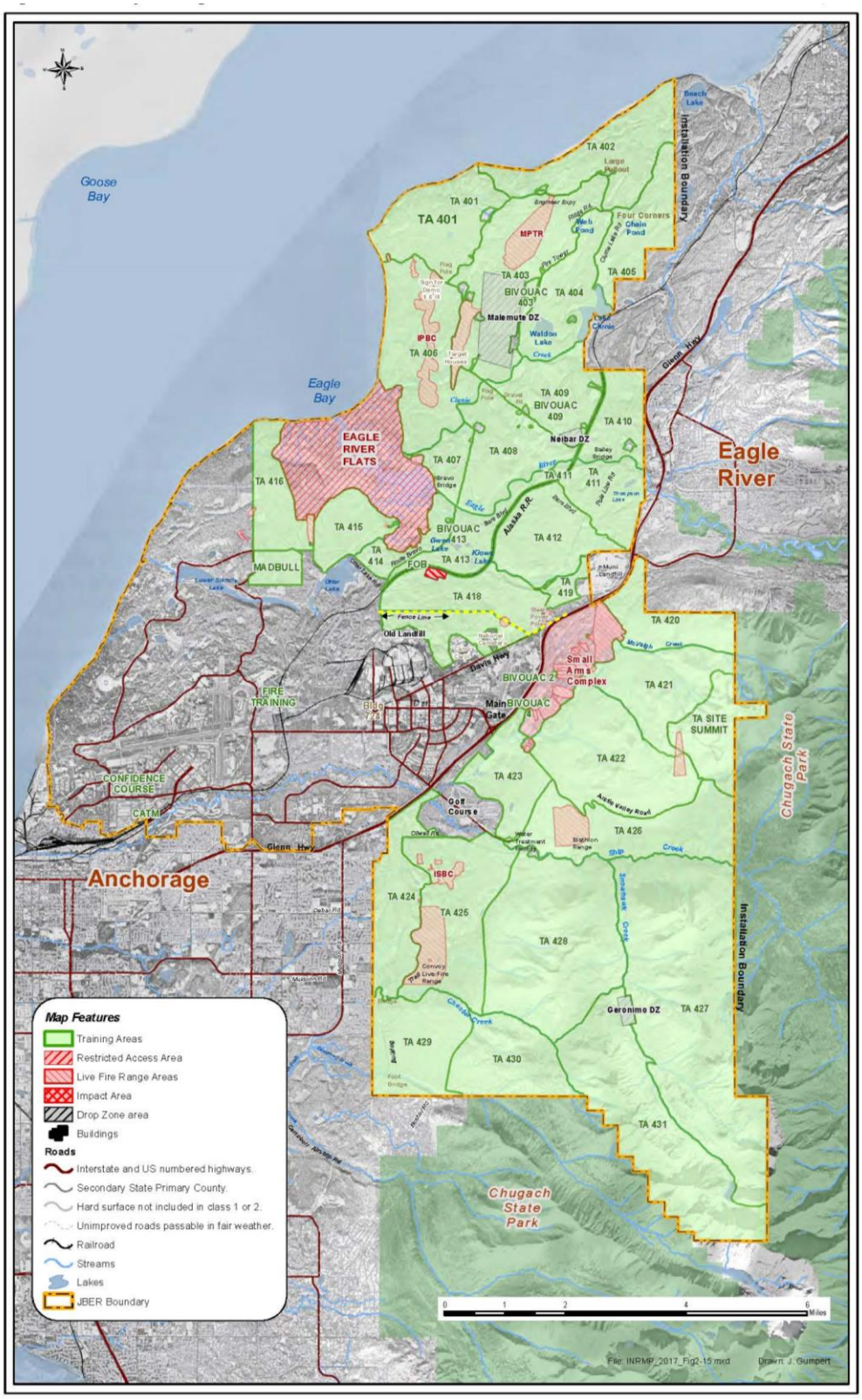
Military land use follows the categories discussed above. Training areas can be separated into two broad categories - maneuver training and weapons training. Maneuver training is conducted primarily in training areas or the unimproved grounds on JBER. A training area is space for ground and air combat forces to practice movements and tactics as specified in the unit's Army Training and Evaluation Program (Figure 2-20). Different unit types may work in support of one another (combined arms), or the unit may operate on its own to practice a specific set of Army Training and Evaluation Program tasks. Bivouac sites, base camps, drop zones, artillery and mortar firing points, and other miscellaneous training areas are included in these areas. Each training area is managed and scheduled by Range Control. Weapons training also have land-based requirements, and occur primarily on firing ranges. Munitions from firing ranges land in surface danger zones or impact areas. Descriptions for military land use on JBER are in the table below.

Table 2-19: JBER Military Land Use Descriptions

Primary Military Land Use Category	Secondary Military Land Use Category	Description
Cantonment Area		The area where most buildings are located, including those for office use, indoor training, and housing.
Recreation Area		Areas where recreation is the primary land use (e.g., Otter Lake Recreation Area, camping areas, and installation golf courses.)
Ammunition Storage		Off-limits areas where ammunition is stored and are typically fenced-off and not compatible with other land uses.
Training Area Facilities and Weapons Training	Firing Ranges	Semi-permanent or permanent facilities for weapons firing, demolition, assault courses, or other specific training, usually with associated buildings or berms. These include firing ranges, assault courses, urban assault areas, etc. Firing ranges are controlled and restricted for firing live ammunition from direct fire or line-of-sight weapons systems at targets within a controlled area. Typically, a range has left and right boundaries, which extend from the firing line forward to just past the last target array. Training ranges are normally reserved and equipped for practice and qualification in weapons delivery and/or shooting at targets. Further, training ranges constitute a functional complex that normally includes a Range Control tower with associated firing points, lanes or pits, a cleared or graded area, target system emplacements, and a firing flag and flagpole, in addition to equipment-in-place, such as target control systems, target systems, targets, and fixed public address system components. A range could include an area for back blast safety zones, which can have a secondary use as non-dudded impact area or maneuver area.
	Airstrips	Airstrips and assault strips are semi-permanent or permanent facilities for aircraft landing and taking off that are not paved or part of an urban area.
	Drop Zones	Drop zones or landing zones are cleared areas used for dropping troops and equipment that are maintained by mowing and hydro axing. These areas should have vegetation, but are highly disturbed. Military activities include airborne assault, air assault in support of

Primary Military Land Use Category	Secondary Military Land Use Category	Description
		combined arms, aeromedical evacuation, and landing zones for rotary wing aircraft.
Maneuver Training Areas	Maneuver Areas	Maneuver areas generally are open to semi-open areas where vehicles can move without running into obstacles, such as trees, range buildings, streams, wetlands, lakes, etc. Military activities that occur in maneuver areas include conducting offensive operations, conducting tactical movement, movement to contact, relocating a unit to a new site, defending an assigned area, relocating/establishing new area of operations, trail construction, mobility and counter mobility operations, reducing obstacles with equipment, and constructing obstacles with equipment.
	Non- Dudded Impact Areas	A surface danger zone or a non-dudded impact area has designated boundaries within which ordnance that does not explode will impact. This area is composed mostly of the safety fans for small arms ranges. The primary function of the impact area is to contain weapons effects as much as possible using earthen berms or natural terrain features. These impact areas may be used for maneuver, at the cost of curtailing use of weapons ranges.
	Dudded Impact Areas	A dudded or high intensity impact area is an area having designated boundaries within which all potential dud- producing ordnance (explosive) will detonate or impact. Vehicle bodies are sometimes used as targets for artillery direct and indirect fire. The primary function of the impact area is to contain weapons effects as much as possible using earthen berms or natural terrain features. Impact areas containing potential unexploded ordnance may not be used for maneuver unless cleared by EOD.
	Bivouac Areas	Bivouac areas are where units stop for a period of time. Most often, bivouac areas are semi-open to semi-closed areas where the units "camp out." Activities conducted in bivouac areas are assembly area operations, combat service support operations, and unit security and defense operations.
	Foot Use Areas	Foot use areas show little or no impacts from military use. Units are on foot and conduct movement to contact and land navigation.
	Firing Points	Firing points are localized areas from which either artillery or mortars are fired. These areas are often open areas with high vegetation disturbance. Firing points are sometimes also designated by survey markers.
	Road Corridors	Road corridors are defined as semi-permanent or permanent access ways including ditches and the open rights-of-way on each side of the road.
	Rights-of-Way	Rights-of-way are any areas used for utility or pipelines (electric, gas, or communication). Areas bordering either side of roads are part of the road corridor and are not considered a separate right-of-way polygon in this case.
	Excavations	Excavations are gravel pits or military engineer training areas and similar types of areas that show signs of digging, either manual or mechanical.

Figure 2-20: Military Training Areas on Joint Base Elmendorf-Richardson



Out-Grants

About 4,045 acres of JBER are out-granted. These areas include, but are not limited to, material sites (weigh station, gravel pits, landfill overflow), the Glenn Highway, a pipeline, utility easements other than utility privatization (water, electrical, cable, gas, and communications), schools, banks, a credit union, fish hatcheries, parks, the Federal Aviation Administration, and the Alaska Army National Guard area (Camp Carroll, Camp Denali, and Bryant Army Airfield). In addition, about 960 acres of JBER are used for private-sector financed housing under a fifty-year lease.

Utilities for installation purposes are owned by Doyon Utilities under a Utilities Privatization contract. Doyon Utilities has an easement but the exact number of acres affected has not been calculated as the unit of measure is in linear feet.

Integrated Training Area Management (ITAM)

Policy and Background

The Army relies on land to achieve its training and testing objectives and maintain force readiness. Force readiness depends on high quality realistic training. The use of these lands for training and testing purposes can cause damage that can potentially reduce the quality of training. ITAM serves the overall needs of the Army by overcoming the apparent conflict between force readiness and stewardship.

The Army's ITAM program is a core program of the Sustainable Range Program (SRP) and is responsible for maintaining the outdoor classroom to help the Army to meet its training requirements. ITAM provides the capability to manage training lands by integrating mission requirements with environmental requirements and sound land management practices. ITAM establishes a systematic framework for decision-making and management by integrating elements of operational, environmental, master planning, and other programs that identify and assess land use alternatives. ITAM includes the following components:

- Training Requirements Integration (TRI), provides trainers and range managers with technical information to balance training needs with land constraints.
- Land Rehabilitation and Maintenance (LRAM), improves and enhances training capacity through repair, maintenance, and reconfiguration of training land.
- Range and Training Land Assessment (RTLA), collects data to determine training land conditions, identifies areas needing repair or reconfiguration, and supports range operations and modernization planning.
- Sustainable Range Awareness (SRA), educates trainers and range managers on how to reduce impacts on training land.
- GIS provides standard mapping and spatial analysis capabilities for ITAM, range operations, and modernization.

ITAM is an Army-funded and operated program that is implemented on JBER-Richardson. ITAM program administration is coordinated with this INRMP for all planned land use actions that alter the current land use condition e.g., erosion control, trail or firing point development. Since ITAM affects and can improve JBER natural resources, it is important that the Natural Resources and ITAM personnel coordinate efforts on lands being jointly managed by them. Meetings and coordination occur between the ITAM and Range Staff as issues arise throughout the year. Coordination occurs on a monthly and as needed basis between ITAM Staff and the JBER Forester throughout the winter months.

Informal meetings and coordination efforts will be planned to occur throughout summer months to help maximize efforts between LRAM, Wildland Support Module, and Forestry work crews. Spring

coordination occurs, as applicable, to combine seasonal ITAM field crew training with JBER staff (e.g., moose and bear safety training, and Red Cross first aid training). In addition, communication with JBER contractors working on various projects to included wetland delineation and cultural resource surveys are coordinated weekly throughout the field season. Additional coordination with the conservation program manager occurs as issues arise.

2.4.3 Current Major Mission Impacts on Natural Resources

Mission-Related Impacts

New installation-level developments can individually or cumulatively impact natural resources. Habitat losses, fragmentation, and wildlife movement corridor restrictions via expansion of the North/South runway, creation of a trail into alpine training lands and development of advanced training ranges and facilities have recently been initiated or are expected to occur in the foreseeable future. See the *JBER Installation Development Plan* (25 October 2015) for additional future land conversion projects. NEPA documents on military construction address these natural resources concerns. Mission-related impacts can also positively impact natural resources. For example, the recent land use conversion of Eagleglen Golf Course to Eagleglen Fitness Park has increased wildlife habitat and restored movement corridor connectivity.

The challenge of properly mitigating or compensating for lost habitat and corridor disruption has increased with diminishing habitats available or capable of meeting modification requirements. Identifying and maintaining adequate travel corridors is challenging. Habitat loss or fragmentation presents an ever increasing wildlife-human conflict safety risk.

Future planned developments will support overall JBER mission accomplishment. However, unless such development is constructed directly on existing hardstands or urban landscaped areas (replacing existing development), these projects inevitably affect natural ecosystem functionality in a cumulative fashion.

JBER natural resources staff works closely with planners, using the NEPA process, to minimize ecological impacts to the highest degree possible. The staff must also manage for multipurpose resource use if possible, maintain a public access program and most importantly ensure no net loss in the installation ability to support its military training program. Forethought given to project siting decisions are often the best opportunities to minimize impacts to ecosystem functionality.

Land-Based Training

Past Impacts

JBER lands were withdrawn during or since World War II. Military use has changed the landscape from its original condition through construction and weapons and maneuver training. While military use has altered these habitats from the original condition before World War II, the withdrawal of land for military use has had a long-term positive effect on natural resources, as the areas likely would have otherwise been enveloped by the expansion of Anchorage and other communities in the area. Most of the land outside of cantonment areas and airfields remains undeveloped, affected only by training impacts. Proactive natural resources conservation programs since the early 1970's have mitigated impacts from military training and have resulted in positive impacts on natural resources.

Present Impacts

Maneuver training impacts to soils, vegetation and wetlands occur primarily from driving vehicles on and off-road. Localized impacts can occur in bivouacs, base camps, and assembly areas from digging, vegetation damage, spills, and trash. These activities also carry the minor risk of the potential for hazardous materials spills or fire starts. Some training activities can cause erosion, road degradation, creation of new trails, and long-term habitat change.

Direct fire weapons training occurs primarily on firing ranges; indirect fire weapons training occurs on mortar or artillery firing points. Munitions from firing ranges land in surface danger zones or impact areas. A live-fire operation is defined as a training event that uses service (or real) ammunition as opposed to blank ammunition. A direct fire operation occurs when ammunition is delivered on target by sighting directly on the target using the weapon system's sighting equipment. During a direct live-fire event, Soldiers maintain an unimpeded direct line-of-sight between their location and the targets, while shooting real bullets at those targets. Indirect fire means that weapons are fired up in the air at a trajectory. Soldiers do not maintain an unimpeded direct line-of-sight between their location and targets, but rather track munitions through a forward observer or other technological means.

Live-fire ranges are maintained and targets replaced on a regular basis to provide realistic training. While some impacts occur on range berms and target locations, most impacts on the environment occur in impact areas. Impacts to soils, water, and vegetation from live-fire weapons training include cratering, target scrap, munitions residues, and the potential for unexploded ordnance and fire starts.

Training to doctrinal standards under realistic combat conditions will affect the environment. Providing premiere and realistic training opportunities requires training lands to be in good environmental condition. It is in overcoming the apparent conflict between force readiness and environmental stewardship that the Army Integrated Training Area Management (ITAM) program serves the overall needs of the Army. The ITAM program essentially acts as an ongoing mitigation program for Army maneuver training activities on JBER-Richardson. It is the formal strategy for focusing on sustained use of training lands, and it provides the Army with the sound planning and execution mandatory to protect JBER land as an essential asset for training. The integration of stewardship principles into training land and conservation management practices ensures that JBER's lands remain viable to support future training and mission requirements.

There are also positive effects of the military mission on natural resources. The land-based military mission fosters relatively healthy, stable ecosystems. The most basic and significant reason for this is found in the very nature of the infantry's use of the land. While infantry-related exercises may cause localized damage, they very seldom threaten ecosystems or biodiversity. Also extremely important is JBER's and the Army's commitments to natural resources management, including minimizing and mitigating military mission damage. These commitments are beneficial for both natural resources, in general, and the people who use them.

Another positive effect of the military mission is the fact that some of the land within a military installation is often protected from encroachment and often remains in a relatively pristine state as compared to similar land off the military installation. For areas on JBER not subject to intensive military use (i.e. infantry-related exercises), the military use actually ensures habitat and ecosystem protection by protecting the land from urban development and minimizing encroachment.

Instead of conflict with the mission, natural resources management emphasizes the accomplishment of multiple objectives for both natural resources management and military training. Habitat enhancement areas (especially habitat enhanced for species that depend on primary successional vegetation, such as moose or

grouse) are often used as bivouac areas for training. Surveys of training lands to identify special interest areas, highly susceptible and easily degradable lands is a continual goal of the INRMP and an ITAM function through the Range and Training Land Assessment (RTLA) program. Conversely, training exercises can be used as a tool to accomplish natural resource management objectives.

Environmental Contamination

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), also known as Superfund, regulates the cleanup of hazardous substance sites and imposes liability for cleanup on the responsible parties. Sites owned or used by Federal agencies are subject to this statute. Responsibilities governed by this statute include the management of hazardous substances, reporting releases of hazardous substances, and cleaning up environmental contamination.

The Defense Environmental Restoration Program (DERP) is a DoD program designed to identify and remediate past environmental contamination on its installations. Procedures for handling, storing, and disposing of hazardous waste prior to the mid-1970's resulted in contamination of the environment, although the procedures were standard at the time. The DERP process evaluates past disposal sites, controls migration of contaminants, controls potential hazards to human health and the environment, and conducts environmental restoration activities. Preliminary assessments are followed by site inspections, remedial investigations, and feasibility studies.

In 1990, Elmendorf Air Force Base was placed on the Environmental Protection Agency's (EPA) National Priorities List. JBER-Elmendorf has six Superfund operational unit sites resulting from past waste management practices or accidental releases. These operable units are comprised of smaller parcels grouped based on geographical proximity and similar contamination types, contaminated media (soil and/or groundwater), and/or remedial approaches. Each operable unit has a record of decision signed by the EPA, Alaska Department of Environmental Conservation, and the U.S. Air Force requiring remedial actions until specific goals are met.

JBER-Richardson has five Superfund operational unit sites. In 1994, Fort Richardson was placed on the EPA's National Priorities List (under Superfund), and Eagle River Flats was designated as a Superfund site due to un-oxidized white phosphorus from smoke producing ammunition. The Record of Decision stipulated remedial action objectives (extensive drainage of ponds within ERF) to allow oxidation of white phosphorus and a 50% reduction in waterfowl mortality from the 1996 baseline within five years, and reduction of mortality to 1% of the total waterfowl population within 20 years) for the site. The reduction in waterfowl mortality has been achieved within the limits of statistical analysis. ERF will remain a Superfund site for the foreseeable future. Section 2.3.6 includes a more detailed description of ERF. The remaining four Superfund sites have little effect on natural resources.

Other Impacts

Public Access

Public access is allowed in accordance with the Sikes Act (16 U.S.C. 670), and is subject to safety requirements and military security. Events over the past several years have forced installations to tighten security requirements, notably the terrorist attack on September 11, 2001. For the foreseeable future, public access to JBER will be closely controlled and in some areas highly restricted. Public access is further discussed in Section 7.2, Outdoor Recreation and Public Access to Natural Resources.

Fish Passage Initiatives

Ship Creek had been identified through a local environmental awareness group, along with state and federal resource agencies, as a candidate system for dam removal/ modification to enhance fish passage. Their objective is to return the system to an ecosystem complete with the nutrients added by anadromous fish (salmon). This goal is shared by the Native Village of Eklutna in hopes of re-establishing potential subsistence sources for salmon. Removal or improving fish passage past the dam, above the hatchery, would: increase the length of anadromous stream on JBER land; increase spawning and productivity for salmon; increase marine derived nutrients to stream vegetation; provide additional resources for wildlife; and potentially increase opportunities for fishing and additional salmon viewing. However, removal/modification may have the potential to significantly increase human-wildlife interactions and mission risks (BASH) if not carefully evaluated. In a 2009 agreement between EAFB and ADF&G it was agreed that by providing land for the expansion of the ADF&G fish hatchery, the Air Force would not remove the dam or allow salmon escapement above the existing fish ladder and dam at the hatchery.

In 2014, JBER obtained the necessary permits to remove the low head dam located at JBER-R fish hatchery. The dam was removed on January 14, 2015, with the work accomplished in-house by the roads and grounds crew.

In 2010, JBER and ADF&G initiated development of Otter Lake/Creek restoration project. The project was designed to rotenone Otter Lake/Creek waters to remove all pike, remove fish passage obstacles, enhance spawning habitat, and reintroduce salmon into the system. Baseline data was collected in 2011-2013 (MWH Pre-treatment Report, 2014). The rotenone application occurred October 6th – 9th, 2015. In the spring of 2016, nets were set underneath the ice on Otter Lake and eDNA samples taken once the ice was off the lake to verify that the treatment worked. Neither the nets nor the eDNA identified presence of pike. Observation of adult coho salmon within Otter Lake and Otter creek upstream from Otter Lake road occurred in 2015. In 2017, the stream channel from the lake outlet was modified, including the replacement of an Otter Lake road culvert. These stream modifications created favorable spawning habitat and enable anadromous fish passage into the lake. The project was successfully completed in the fall of 2017, with the completion of all construction and restoration, including observations of coho salmon migrating into Otter Lake.

2.4.4 Potential Future Mission Impacts on Natural Resources

Future impacts to natural resources as a result of mission changes that are not covered under current planning documents will be addressed by separate NEPA documentation. Natural resource management on JBER is not optional. In addition to the Sikes Act requiring natural resource management on all military (including withdrawn) lands, natural resource management and effects are typically analyzed thoroughly for all internal and externally prepared NEPA documents.

Noise Impacts on Beluga Whales and Other Marine Mammals

Military mission-generated noise becomes a natural resources issue when it has the potential to affect a listed species or designated critical habitat, such as the endangered CIBW and its critical habitat. Sound waves (noise) propagate through land and water and can cause auditory fatigue, auditory masking, auditory injury, and behavioral changes, to individual marine mammals; with similar effects to their prey.

Auditory masking occurs if the noise from an activity interferes with an animal's ability to detect, understand, or recognize biologically relevant sounds of interest. Biologically relevant sounds for the beluga whale likely includes calls from other belugas (e.g., those between cow and calf), self-generated echolocation click trains, and calls and click trains from predators (e.g. killer whale). The frequency,

received level, and duty cycle for both the potential masking noise and the signal of interest determine the potential degree of auditory masking. Detections of signals under varying masking conditions have been determined for active echolocation and passive listening tasks in odontocetes (Johnson 1971; Au and Pawloski 1989; Erbe 2000). These studies provide baseline information from which the probability of masking can be estimated.

If anthropogenic noise is detected by marine mammals, a behavioral or physiological stress response could occur. Animals that alter their natural behaviors such as feeding, breeding, and sheltering may incur a biologically significant cost from such responses. However, costs that result from brief interruptions to transiting or migrating are likely to be less important. A physiological stress response is characterized by a release of hormones (Reeder *et al.* 2005) or other stress-related chemicals.

Auditory fatigue, or temporary threshold shift (TTS) may result from overstimulation of the delicate hair cells and tissues within the auditory system. The result of TTS is a temporary increase in hearing threshold (i.e., decreased hearing sensitivity) which eventually returns to normal. Decreased hearing sensitivity that does not return to normal after a relatively long period of time post-exposure (usually in the order of weeks), is considered auditory injury, or permanent threshold shift (PTS) (Southall *et al.* 2007). PTS could result in decreased fitness and even death of individual belugas.

NMFS recently released new acoustic criteria for assessing the onset of TTS and PTS as a potential result of a given anthropogenic noise. This guidance divides marine mammals into functional groups based on their shared hearing physiology: Low frequency cetaceans (LF), Mid-frequency cetaceans (MF), High-frequency cetaceans (HF), Phocid pinnipeds- underwater (PW), and Otariid pinnipeds- underwater (OW). The CIB is in the MF group, the harbor porpoise is in the HF group and the harbor seal is in the PW group. For impulsive noises, NMFS uses a dual criteria to assess threshold onset: peak SPL (unweighted) and weighted SELcum accumulated over a maximum of 24 hours. The SELcum criteria must also be adjusted using an auditory weighting function specific to each functional group. These functions encompass current knowledge of marine mammal hearing and susceptibility to noise induced damage and are designed to adjust a measured or estimated SEL to account for the frequency content of the noise.

These new criteria are considerably more complicated to employ than the previous acoustic thresholds used by NMFS. In recognition of this, the new technical guidance offers multiple alternate methods to analyze the potential for an action to result in the onset of TTS or PTS. However, given the complexity of the sound field presented in the Eagle River Flats and the importance of getting the most realistic measurements for the analysis, JBER decided to obtain site specific data within ERF. A joint team from the U.S. Air Force, Army and Navy, in addition to members from the National Marine Mammal Foundation, Colorado State University and the Alaska Sea Life Center, conducted underwater acoustic measurements of explosive detonations (ordnance and C-4 equivalents) placed within ground impact areas of ERF on 18 and 19 July, 2018 at multiple, concurrent locations in Eagle River and Eagle Bay. The detonations were conducted under an informal consultation with the National Marine Fisheries Service under section 7(a)(2) of the Endangered Species Act (NMFS PCTS # AKR-2018-9779). Measurements were obtained for 60-mm high explosive (HE) mortars [0.9 lb. (0.4 kg) net explosive weight (NEW)]; 105-mm HE rounds [8.4 lb. (3.8 kg) NEW] and C-4 equivalents; and 155-mm HE rounds [15.7 lb. (7.1 kg) NEW]. The distances from the detonations and the measurement sites during this test were between 160m and 990m in Eagle River and between 1000 and 2200 m in Eagle Bay.

Peak sound pressure levels (SPL), unweighted sound exposure levels (SELs), and weighted SELs (per marine mammal hearing group) were provided in a report for each detonation and measurement location and it was noted that the values measured for all detonations during the test were below the thresholds for the onset of TTS and PTS for all hearing groups measured (mid frequency, high frequency, pinniped) (U.S. Navy, 2019).

Proposed Mortar and Artillery Training

The Army currently fires indirect weapons systems (i.e. artillery and mortars) into the Eagle River Flats Impact Area from November through March, provided that there is sufficient ice cover to protect the underlying sediment (5 inches of ice cover for 120mm HE mortars and 105 mm HE Howitzer rounds; and 2 inches of ice for 60 mm and 81 mm HE mortars). Pursuant to section 7 of the ESA, NMFS concurred with JBER that firing HE rounds into the ERF during frozen months may affect, but is not likely to adversely affect the CIBW or adversely modify its critical habitat. This determination was predicated, on mitigation measures offered by JBER during the consultation process (see Section 7.4.2).

The Army identified a need to expand live-fire training in the ERF into non-winter months. In a draft Environmental Impact Statement (U.S. Army Alaska 2010a), U.S. Army Garrison, Fort Richardson considered an alternative that, if implemented, would reinstate year-round, live-fire training at ERF Impact Area. After careful study, the Army determined that the resumption of year-round, live-firing at ERF Impact Area was likely to adversely affect the CIBW because the noise associated with high explosive munitions training may result in behavioral take of marine mammals. NMFS issued a biological opinion (BiOp; NMFS 2011) on this proposed action and determined that CIBWs may be exposed to impulsive noise (explosions) less than 180 decibel (dB) re 1 microPascal (μPa) root mean square (rms), but more than 160 dB re 1 μPa_{rms} in Eagle River, and less than 160 dB re 1 μPa_{rms} in Eagle Bay. An incidental take statement (ITS) for CIBW was not included in that BiOp pending the requisite issuance of an incidental take authorization under the Marine Mammal Protection Act. In the BiOp, NMFS expressed its intention to grant an incidental take statement under the ESA for the CIBW as appropriate (NMFS 2011), but JBER's take authorization under the MMPA was never finalized. Because the current firing restrictions do not allow the Army to meet training objectives at JBER, the Air Force is following the environmental impact statement process and related consultation requirements to assess the potential social, economic, and environmental impacts associated with modifying the conditions under which indirect live-fire weapons training can be conducted at JBER.

Ongoing Military Activities

JBER and NMFS conducted two separate informal consultations on the potential effects of military fighter aircraft overflights of Knik Arm. In both cases, 1) addition of seven F-22 aircraft and 2) proposed relocation of 21 F-16 aircraft to JBER, NMFS concurred with JBER's determination that overflights by F-22's and F-16's may affect, but were not likely to adversely affect, the CIBW and that these overflights would not result in adverse modification to designated CIBW critical habitat. Included in the F-16 consultation was an analysis of the effects on the CIBW from overflights of other aircraft already operating from JBER, including: F-22, C-17, C-130, E-3A, and transient aircraft (transient F-15E, C-130, C-17, B-737, KC-135R, and C-5A). The potential effects from these aircraft operations, in addition to the F-16's, were included in JBER's final may affect, not likely to adversely affect determination.

Both the Army and Air Force on JBER train using high explosives that are detonated on land. The ERF Impact Area has been used for weapons (e.g., artillery and mortar) training since the 1940s and sustained heavy year-round use until February 1990, when the Army voluntarily implemented a temporary firing suspension. In December 1991, live-fire weapons training within ERF Impact Area was resumed, restricted to winter months only, when specified ice conditions are met.

Additionally, JBER conducts explosive ordinance training such as Explosive Ordnance Disposal (EOD) and demolition training. The Air Force and Army have designed training areas for live fire training with conventional and improvised explosives. A recent study conducted by JBER and the Navy found that a 74 pound (lb) Net Explosive Weight (NEW) charge of buried C4 detonated at an explosive ordnance range on

JBER (Demo III, located approximately 800 m from Knik Arm) resulted in a maximum Sound Pressure Level (SPL) of 139 dB_{rms} re 1 µPa in Eagle Bay (Henderson et al. 2012). A later study found that a 151 lb. NEW charge buried on the same range (Demo III) resulted in a maximum SPL of 145 dB_{rms} re 1 µPa in Eagle Bay (Henderson et al., 2013). Based partially on these results, NMFS, under informal consultation with JBER, agreed with JBER's determination that explosive ordnance activities on the base may affect but were not likely to adversely affect the CIBW; and that they were not likely to adversely modify its critical habitat.

Mission Sustainment

Encroachment is defined in AFI 90-2001 (31 July 2019) as "any deliberate action by any governmental or non-governmental entity or individual that does, or is likely to inhibit, curtail, or impede current or future military activities within the installation complex and/or mission footprint; or any deliberate military activity that is, or is likely to be incompatible with a community's use of its resources." AFI 90-2001 groups mission sustainment hazard categories into seven broad categories: airspace; land and sea; spectrum; water; energy; climate and weather; and natural and cultural resources. Encroachment is also a focus of the Army Sustainable Range Program described in Army Regulation 350-19, (30 Aug 2005) which defines "range encroachment" as "external influences threatening or constraining range and operating area activities required for force readiness and weapons research, development, testing, and evaluation." It includes, but is not limited to, endangered species and critical habitat, unexploded ordnance and munitions, electronic frequency spectrum, maritime, airspace restrictions, air quality, airborne noise, and urban growth. Current or potential encroachment challenges from within all seven Air Force categories and many Army examples exist within and around the installation and the JBER installation complex/mission footprint.

Mission sustainment challenges identified by the JBER Installation Mission Sustainment Team include: proposals by non-military entities to acquire JBER lands; incompatible land use in areas adjacent to the installation; the effect of the planned development north of the installation; lack of knowledge among community stakeholders of the military mission leading to unreasonable expectations; conflicts with unauthorized recreationists in military training areas, specifically associated with the use of the South Post Training Areas. Modern military systems tend to require larger standoff distances and safety buffers than legacy systems, resulting in constraints in military areas that were previously adequate. Mission impacts are also aggravated by the limited land and airspace within the Anchorage Bowl, the largest urban center in the state, and the Matanuska-Susitna Borough, the population of which is expected to continually increase.

Air Force and Army encroachment management guidance emphasizes the need for communication and collaboration with external stakeholders to avoid, manage, and minimize mission impacts resulting from encroachment challenges. This may take the form of engagement with individual stakeholders, participation in local and regional bodies and planning exercises, or even partnerships to create buffer areas outside installation boundaries. The Readiness and Environmental Protection Integration Program of the Department of Defense partners with non-DOD stakeholders to conserve land across the nation to benefit the DOD mission, local communities, and natural resources. The DOD's Office of Economic Adjustment administers the Compatible Use Program, which provides assistance to state and local governments to ensure mission compatibility.

Port of Alaska

The Port of Alaska serves 85 percent of the population of Alaska by providing about 50 percent of all consumer goods for the state, including military fuel, materials, and supplies. The Port of Alaska current infrastructure is past its economic and design life and is in need of replacement. The Port is in the process

of modernizing the facility, known as the Port of Alaska Modernization Program. The goals of the project include:

- *Enable safe, reliable and cost-effective Port operation*
- *Improve resiliency to enable facilities to survive extreme seismic events and Cook Inlet's harsh marine environment with minimal operation disruption for at least 75 years*
- *Update facilities to improve operational efficiency and sustainably accommodate modern shipping operations (e.g., support larger, deeper draft vessels, etc.)*
- *Optimize facilities to accommodate changing statewide economic and market needs (e.g., petroleum product shipments are increasing significantly faster than general cargo growth due to Flint Hills refinery closure in 2014)*
- *Optimize project scope, schedule and budget to deliver practical, timely and cost effective port modernization program*

Beginning in 2020, the project is anticipated to last seven years and will be phased/managed to enable continuous port and tenant operations.

The biological opinion for the project considered direct, indirect, and cumulative effects on the CIBW. The proposed action is expected to result in direct and indirect impacts to these whales. It is estimated 34 whales may be taken annually during the term of the MMPA authorization (i.e., construction period) by harassment. This harassment is not likely to result in injury or death. After construction, some whales would be exposed to increased noise due to operation of the Port. Again, it is unlikely this exposure would cause injury or mortality, although individual whales may alter their behavior for a brief period of time. An accounting of the probable level of removals associated with other anthropogenic actions and a projection of cumulative impacts to this population does not suggest current trends in this population would be altered.

Climate Change and Adaptation

Effects of climate change are already taking a toll in Alaska. Damage to forests, loss of wetlands, degradation of salmon habitat, shrub encroachment into alpine ecosystems, and rising ocean levels are being attributed to a permanent and significant climate regime shift. Major changes in temperature, warming of rivers, and extensive melting of permafrost have been clearly documented in Alaska and Canada over the last 20 years. The widespread melting of permafrost is a major concern in northern portions of Alaska where continuous and discontinuous permafrost are present.

An example of climate change effects on the environment have been identified in recent studies of forest health. Tree growth studies conducted by University of Alaska Fairbanks Professor, Glenn Juday, have found clear indication that normal cycles of forest growth changed dramatically in the early to mid- 1970's. The studies also show that the forests have been experiencing stresses since then, often involving complex interactions of different effects of climate change that have no precedent in the historical record. However, spruce beetle (*Dendroctonus rufipennis*) infestations reached epidemic proportions during the 1990's, potentially the result of warmer than average summers and other climatic and forest conditions. Infestation spread and persistence has resulted in widespread loss of spruce trees larger than nine inches in diameter in certain areas of the state. This infestation, as well as those insects that attack other plant species, reduce forest diversity and increase fuel loading, which substantially increases forest fire danger in affected areas. In 2017, an increase in spruce beetle activity throughout the Matanuska-Susitna Borough was detected by the state, and an increase in activity was also documented on JBER. Heightened monitoring throughout JBER and the state in 2018 revealed that spruce beetles have been maturing in approximately one year,

instead of the customary 2-year cycle. Climate conditions over the past three years are likely to have influenced the outbreak.

Much of JBER is old growth boreal forest or recovering disturbed sites dominated by alder and blue joint grass. The region-wide beetle infestation of the 1990's and subsequent salvage logging of the dead spruce trees resulted in further blue joint grass dominance. The two major methods for dealing with the abundance of grassland are proper revegetation techniques for restoration of forest land or use of prescribed fires to manage overgrowth of grasses. Prescribed burning opportunities are limited due to narrow burning windows and air quality standard conflicts, but grass-dominated firing ranges are managed annually with prescription fire.

Significant patterns of range expansion by tall woody shrubs into dwarf and low alpine habitats have been mapped recently in studies on JBER (Rinas et al. 2017) in response to climate driven thermal shifts on alpine slope not otherwise colonized by tall shrub species such as alder (*Alnus sp.*) and typically low elevation willows (*Salix spp.*). Similar observations made during field reconnaissance in 2017 showed *Alnus viridis* on south facing slopes as high up as 2,720 feet (830 m), *Picea glauca* and *Betula papyrifera* seedlings as high up as 2,887 feet (880 m), and *Salix barclayii* and *S. pulchra*, dominant species at subalpine elevations (Collet 2010), as high up as 3,150 feet (960 m). Further study of shrub encroachment patterns and implications for watershed management and training use began in 2018 and will be complete in 2020.

Rising world ocean levels is also identified as a likely source of impact to JBER. JBER has approximately 20 miles of shoreline along Knik Arm of Cook Inlet, where tidal action is significant with up to 40 feet elevational change. The influence of rising ocean levels is likely to be seen first in the Eagle River Flats impact area.

Effects of climate change on JBER natural resources will be monitored through ecosystem management (Section 7.1.4). Efforts will be made to anticipate their future impacts on the military mission for planning purposes.

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The USAF environmental program adheres to the Environmental Management System (EMS) framework and its Plan, Do, Check, Act cycle for ensuring mission success. Executive Order (EO) 13693, *Planning for Federal Sustainability in the Next Decade*, DoDI 4715.17, *Environmental Management Systems*, AFI 32-7001, *Environmental Management*, and International Organization for Standardization (ISO) 14001 standard, *Environmental Management Systems – Requirements with guidance for use*, 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 manage associated risks, and instill a culture of continual 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 4-1: General Roles and Responsibilities

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
Installation Commander	The 673 ABW is the host unit at JBER, with responsibilities to maintain daily operation and furnish services and support to JBER military personnel, supported and tenant organizations, civilian staff, family members, and the surrounding community. The Commander, 673 ABW bears ultimate approval authority for this INRMP.
673d Air Base Wing Vice Commander	The Environmental Safety and Occupational Health council is typically chaired by the Vice ABW Commander if so delegated by the ABW Commander. The Environmental Safety and Occupational Health council frequently addresses INRMP issues.
673d Air Base Wing Judge Advocate's Office (JA)	673 ABW/JA provides legal support to commanders and the installation engineering and technical staffs on all environmental programs and compliance and liability issues, to include natural resource issues. 673 ABW/JA attorneys appointed as Special Assistant U.S. Attorneys assist with the prosecution of JBER natural resource cases involving civilian offenders in Federal magistrate court. Regarding violations of State fish and wildlife laws and regulations by personnel in active duty status, 673 ABW/JA will notify the State attorney appointed as a Special Assistant U.S. Attorney (SAUSA) and provide a copy of the violation notice, probable cause statement, and any other relevant matters so that the State's SAUSA will have the necessary information to pursue disposition of such cases in federal magistrate court. The U.S. Attorney's office will provide backup when State attorneys are not available. Regarding felony-level cases involving fish and game violations, as well as any types of more serious misdemeanor fish and game cases of which the State informs JBER that it has a particular interest in handling, 673 ABW/JA will consult with the State in determining the most appropriate prosecutorial entity for handling the case.
673d Air Base Wing Public Affairs	673d ABW Public Affairs is required, upon request, to provide JBER personnel, dependents, and the general public, information on hazards of wildlife and bird activity and measures to minimize them. The Public Affairs Office also provides the public with information concerning JBER activities dealing with natural resources or the outdoor recreation program. The Public Affairs Office is also involved in natural resource public awareness programs.
673d Civil Engineer Squadron	The 673d Civil Engineer Squadron (CES) Natural Resources office manages natural resources on JBER, including forestry, fish and wildlife, outdoor recreation, and land management. CES Natural Resources is responsible for documenting all INRMP actions taken or planned. 673 CES Installation Management is primarily responsible for coordinating JBER-wide planning and associated NEPA analysis and coordination for all activities. The 673 CES is also responsible for maintaining the JBER GeoBase, but Natural Resources is responsible for producing clean and current data for entry into the system.

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
673d Logistics Readiness Group	The 673d Logistics Readiness Group Commander is part of the Bird Hazard Working Group. The 673d Logistics Readiness Group provides vehicles and equipment to support the bird dispersal efforts when necessary.
3d Wing Vice Commander	The Vice 3d Wing Commander chairs the Bird Hazard Working Group as mandated by 3 WGI 91-212 (Bird and Wildlife Aircraft Strike Hazard (BASH) Program). The commander also has approval authority for recommendations of the Bird Hazard Working Group.
3d Wing Safety/BASH Officer	The 3d Wing Safety has primary responsibility in regard to 3 WGI 91-212 or BASH Program. The 3d Wing Safety office works with newly arrived personnel, making sure that all are briefed on the JBER BASH program and that squadron safety officers have an established briefing on bird hazards and know report procedures. The 3d Wing Safety/BASH Officer schedules Bird Hazard Working Group meetings, takes minutes and attendance at these meetings, and maintains the minutes for at least three years.
3d Wing Operations Group	The 3d Wing Operations Group and its entities are involved in the BASH program. They perform the day- to-day coordination, monitoring, briefing, and reporting of hazardous bird activities to maintain the safety of those flying in and out of JBER.
AFCEC Natural Resources Media Manager/Subject Matter Expert (SME)/ Subject Matter Specialist (SMS)	AFCEC/CZOP provides installation support for the JBER natural and cultural resource program and is consider the Alaska natural and cultural resource Subject Matter Expert.
Installation Security Forces	673 Security Forces will work with the 673 CES Conservation Law Enforcement Program managers and officers in establishing and defining operational support and reporting procedures for the conservation law enforcement officers (CLEOs) and the Military Conservation Agent (MCA) Programs
Installation Natural Resources Manager/POC	673d Civil Engineer Group (CEG) provides most of the natural resources direction for JBER. Figure 4-1 shows organizations within the 673d CEG that are involved with natural resources management. Annual INRMP reviews, updates, and changes are approved by the 673d CES Commander.
Installation Unit Environmental Coordinators (UECs)	Environmental Management System (EMS) vision is for an effective framework to meet AF environmental obligations. Organizational or squadron commanders appoint primary and alternate Unit Environmental Coordinators (UECs). UECs participate in and help determine the adequacy and effectiveness of the installation EMS. Installation Unit Environmental Coordinators (UECs) role description are defined below. Serve as the EMS conduit between installation environmental function and their unit. Attend appropriate working group meetings as requested. Advise the work area supervisor on any EMS and environmental policies. Manage and monitor the EMS requirements for the unit. Provide any information required for installation environmental and sustainability performance measures. Participate and support EMS and compliance assessments and assist with developing corrective actions to address identified findings.
Installation Wildland Fire Program Manager	The Air Force Wildland Fire Center, Environmental Operations Division, AFCEC/CZ is the principal office responsible for overall Wildland Fire management on JBER.
Pest Manager	The 773 CES is responsible for control and management for pest management activities on JBER, with exception of pest issues within privatized housing units.

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
Range Operating Agency	USARAK provides operational management and support for the JBER training lands.
Conservation Law Enforcement Officer (CLEO)	673d CES provides conservation law enforcement support and minimizing wildlife conflicts or concerns within the cantonment and training areas. CLEOS are also responsible for issuing U.S. District Court Violation notices for fish and game violations committed by both civilians and Title 10 personnel who commit fish and game violations. The CLEOs will provide fish and wildlife violation notice information annually to the State.
NEPA/Environmental Impact Analysis Process (EIAP) Manager	673d CES provides EIAP support for the base and the applicable tenants.
US Environmental Protection Agency	The Environmental Protection Agency (EPA) is involved in various federal programs related to natural resources management, particularly the wetland permitting process, delegated nationally to the U.S. Army Corps of Engineers. The EPA will be involved in remedial actions to rehabilitate contaminated areas and is involved with air and water regulations.
National Oceanic and Atmospheric Administration (NOAA)/ National Marine Fisheries Service (NMFS)	In accordance with DoDI 4715.03, the National Marine Fisheries Service (NMFS) is a signatory cooperator and partner in the implementation of this plan due to the presence of beluga whales, harbor porpoise and harbor seal on or adjacent to JBER. The NMFS provides scientific expertise and legal authority for marine mammals, marine endangered species, and Essential Fish Habitat identified in the Magnuson - Stevens Fishery Conservation and Management Act. The NMFS is the lead agency for issues regarding harbor porpoise, harbor seal and the Cook Inlet population of beluga whales (see Section 7.4.2, Protection of the Cook Inlet Beluga Whale on JBER) and is a key partner in implementation of this plan
US Forest Service	JBER, the U.S. Forest Service, and the Alaska Division of Forestry (AKDOF) have a memorandum of agreement (MOA) regarding wildland fire response on JBER. This MOA (JBER-MOA-216) was finalized on 22 March 2015.
US Fish and Wildlife Service	In accordance with the Sikes Act, the USFWS is a signatory cooperator and partner in the implementation of this plan. USFWS has been working collaboratively with JBER on a conservation effort to survey wetland boreal bird presence, abundance and distribution, and freshwater salmon productivity. Coordination with USFWS in regard to BASH has been maintained throughout the planning process. Migratory bird and Bald Eagle permits are acquired by JBER from the USFWS. USFWS has also provided volunteers for species monitoring programs such as Loon Watch.
US Department of Agriculture, Animal Plant Health Inspection Services and Wildlife Services	U.S. Department of Agriculture, Animal Plant Health Inspection Service, Wildlife Services (USDA- APHIS-WS) has national expertise in developing actions and strategies for BASH programs. USDA-APHIS-WS is under contract with 3d Wing to provide 24/7 BASH activities between 1 April and 31 October and daylight-work-week coverage during winter. USDA-APHIS-WS activities involve removing birds within the Bird and Waterfowl Exclusion Zones and other wildlife within the airfield fence. Bryant Army Airfield also finalized an airfield BASH plan in 2015.
USDA, Natural Resources Conservation Service	This agency provides technical assistance in identification and conservation of soils.
Alaska Department of Fish and Game	In accordance with the Sikes Act, ADF&G is a signatory cooperator and partner in the implementation of this INRMP. It is also the primary state agency for fish and wildlife management in Alaska, including JBER. JBER is part of the Anchorage Management Area for fisheries and Game

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
	Management Unit 14C for wildlife. JBER cooperates with ADF&G in the State's management of fish and wildlife populations on JBER, including but not limited to fish stocking, moose and bear management, wildlife conflict, and BASH management. The ADF&G Habitat Division is responsible for issuing permits for activities that may impact anadromous/fish waterways, including stream diversion, stream bank disturbance, stream bank restoration, erosion control, gravel extraction from waterways, culvert and bridge construction, water withdrawal, and recreational mining. Removing beaver dams also requires a permit from the Habitat Division, when machinery is used. ADF&G has developed a number of species management plans. The plans can be accessed on the ADF&G website. JBER management activities, as delineated in this INRMP, are consistent with these plans. However, special circumstances or requirements of military readiness may occasionally require deviations. In this event, coordination between ADF&G and JBER will address any management concerns. JBER and ADF&G frequently discuss projects of mutual interest. One cooperative agreement exists with the ADF&G; Coop 14-010, "Rehabilitation of Salmon Fisheries in Otter Creek Drainage on Joint Base Elmendorf-Richardson".
Alaska State Troopers	The Conservation Law Enforcement Officers coordinate with the Alaska State Troopers in situations that involve dispatching animals, in cases that require prosecution by the State, and in cases involving resources that move off of the installation.
Alaska Department of Law	The Alaska Department of Law will appoint attorney(s) as Special Assistant U.S. Attorney (SAUSA) to handle violations of State fish and wildlife laws and regulations by personnel in active duty status and will pursue disposition of such cases in federal magistrate court.
U.S. Bureau of Land Management	Approximately 65,262 acres (89%) of land currently used by JBER is on long-term withdrawal from public domain lands originally assigned to the BLM (Figure 2-4). Provisions for management of these lands are generally specified in public laws, public land orders, executive orders, and other enabling documents. Whenever the military uses withdrawn public land, it incurs legal and moral responsibilities for the stewardship of the land and its resources. Residual responsibility for JBER withdrawn lands remains with BLM, which retains interest in the stewardship of the transferred parcel, even though the land is under DoD's long-term management. The Secretary of Interior, through BLM, reserves authority to change use and grant various rights, with Air Force concurrence, so others may use the land for such things as rights-of-way, utility lines, fuel pipelines, gas, water, electric, cable, television, sewer, telephone, fiber optics, and specifically ADF&G fish hatcheries. The BLM is a key partner in the implementation of this plan. JBER has historically used BLM Alaska Fire Service (AFS) to accomplish fire suppression requirements, however in 2015, a Memorandum of Agreement was established with the Alaska Department of Natural Resources Division of Forestry to provide preventative treatments, wildland fire training, and response. Section 7.8 discusses BLM vegetative rights on JBER forest lands and includes procedures JBER will use for commercial timber sales and personal-use wood sales.

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
	JBER land is withdrawn from other public use to the military to enhance military readiness and national defense. All JBER land is withdrawn or reacquired federal land reserved for military purposes prior to Statehood; and as a consequence, the federal government exercises legislative jurisdiction over all JBER real property.
Alaska Department of Natural Resources	*Division of Forestry* The Division of Forestry (AKDOF) is responsible for fire suppression on all lands, regardless of ownership, in the southern half of Alaska. JBER has established a Memorandum of Agreement with the AKDOF for wildland fire prevention, suppression, and training. JBER falls into the Coastal Zone Management Unit. The Division of Forestry is a cooperating agency in management programs that deal with prescribed fire and wildfire suppression, forest pest management, general forest management, and forest inventories. *Division of Parks and Outdoor Recreation* The Division of Parks and Outdoor Recreation may be involved with JBER on issues of public access on adjacent Chugach State Park and ways the JBER recreation plan affects tourism within the Anchorage area. Additional coordination with Chugach State Park, MWR and Range Control is anticipated concerning recreational trail development. *State Historic Preservation Officer (SHPO)* JBER coordinates all undertakings with the SHPO for compliance with the National Historic Preservation Act. The SHPO also serves as a repository of cultural resource information. *Plant Materials Center* The Plant Materials Center has the skills to assist or advise JBER on habitat enhancement, rehabilitation, or maintenance. The Plant Materials Center grows seedlings from seeds collected on JBER as well as other nursery stock for re-vegetation projects.
Alaska Department of Environmental Conservation	The Alaska Department of Environmental Conservation (ADEC) is the State's primary agency for regulation of contaminated areas, water quality, and wetlands. JBER coordinates with ADEC on these issues. ADEC also guides and provides assistance with spills in accordance with the JBER Spill Plan and disposal of solid or hazardous waste.
Tribal Governments	The United States has a unique legal relationship with Indian tribal governments as set forth in the U.S. Constitution, treaties, statutes, executive orders, and court decisions. The United States recognizes Indian tribes as domestic dependent nations under its protection. EO 13175 and the American Indian and Alaska Native Policy (Department of Defense 1998), supplemented by DoDI 4710.02, DoD Interactions with federally-Recognized Tribes (September 24, 2018) and AFI 90-2002 (November 19, 2014), Air Force Interactions with Federally-Recognized Tribes requires regular and meaningful consultation and collaboration with Indian tribal governments. JBER provides a process that permits elected officials and other representatives of Alaska Native tribal governments to provide meaningful and timely input on actions or policies that might be of tribal

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
	interest, such as those that affect sacred sites or traditional cultural properties. Maintaining a working relationship with Alaska Native tribes is an important component of the Air Force's operations in Alaska. JBER lies within traditional lands of the Dena'ina northern Athabascan tribes of Cook Inlet. These withdrawn lands hold resources that were traditionally used by Alaska Native tribes; therefore, tribal governments continue to have an interest in the management of these lands. Agreement documents between JBER and the Native Village of Eklutna ((JBER-MOA-316, 18 May 2010) and Chickaloon Native Village formally recognizes the government-to-government relationship and mutual areas of concern and support. Three federally recognized native tribes, Native Village of Eklutna, Chickaloon Native Village, and Knik Tribe-are primary points of contact for Alaska Native consultation. JBER also consults with regional and village Alaska Native Corporations when issues are relevant.
U.S. Army Alaska	U.S. Army Alaska's mission is to deploy combat ready forces to support joint military operations worldwide and serve as the Joint Force Land Component Command to support Joint Task Force Alaska. Other missions of U.S. Army Alaska are the defense of Alaska and coordination of Army National Guard and Reserve activities in the state. Prior to JBER stand-up, FRA, the southernmost installation of U.S. Army, Alaska (USARAK), encompassed approximately 61,000 acres and was home of the 4/25th Infantry Brigade Combat Team (Airborne). FRA provided 30 individual training areas managed by Directorate of Plans, Training, Mobilization and Security. Under JBER, USARAK retains responsibility for managing range complexes, coordinating military training, and releasing training areas for forestry, land rehabilitation, and recreational use. The 673d Air Base Wing will ensure the U.S. Army training mission on JBER will be met through close coordination with Directorate of Plans, Training, Mobilization and Security.
U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory	U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory provide cooperative support in water quality, hydrology, vegetative, permafrost and range studies related to munitions and noise.
U.S. Army Corps of Engineers, Alaska District	The Corps of Engineers is responsible for issuing wetland permits in accordance with Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. They also provide contract service to the natural/cultural resources program, as their staffing allows.
U.S. Geological Survey	The U.S. Geological Survey is an independent fact-finding federal agency that collects, monitors, analyzes, and provides scientific understanding about natural resources conditions, issues, and problems. The U.S. Geological Survey will support the development of JBER's GIS (673 CES GeoBase). This federal agency is a good source for remotely-sensed imagery, as well as terrain, hydrology, and vegetation data. Wildlife expertise is also available from the Alaska Science Center. Specifically, the Alaska Science Center provides bird survey advice and coordination.
The Nature Conservancy	Evaluates regional ecosystem management
Municipality of Anchorage	The outdoor recreation program and fish and wildlife management in general are of interest to the Municipality of Anchorage. Additionally, JBER must

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
	coordinate with Anchorage, which controls air quality permits for any planned prescribed burns on JBER.
Universities	JBER partners with universities for natural resources management expertise through U.S. Army Corps of Engineers cooperative agreements. Experts from universities have provided specialized knowledge needed to effectively manage natural resources on JBER lands.
Contractors	Private contractors are important to all facets of military installation management. JBER uses contractors for many programs associated with natural resources, such as NEPA documentation, natural and cultural resources surveys, implementation of the BASH program, and INRMP preparation.

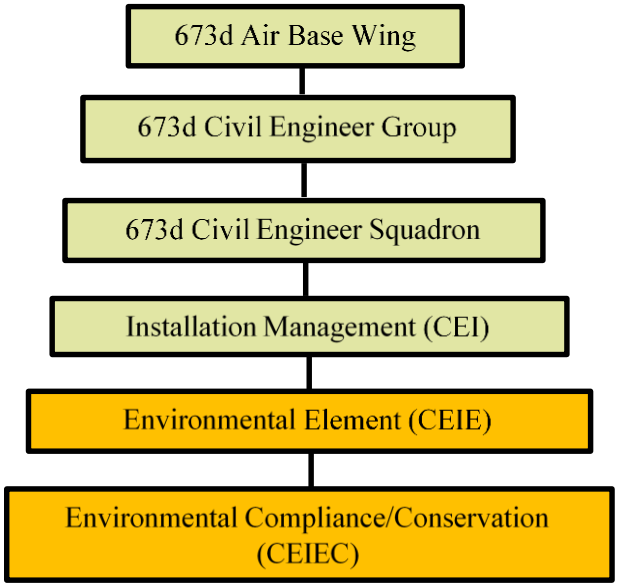


Figure 4-1: Organizational Chart of the 673 ABW, Emphasizing the 673d CEI Environmental Element

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.

GUIDANCE FROM AFI 32-7064:

- *NRMs at Category I installations must take the course, DoD Natural Resources Compliance, endorsed by the DoD Interservice Environmental Education Review Board and offered for all DoD Components by the Naval School, Civil Engineer Corps Officers School (CECOS). See http://www.netc.navy.mil/centers/csfe/cecos/ for CECOS course schedules and registration information. Other applicable environmental management courses are offered by the Air Force Institute of Technology (http://www.afit.edu), the National Conservation Training Center managed by the USFWS (http://www.training.fws.gov), and the Bureau of Land Management Training Center (http://training.fws.gov).*

- *Natural resource management personnel shall be encouraged to attain professional registration, certification, or licensing for their related fields, and may be allowed to attend appropriate national, regional, and state conferences and training courses.*

- *All individuals who will be enforcing fish, wildlife and natural resources laws on AF lands must receive specialized, professional training on the enforcement of fish, wildlife and natural resources in compliance with the Sikes Act. This training may be obtained by successfully completing the Land Management Police Training course at the Federal Law Enforcement Training Center (http://www.fletc.gov/).*

- *Individuals participating in the capture and handling of sick, injured, or nuisance wildlife should receive appropriate training, to include training that is mandatory to attain any required permits.*

- *Personnel supporting the BASH program should receive flight line drivers training, training in identification of bird species occurring on airfields, and specialized training in the use of firearms and pyrotechnics as appropriate for their expected level of involvement.*

- *The DoD supported publication Conserving Biodiversity on Military Lands -- A Handbook for Natural Resources Managers (http://dodbiodiversity.org) provides guidance, case studies and other information regarding the management of natural resources on DoD installations.*

5.1.1 Installation 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:

Newly hired JBER natural resources managers are required to take the course, DoD Natural Resources Compliance offered by the Naval School, Civil Engineer Corps Officers School. Other DoD environmental management courses can be found at the Air Force Institute of Technology and the Army Logistics Management College. Natural resources managers are also encouraged to attend appropriate national,

regional, and state conferences and training courses although current funding constraints have severely restricted the ability to travel.

Natural Resources usually sends at least one representative to the North American Wildlife Conference and joint meetings of the National Military Fish and Wildlife Association. Individuals also occasionally attend the Society of American Foresters meeting, annual Wildlife Society meeting, Alaska Marine Science Symposium, Alaska Forum on the Environment, Joint Service Environmental Management conference, and various specialized training sessions related to ecosystem management and biodiversity. A JBER representative occasionally attends the national annual BASH conference. Maximum use is made of locally available training.

The AFI 32-7064 identifies additional training requirements such as appropriate training for individuals participating in the capture and handling of sick, injured, or nuisance wildlife, as well as encourages NRM personnel to attain professional registration, certification, or licensing for their related fields, and may be allowed to attend appropriate national, regional, and state conferences and training courses. Conservation Law Enforcement personnel training is discussed in Section 7.3.5, Training and Section 5.0. Natural resources volunteers receive initial orientation and safety training and are then trained on their job- specific tasks.

Conservation Law Enforcement Investigators/Park Ranger

Conservation Law Enforcement full-time personnel must meet basic training requirements to remain in compliance with AFI 32-7064. The preferred training avenue is the Federal Law Enforcement Training Center's Land Management Training Program. Ancillary training is attended and ongoing following graduation from this program.

Military Conservation Agents

Level 1 MCAs receive eight hours of orientation and training and are then assigned to Level 2 or 3 trainers for field training. Field training includes a minimum of 40 hours on-the-job training, attending a 60-hour enforcement class, and completing a 4-hour shotgun course. After a 6-month probationary period, most Level 1 MCAs are scheduled to attend Level 2 MCA enforcement training. As mentioned above, Level 2 MCAs are trained and recognized as state Peace Officers for Fish and Wildlife protection jurisdiction on military lands only. Initial training for Level 2 agents totals 110 hours and annual refresher training is required.

Training is conducted by Alaska Wildlife Troopers, NMFS Enforcement, USFWS Special Agents, US Park Service, and Conservation Law Enforcement Officers. Training topics include legal authority, jurisdiction, search and seizure, state and federal fish and wildlife laws, natural and cultural resources laws, officer safety, use of force, and weapons qualification. For Level 2 agents to acquire Level 3 status an additional 36 hours of field training patrol, incident command courses 100 and 200, and all-terrain-vehicle and snowmachine certification courses must be completed. Level 3 agents receive additional training in wildlife investigations wildlife response procedures, and incident command courses 700 and 800. All qualified MCAs must successfully complete an annual quality control practical to maintain qualifications.

6.0 RECORDKEEPING AND REPORTING

6.1 Recordkeeping

The installation maintains required records IAW Air Force Manual 33-363, Management of Records, and disposes of records IAW 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.

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.

An annual report of fish and game violations will be sent to the Alaska State Troopers and the ADF&G Anchorage Area Biologists for Wildlife and Sport Fish by 31 January of the following year.

6.3 Publications

The generation and wide distribution of sound scientific studies conducted on JBER is strongly encouraged by the Air Force for the dissemination of significant scientific and technical findings. Additionally, the Air Force encourages its scientific and technical personnel to publish research results in recognized scientific and technical journals. Journal publication is important to the Air Force's Research and Development (R&D) program and therefore Air Force funded and sponsored publications should direct relevant credit to the Air Force. AFI 61-201 (29 January 2016) describes the policies and procedures for processing, distributing, and publishing technical documents generated in-house or by contract, subcontract, or grant. This policy may be extended by reference to include generation of oral presentations, presentation materials, posters, or any other public means of information dissemination to the public (AFI 61-201 Sec. 4). Section 10 of the AFI is specifically devoted to Publications and Reprints of Article in Technical Journals.

Basic scientific research findings, such as those typically generated from tasks and projects described in this INRMP, should not be classified, except in rare cases. Classified information is not to be publically disseminated. Publications must be determined, by the Air Force, as "OFFICIAL" or "UNOFFICIAL" and publications should be demarcated as such. Work that is funded by the Air Force is typically considered official material, and is not subject to copyright law. It is the responsibility of the author to ensure that the publisher is aware of this. Contracted work that is based upon a scope of work generated by the Air Force or including work facilitated by Air Force and/or Air Force staff may consider crediting the program manager or staff as co-author(s), as appropriate.

Contracted materials or publications proposed by cooperative partners or contractors outside the Air Force must have the article reviewed and get approval from the Air Force sponsor according to Air Force information-release policies and procedures. All materials proposed for publication must be approved by JBER Public Affairs.

The following statements should be included in each publication:

- "This report is published in the interest of scientific and technical information exchange and does not constitute approval or disapproval of its ideas or findings."
- "Opinions, interpretations, conclusions, and recommendations are those of the author and are not necessarily endorsed by the United States Air Force."
- "This research was sponsored by (name of sponsoring organization), Department of the Air Force grant or contract number ( )."

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.

Policy and Background

Ecosystem management philosophy, policy, and background are discussed in Section 1.2, Management Philosophy. JBER has identified seven major procedures or components that are integral to the successful execution of the ecosystem management program:

1. Inventory and monitoring of biological resources
2. Selecting priority species for management
3. Habitat-based approach to management
4. Habitat preference information for management priority species
6. Evaluating conflicts in land use issues
7. Specification of the land use mosaic
8. Regional management efforts

Partnerships

The Sikes Act (PL 105-85) requires the military to establish partnerships with major landowners, such as BLM, and other interested agencies, including the USFWS and ADF&G. All agencies are tied by policy to use an ecosystem management approach to land management. Cooperative relations among the military services and other land management agencies foster regional approaches to dealing with stewardship issues that provide benefits beyond what could be achieved by each agency separately.

This INRMP cannot be implemented by JBER alone. In accordance with land withdrawal legislation and the ecosystem management philosophy, JBER is actively maintains partnerships with various agencies to manage its natural resources. Major partners in the implementation of this plan are USFWS, NMFS, and ADF&G. Other partners in this effort include the Alaska Department of Natural Resources, universities, BLM and other federal and state agencies, native groups, contractors, and private citizens.

Partnerships are usually formalized as cooperative or support agreements or memorandums of agreement or understanding. While several formal agreements have been enacted at DoD or Air Force level, installations are encouraged to enter into agreements with State and federal agencies to coordinate and

improve management of natural resources on the installations (Memorandum of Understanding - DoD, USFWS and International Association of State Wildlife Agencies, July 2013).

In accordance with the Sikes Act, the INRMP describes how fish and wildlife resources on JBER lands will be cooperatively managed. This includes the recognition that states in general possess broad trustee and police powers over fish and wildlife within their borders, including -absent a clear expression of Congressional intent to the contrary -fish and wildlife on federal lands within their borders. Where Congress has given federal agencies certain conservation responsibilities, such as for migratory birds or species listed as threatened or endangered under the Endangered Species Act, the states, in most cases, have cooperative management responsibilities (Memorandum of Understanding - DoD, USFWS and International Association of State Wildlife Agencies, July 2013). The INRMP provides a program of planning for, and the development, maintenance, and coordination of wildlife, fish, and game conservation. The INRMP provides for fish and wildlife habitat improvements or modifications; wildlife considerations in all range rehabilitation; control of off-road vehicle traffic; use and protection of fish and wildlife resources, to include both consumptive and non-consumptive use and natural resources law enforcement requirements; and designated responsibilities for control and disposal of feral animals.

Appendix G (a) is a Memorandum of Understanding among DoD, USFWS, and International Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resource Management Program on Military Installations. This Memorandum of Understanding establishes a cooperative relationship among DoD, USFWS, and state fish and wildlife agencies, as represented by the International Association of Fish and Wildlife Agencies, in preparing, reviewing, and implementing INRMPs on military installations.

Appendix G (b) is a Cooperative Agreement between Alaska District, Corps of Engineers and Bureau of Land Management that defines responsibilities for authorizing use (rights-of-way, leases, licenses, permits) by others of public lands in Alaska withdrawn for the Department of the Army and the Department of the Air Force.

JBER is in the process of updating agreements made prior to the formation of JBER. Appendix G (c) includes a list of agreements. Appendix G (d) is a Cooperative Agreement between the ADF&G and the Air Force, 673d Civil Engineer Group that provides for the rehabilitation of salmon fisheries in Otter Creek Drainage on JBER. Appendix G (e) lists partnerships that JBER has formed or is likely to form in the near future.

JBER Monitoring Priority Species

As a more scientifically-based alternative to single species management, ecosystem management emphasizes multiple species management where a variety of habitats, species viability, species interactions, community structure, mutualistic relationships, edge effects, and connectivity are all considered. With a broader ecosystem approach to management, both the spatial and ecological scale of management efforts are greatly expanded so that management is conducted for many species over much larger geographic regions, including species of concern. Ecosystem management also recognizes that humans have been and will continue to be part of the landscape, and it endeavors to integrate human and non-human uses of the land. Importantly, ecosystem management seeks to place management actions within a larger landscape context, specifically recognizing that the effects of actions at a local scale, for example, can have larger ramifications at a landscape scale.

While multiple species management is the goal of the ecosystem approach, sometimes single species may take priority. In this case, all efforts will be made to incorporate the needs of multiple species into any required management actions. Table 7-1 lists JBER monitoring priority species.

Species fall into several categories under multiple species management, including keystone or key species, featured species, species with legal constraints, and management indicator species. Important considerations of species priority also include selection of species that can be monitored with the manpower and funding likely to be available and the degree to which management and habitat can be controlled.

Keystone or key species (K) play a disproportionately large role in ecosystem structure. Their significant ecosystem role may be because they are important to the feeding structure, provide a critical process in the system, provide necessary interactions, or generally have a significant impact on the ecosystem.

Managed species (M), unlike key species, are chosen based on human values instead of ecosystem values. These species may or may not be key or indicator species. These likely have socioeconomic importance as a locally harvested species.

Species with legal constraints (L) have been listed as endangered, threatened, or otherwise protected by the USFWS, NOAA and/or designated as SGCN by ADF&G. Additionally, this group could contain species that are of concern from an installation, regional, or state perspective (USFWS, BLM, USFS, and Audubon) as summarized in the 2013 Alaska Natural Heritage Program species tracking lists.

Indicator species (I) are species that managers choose to track ecosystem health or status or have specific management programs. These species may or may not be key or managed species, and may include invasive species.

Table 7-1: Potential JBER Monitoring Species

Species	Ecotypes Represented	Species Category
Mammals		
Little Brown Bat	Human modified, Upland, Lowland	M, L, I
Gray Wolf	All but Human modified	M, K
Lynx	Upland, Lowland, Subalpine	K
Wolverine	Alpine, Subalpine, Upland	M
Harbor Seal	Coastal	L
Harbor Porpoise	Coastal	K, L
Black Bear	Upland, Lowland, Subalpine	M
Brown Bear	All but Human Modified	M, K
Cook Inlet Beluga Whale	Coastal	L, I
Moose	All but Pavement	M
Dall Sheep	Alpine	M
Beaver	Lowland, Riverine	K, M
Microtines	All but Pavement	I, L
Collared Pika	Alpine	I, L
Snowshoe Hare	Upland, Lowland, Subalpine, Riverine	K, M, I, L
Birds (See Table 2-13 Avian Species of Special Concern Recognized for Joint Base Elmendorf-Richardson)		
Amphibians		
Wood Frog	Lowland, Upland	I, L
Fish		
Northern Pike	Lowland, Riverine	K, I
Coho Salmon	Lowland, Riverine	K, M, I, L
Sockeye Salmon	Lowland, Riverine	K, M, I, L
Chinook Salmon	Lowland, Riverine	K, M, I, L

Species	**Ecotypes Represented**	**Species Category**
Pink Salmon	Lowland, Riverine	K, M, I, L
Chum Salmon	Lowland, Riverine	K, M, I, L
Rainbow Trout	Lowland, Riverine	M
Dolly Varden	Lowland, Riverine	K, L
Insects		
Spruce Beetle (Dendroctonus rufipennis)	Upland, sub-alpine	K, M
Freshwater Invertebrates (Orders: *Ephemeroptera, Odonata, Plecoptera, Trichoptera, Cladocera*)	Lowland, Riverine	I
Terrestrial Invertebrates (Orders: *Hymenoptera, Diptera, Odonata, Lepidoptera, Arachnida*)	All	I
Plants		
White spruce *(Picea glauca)*	Upland	M
Paper birch *(Betula papyrifera)*	Upland	K, M
*Alaska Dwarf Primrose *(Douglasia alaskana)*	Alpine	I
Bird vetch *(Vicia cracca)*	Upland, Human modified	I^
Reed canarygrass *(Phalaris arundinacea)*	Human modified, Lowland, Riverine	I^
Orange hawkweed *(Hieracium aurantiacum)*	Upland, Human modified	I^+
Canadian waterweed/Elodea *(Elodea canadensis)*	Aquatic	I^
Canada thistle *(Cirsium canadensis)*	Upland, modified	I^+
European Bird Cherry *(Prunus padus)*	Lowland, Riverine	I^
White sweet clover *(Melilotus albus)*	Upland, Human Modified	I^

** SERDP ^ Exotic/Invasive + Prohibited-Noxious*

Integrated Natural Resources Management Planning

Prior to implementing INRMP identified project JBER will ensure the Environmental Impact Analysis Process (EIAP) is implemented in accordance with Title 32, CFR, Part 989 (32 C.F.R. 989). The overarching purpose of EIAP is to ensure the Air Force achieves and maintains compliance with NEPA and the Council of Environmental Quality regulations for implementing the procedural provisions of NEPA. Both the project proponent and the environmental planning function have certain roles and responsibilities as part of the EIAP. Most natural resource projects will qualify for Categorical Exclusion. A more detailed description of the EAIP process is found in Section 9.0.

This INRMP must be reviewed annually by JBER, in coordination with its signatory partners, in accordance with DoDI 4715.03 and AFI 32-7064. This will be accomplished using a list of the goals, objectives, and associated projects in the plan, as summarized in the work plans in Section 8 and 10. Yearly reviews and updates will allow managers to adapt the plan to consider the following:

- changes to funding and staffing resources;
- integration of new information from inventories, monitoring, and research;
- changes in military mission;
- changes in laws and mandates;
- changes in the status of abiotic or/and biotic components of the ecosystem; and

- additional issues from stakeholders.

A major INRMP review is required every five years at a minimum. If significant changes are required, the INRMP must be revised. AFI 32-7064 defines a INRMP revision as; an INRMP that requires significant edits because of changes to mission or natural resources, comments received from a review for operation and effect, or other changes, and INRMP update as; an INRMP that requires minor edits to address new information or management priorities. The last major INRMP revision was completed in December 2012. The premise for this revision was the need to thoroughly integrate the former separate EAFB and FRA INRMPs into a JBER combined plan. Major revisions to an INRMP are not required unless (1) changes in the installation military mission significantly change land uses, or (2) new natural resources issues (e.g. new listed species) require changes to INRMP goals and objectives. In most cases, the annual INRMP review and update will keep the plan current and negate the requirement for a costly major revision.

7.1 Fish and Wildlife Management

This section applies to all AF installations that maintain an INRMP. JBER is required to implement this element.

7.1.1 Policy and Background

The fish and wildlife management program provides for the regulation and conservation of game and non-game populations and their habitats. JBER management practices are consistent with accepted scientific principles and comply with the ESA and all other applicable laws and regulations (Appendix C). Management goals are consistent with the integrated natural resources program. Emphasis is placed on maintenance and restoration of habitat favorable to the production of native fish and wildlife. Lands and waters suitable for conservation of fish and wildlife resources are managed to sustain those resources.

Both game and non-game species are considered when planning natural resource management activities. The natural resources program on JBER has traditionally been based on multiple-use management philosophies. However, military training has always been and continues to be the primary land use.

Maintaining functional ecosystems is the primary goal of the JBER natural resources management program. “Realistic training lands” are often quoted as essential needs by military trainers; on JBER this translates into functional ecosystems that provide a realistic subarctic training environment and can be sustained indefinitely.

Fish and wildlife management actions fall into two categories: population management and habitat management. Fish and wildlife population management is accomplished through actions directly affecting wildlife species. Setting population goals and managing harvests are the primary actions used in population management. Habitat management, on the other hand, affects wildlife populations indirectly by manipulating their habitat. JBER cooperates with ADF&G in the State's management of fish and wildlife populations on JBER and management objectives are outlined in this INRMP.

Inventory and monitoring programs are critical components of ecosystem management. They lie at the heart of the concept of adaptive management, providing much of the information or feedback that is used to make decisions about and modify management practices. There are a number of different types of monitoring, including baseline, trend, and effectiveness monitoring.

Baseline monitoring is an initial inventory of resources. Monitoring in general can be thought of as periodic checks of a resource or community, which are then compared to baseline data to determine trends. Effectiveness monitoring provides direct feedback about specific management issues or programs.

Fish and wildlife management at JBER supports and is supported by the following programs, discussed further in the referenced INRMP sections:

- Inventory and Monitoring Programs (Section 7.0 Natural Resources Program Management)
- Policies, Programs, and Methods Used to Control Feral Animals (Section 7.1 Fish and Wildlife Management Plan and Section 7.11 Integrated Pest Management)
- Wildlife Pest Problems and Techniques Used for Wildlife Control (Sections 7.1 Fish and Wildlife Management Plan and 7.11 Integrated Pest Management Program)
- Migratory Bird Management (Section 7.1 Fish and Wildlife Management Plan and Section 7.4 Management of Threatened and Endangered Species, Species of Concern and Habitats)
- Hunting and Fishing Program Organization and Management (Section 7.1 Fish and Wildlife Management Plan and Section 7.2 Outdoor Recreation and Public Access to Natural Resources)
- Permitted Access for Hunting, Fishing and Wildlife Related Outdoor Recreation (Section 7.2 Outdoor Recreation and Public Access to Natural Resources)
- Demand for Hunting, Fishing and Non-Consumptive Resource Uses (Section 7.2 Outdoor Recreation and Public Access to Natural Resources)
- Hunting and Fishing Policy, Regulations and Fee structure (Section 7.2 Outdoor Recreation and Public Access to Natural Resources)
- Natural Resources Law Enforcement (Section 7.3 Conservation Law Enforcement)
- Watchable Wildlife Areas (Section 7.2 Outdoor Recreation and Public Access to Natural Resources and Section 7.15 Public Outreach)
- Wildlife Education and Interpretive Programs (Section 7.15 Public Outreach)

7.1.2 Fisheries Management

The primary objectives of fisheries management on JBER is to sustain, maintain and enhance the aquatic ecological integrity for ensuring sustainable use and environments required for realistic military training and recreational use. Streams and Lakes on JBER are managed for a variety of purposes including military training, recreational fishing, and protection of ecosystem health, sustainability, and productivity.

Non-Anadromous Fisheries

Lakes and ponds occurring on JBER are discussed in Section 2.2.4, Hydrology. These lakes vary in size between 2 and 124 acres (Table 2-7). JBER has 11 ADF&G stocked lakes which include Upper and Lower Sixmile, Spring, Hillberg, Fish, Triangle, Green, Otter, Clunie, Thompson, Waldon, and Gwen lakes. Recreational fishing is discussed in Section 7.2.3, Hunting and Fishing.

Most of the lakes on JBER are relatively shallow with the exception of Otter and Clunie lakes that reach depths of over 30 feet. Fish Lake has been known to completely freeze in the winter. Winter oxygen levels and lack of spawning habitat are problems in all the kettle lakes. For this reason, these lakes are routinely stocked with fish by ADF&G. Other bodies of water, which have only small numbers of fish, include the golf course cooling pond and Oval/Beebe Lake. Past studies of JBER lakes have found slow growth for fish in Clunie and Thompson lakes, as well as Clunie Lake fish were found to be heavily parasitized with

cestoid flatworms (JBER, 1981), possibly due to tapeworms that were frequently found in the intestines of fish from those lakes.

Resident fish stocks on JBER have not been consistently monitored. Monitoring the lakes on JBER, with an emphasis of the ADF&G stocked lakes, is important to help make informed decisions for JBER program managers and ADF&G. Collaboration started in 2019 with ADF&G Sport Fish Division to assess the stocked lakes on JBER to provide information to support management decisions for stocking strategies. Stocked lake surveys include focus on year-round monthly water quality parameters (temperature, pH, dissolved oxygen, and conductivity) and other select physical parameters, and evaluations of over-winter growth, health and survival of stocked fish populations.

Anadromous Fisheries

All five species of Pacific salmon, as well as coastal pelagic species, groundfish species, and highly migratory fish species are regulated and managed under the Magnuson-Stevens Fishery Conservation and Management Act of 1976, and essential fish habitat (EFH) as amended through 1996 (MSFCMA). In addition to the MSFCMA, four of the five Pacific salmon species (Chinook, coho, sockeye and chum) are identified as one of the five primary constituent elements (PCEs) in the survival and recovery of the NMFS listed Endangered Cook Inlet beluga whale (CIBW). Therefore it is important for JBER to manage and monitor the anadromous waters on JBER. JBER has eight creeks and two lakes identified within the ADF&G Anadromous Waters Catalog, which are discussed in Section 2.3.3, Fish and Wildlife. Additional information on fisheries management efforts in regards to the endangered CIBW is found in Section 7.4.2. *Protection of the Cook Inlet Beluga Whale*.

Management efforts focus on developing long-term data sets on the salmon runs and freshwater productivity of the three main anadromous systems on JBER. Current monitoring efforts include adult salmon escapement monitoring in Eagle River, Sixmile system and Otter Creek. Salmon smolt out-migration is monitored at the outlet of Sixmile Lake and beginning in 2021 at the outlet Otter Lake.

Fish Habitat Improvement

Fish habitat improvements focus on addressing the limiting factor(s) present in specific systems. Fish habitat improvements also focus on shoreline restoration/protection efforts. Primary criteria for selection of habitat improvement prioritize areas degraded due to human impacts. These improvement projects may enhance salmon productivity on JBER. Prior to initiating habitat improvements in either lakes or streams, habitat surveys were conducted during the 2015-17 field seasons. These surveys focused on stream and lake water and habitat quality as it relates to fish. These surveys identified potential locations needing habitat improvement.

Salmon appear to be fully utilizing all existing spawning redds in Upper and Lower Sixmile lakes. Late arriving salmon have been observed reworking spawning redds used by the early arriving salmon. This results in the destruction of the earlier eggs, reducing the number of salmon fry produced by the run. Over-spawning by returning salmon may cause periodic reductions in the number of fish in future salmon runs. Most spawning takes place in Upper Sixmile Lake and a small portion of Lower Sixmile Lake near the culvert. Sixmile and Otter Lakes are also recreational sport fisheries annually stocked with rainbow trout by ADF&G. Upcoming collaboration with USFWS is going to focus on use of existing data to identify data gaps and drivers of productivity declines in coho and sockeye salmon in the Sixmile and Otter Lake/Creek drainages. This will also include data collection filling in the data gaps and potential habitat enhancement. The initial study will focus on Sixmile and Otter Lake drainages and then expand to Eagle River and Eagle

River Flats to encompass the major anadromous systems that support recovery of the endangered Cook Inlet beluga whale.

Fisheries/Aquatic System Conflict Issues

Illegal Fish Stocking

Northern pike are believed to have been illegally introduced into Otter Lake sometime in the mid 90's. Historically, Northern pike have also been said to be found in Gwen Lake. However, based on heavy winter die-off in the lake and 2016 visual surveys, it is unlikely pike are in Gwen Lake. There are also unconfirmed reports of pike in Clunie, Fish, and Green lakes. Pike are not native to south-central Alaska and can have devastating effects on ecosystems that have not adapted to their presence. Native forage fish and visiting wildlife (waterfowl, small mammals, etc.) are likely to suffer from the highly predatory pike. Additionally, stocked rainbow trout in these lakes would be impacted. Natural Resource personnel monitor for the presence/absence of pike in JBER lakes and remove as many pike as possible from water bodies harboring pike. This issue is discussed in Section 7.11.3, Invasive or Deleterious Fish and Wildlife Species. In the early 2000s, surveys for Northern pike presence and potential spawning and rearing habitat were conducted on Otter, Gwen, Thompson, Walden and Clunie lakes and should be reassessed as needed. Any proposed introduction or reintroduction of fish and wildlife species must be thoroughly assessed in accordance with the National Environmental Policy Act and associated ADF&G and USFWS requirements to determine the impact on existing flora and fauna and the installation mission.

7.1.3 Wildlife Management

Wildlife management on JBER consists of population monitoring, game management, conservation actions, and restoring and improving wildlife habitat. Monitoring priorities for JBER natural resources must consider cost and practicality of monitoring methods and whether the species selected to be monitored will be directly affected by management activities proposed. JBER monitoring priority species are listed in Table 7-1.

Monitoring of some priority species will require that habitat preference data be determined and created to maintain spatially explicit data for these species in the GIS. The resulting data will then require incorporation into ecotype (habitat) classes as was done for FRA in Jorgenson *et al.* (2002). A map with key habitats highlighted can then be developed for all JBER priority species, and used for management and land use recommendations.

Wildlife Population Status and Management

Fish and wildlife harvest is the most commonly used form of population management. Hunting, and fishing are forms of outdoor recreation that help ADF&G maintain population goals. Hunting and fishing, are conducted under regulations promulgated by ADF&G to ensure that populations can be supported by available habitat, as well as, meet recreational demand. JBER manages hunting and fishing in terms of areas available, dates within ADF&G seasons, safety requirements, permit and reporting requirements, and other parameters to avoid conflicts with the military mission and to provide safe, high quality recreational experiences. Additional information on hunting and fishing is discussed in Section 7.2.3.

Bats

Little brown bats are the only known species of bat on JBER, but presence of their maternal roosts and any hibernaculum have not been documented. If maternal colonies are identified, protection and monitoring

programs will be initiated. JBER will work and coordinate with USFWS and ADF&G to ensure the protection of bats and help prevent the introduction of the fungus (*Pseudogymnoascus destructans*).

Acoustic monitoring is the primary means to sample bat community presence, composition, relative abundance, and activity levels. At least 3 models of bat acoustic monitoring devices are available commercially. Mist netting surveys are also frequently used in tandem with acoustic monitoring to verify species identification. When properly applied acoustic monitoring devices and analytical software can detect arrival, distribution, trends in populations and species composition. Funding has been provided to initiate monitoring surveys.

Bear (Black and Brown)

In 1997, a nuisance black bear study was conducted on JBER. Based on the preliminary report it was estimated that there were approximately 35 – 42 bears on base. The study recommended that black bear populations for JBER be kept at no more than 40 bears (Bostick 1997). Conducting a current black bear population size at this time would be impracticable with the available in-house resources. However, levels of nuisance bears and sightings suggests a stable to abundant population that would not be impacted by a modest harvest. Through a collaborative bear management effort led by ADF&G, JBER incorporated a permit lottery black bear hunt on JBER-Richardson using only shotgun with non-toxic slug beginning spring 2017.

The minimum number of brown bears using JBER lands during a 2005-2007 study was 15, but evidence suggests more were present but undetected by sampling methods (Farley *et al.* 2008). The current population and trend of black and brown bears utilizing JBER lands is unknown.

A cooperative effort between ADF&G and JBER will be maintained to monitor and evaluate bear populations due to their ecosystem importance and for potential wildlife conflict issues on JBER. Monitoring and evaluation approaches should include employing DNA based identifications for population estimation and familial impact to conflict bear activities, determination of habitat use and the ranking of habitats for their value to black and brown bears, and finally measures of nutritional cost for locomotion by bears as landscapes are modified by climate change and human activities. Levels of nuisance bear activity cannot be used as a reliable indicator of bear populations, as many other factors, such as natural food availability or habituation levels of bears, can have an effect on nuisance bear activity levels.

Currently, Natural Resources personnel use both nuisance bear activity and bear sightings as a tool to identify fluctuations in bear activity near road accessible areas. These observations had been historically supplemented by selected den checks of radio-collared females during the winter to determine number of cubs, sex ratios, etc. This method, however, required a long- term commitment to provide meaningful data. JBER staff is currently working with ADF&G staff to provide a better understanding of the needs and development of successful bear monitoring.

Moose

The moose population on JBER is part of a larger population throughout GMU 14C. Decisions for management actions are coordinated with ADF&G and are based on the overall moose population. JBER moose management is focused on striking a balance between moose hunting and viewing opportunities, concerns about severe over-browsing in primary wintering areas, moose-vehicle collisions, and conflicts with people and pets. Section 7.1.3, Wildlife Management further discusses moose as part of the JBER wildlife conflict management program.

Monitoring the moose population on JBER requires surveying for population numbers and composition to assess productivity. JBER is typically aerially surveyed each fall/early winter by ADF&G, conditions dependent. While aerial survey results provide an indication of population trends, additional directed research is necessary in order to understand moose ecology and explain causes of changes in the population (e.g. cause specific mortality, disease etc.).

Habitat quality, including spatial arrangement of cover types must also be monitored to ensure habitat-to-population levels are compatible. Currently little information exists on locations of critical winter habitat, and moose habitat quality has not been systematically quantified. A 2009-2010 study of moose movement and habitat utilization on JBER shed light on critical winter habitat areas, however a moose habitat and seasonal pattern assessment on JBER should be formalized using the latest remote sensing and telemetry technology.

Furbearers

Monitoring the distribution and abundance of furbearers, including some small mammals, can be important for documenting the effect of harvest, habitat change, and environmental variability on these populations. Many furbearers and small mammals are difficult to repeatedly recapture and naturally occur at lot to moderate densities, making it difficult to estimate abundance over large areas using traditional methods (e.g. mark-recapture, distance sampling etc.). Winter track surveys are readily observable following snowfalls and can encompass multiple species. Winter track surveys were conducted during the winters of 2004 to 2008 and will resume based on staffing and funding availability.

One of the furbearer species of top concern on JBER are wolves. The wolf population in GMU 14C is important as this population has previously been deemed a risk to public safety. Since 1995, individual wolves in the vicinity of Joint Base Elmendorf-Richardson (JBER), Eagle River, and Birchwood displayed increasingly habituated and aggressive behavior toward humans and pets. Starting in 2007, negative human/wolf encounters increased and during the winter of 2007–08, several dogs were killed or injured by wolves in this area. In May 2010, 2 female runners were pursued until forced to climb a tree by 2 wolves on Artillery Road on JBER. The runners were accompanied by a dog, but these 2 wolves reportedly ignored the dog and focused their attention on the humans. During the winter of 2010-11 ADF&G and JBER Conservation personnel removed 9 wolves from JBER via trapping and ground-based shooting efforts. In addition, wolf predation of moose in GMU 14C is generally assumed to be compensatory, moose in GMU 14C are an Intensive Management (IM) population. So there is additional interest in both wolves and moose in this GMU. As wolf and moose populations can shift dramatically over short time spans, it is important to estimate the current wolf population in this GMU. Over a 3 year span, ADF&G plans to collar at least 2 wolves from every pack on both JBER and that portion of 14C outside of JBER management area. JBER staff are currently in the process of working with ADF&G to develop these plans in support of the ADF&G GMU 14C study.

Small Mammals

Small mammal monitoring is part of the broader Long-term Ecological Monitoring (LTEM) management framework, which was implemented beginning in 2014. As previously mentioned, other small mammals such as snowshoe hare are monitored in conjunction with furbearers. The snowshoe hare is considered a keystone species due to its close relationship with lynx, as well as other furbearers. Snowshoe hares are also a major prey species for numerous predators, such as coyotes, foxes, owls, and goshawks. Snowshoe hare populations are closely tied to early forest successional stages and can serve as an ecological indicator in this respect.

The collared pika (*Ochotona princeps*) have been identified by the ADF&G within the State Wildlife Action Plan as a species of greatest conservation need. Collared pika are found on JBER in the Chugach Mountains around Training Areas 427 and 431. Collared pika inhabit talus slopes at high elevations, and rely on consistent snow pack for insulation. Surveys were conducted in 2013 and 2014 by APU as part of the LTEM, to identify pika habitat within the alpine areas of JBER, during which several pika observations were made near Tanaina Lake (Dial, *et. al.*, 2014). During the 2016 and 2017 alpine trips, pika observations were made around the same Tanaina Lake areas, as well as, and in the South Fork Snowhawk Valley. Currently, a collared pika survey is a component of the JBER Alpine Training Support Project. JBER Natural Resources collaborated with ADF&G and incorporated surveying collared pika on JBER as part of a larger ADF&G study aimed to fill in the information gaps of species presence, abundance, and reproduction across Southcentral and interior Alaska.

Migratory Birds

Migratory birds are a large, diverse group of birds which include many of our songbirds, waterfowl, birds of prey, waterbirds and shorebirds. Migratory birds on JBER can occur as year-round residents, which live on the installation throughout the year; breeding residents, which breed in the region in the summer and migrate south to wintering grounds in warmer regions; or transient, which use JBER as stopover habitat during migration.

Regardless of how birds use JBER, their presence provides important ecological services and an important indicator of ecosystem health. Primary considerations with regard to migratory bird management include habitat management and compliance with the Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (BGEPA). Guidance for compliance with these laws is provided under EO13186 (*Responsibilities of Federal Agencies To Protect Migratory Birds*) and the resulting Memorandum of Understanding (MOU) with the USFWS and the Final Rule for the Take of Migratory Birds by the Armed Forces (50 CFR Part 21).

Passerines

Many of the priority neo-tropical species that are vocal during May and June can be adequately monitored through breeding bird surveys using a combination of point counts and roadside surveys.

Wetland areas, potential breeding habitat for Rusty Blackbirds, Solitary Sandpipers, and Lesser Yellowlegs can be surveyed using techniques described by Matsuoka *et al.* (2008), which used a combination of rapid surveys of selected wetlands and then revisited those with positive results to delineate breeding pairs and nest locations.

Application of the method described by Matsuoka *et al.* (2008) to other wetland nesting species including sandpipers should provide an adequate estimation of nesting densities by these species on JBER. Management activities likely to benefit the above mentioned species include wetland and adjacent spruce forest protection. Wetland management is discussed in Section 7.6, Wetland Protection.

Loons and Grebes

Common and Pacific loons and Red-throated and Horned grebes are visually monitored on JBER each year, including nesting success using Alaska Loon Watch volunteers. Loon Watch volunteers report their results through the USFWS, per the ADF&G Conservation Action Plans.

Loon pairs and chick production seem very consistent over the years. The management activity employed to maintain a productive loon population is public education. Public education is discussed in Section 7.15,

Public Outreach. Habitat loss and disturbance of nesting loons are primary human causes for abandonment or low production. JBER boaters are warned with ADF&G furnished signs at boat launching sites. A primary cause for limitations to higher chick fledging seems to be predation by aerial predators; Bald Eagles are suspected. Management activities likely to benefit loons include wetland protection. Wetland management is discussed in Section 7.6, Wetland Protection.

Owls

Owls are identified as BASH risks and unique species with the need for improved population understanding. Owls are aerial predators whose population status relies on prey availability and nesting habitat. In past years (2003-2005, 2010, and 2012) owls were monitored with breeding season call surveys using techniques recommend by Andres (2001). These surveys were conducted on established routes that provide coverage of most of JBER-Elmendorf and a small portion of Richardson. Owl surveys conducted during 2003-2005 showed a stable trend in great horned owls, a declining trend in northern saw-whet owls, and an increase in Boreal owls.

Bald Eagles

Bald Eagles are protected under the Bald and Golden Eagle Protection Act, and they also pose a serious BASH risk. Documenting their distribution and population levels on JBER is necessary to support future BASH actions. In 2011, annual aerial Bald Eagle surveys began in order to identify the locations of all active nests. These surveys are conducted prior to leaf-out but late enough that active pairs are incubating on the nests. Subsequent ground checks late in mid-June and late July/early August can identify productivity and success. This monitoring system is relatively easy to duplicate with little cost, not exceeding 5 total hours of flying time. Locating and documenting active Bald Eagle nests is included as part of the project identified in Section 7.4.5.

Bald Eagle populations are currently displaying a stable trend. Section 7.4.5, Bald and Golden Eagles discusses eagle management activities, which is primarily protection of eagles and nesting trees.

Northern Goshawk

Northern Goshawks have narrow habitat type preferences. Surveys for presence and productivity of the northern goshawk can be completed on foot early in the nesting season when pairs are extremely vocal and territorial. Productivity can be measured by visiting the active nest sites prior to fledging. Performing annual raptor nest surveys for presence of Northern Goshawks is included as part of the project identified in Section 7.4.5. Forest management is the primary management program affecting goshawk populations on JBER.

Geese

The number of geese being observed on the ground within the waterfowl exclusion zone has also decreased substantially since 1995 due to an aggressive BASH program. Numbers of birds observed, hazed, and killed are maintained in a database by USDA-APHIS-WS. A digital database indexing spatial BASH risk is recommended in AFI 91-212 *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Program*. Recording the GIS locations of where avian hazing and take occurs over time will establish a baseline of avian usage of the airfields and the BEZ/WEZs. Occupancy trends and comparisons can then evaluate habitat affinity and BASH program effectiveness. Canada geese within the Bird Exclusion Zone (BEZ) pose BASH risks, and their population level on JBER reflects effectiveness of BASH reduction management and procedures. This effort is ongoing through the dispersal reports provided by USDA-APHIS-WS.

Amphibians

Wood Frogs

With global declines in amphibian populations, there is a growing concern for wood frogs, the only frog species found in Alaska. Current frog population survey techniques are spring calling counts conducted during the peak period of breeding activities. Methodology outlined by the North American Amphibian Monitoring Program requires following a survey route that visits pre-designated stops near wetland areas during mid-evening. Calling frogs are enumerated if few in number, or categorized by relative density if numerous. Survey effort has been focused on collecting a baseline data set for future comparison. These actions are detailed in the ADF&G Conservation Action Plans. There is a need to investigate the health of wood frog populations on JBER, thereby evaluating the validity of including wood frogs as an indicator species for environmental health. Baseline population levels should be established.

While wood frog monitoring surveys suggest a well distributed population on JBER, there are aquatic systems with very low densities. Specifically, seepage areas producing wetlands emptying into Ship Creek between the decommissioned JBER-Elmendorf power plant and golf course have produced less than 2-3 frogs heard in more than two spring listening seasons (2003 and 2004). Green Lake also produces a low density during listening surveys, probably a reflection of habitat quality. Wood frog numbers seem highest in emergent wetlands surrounding Hillberg Lake. Wood frog populations on JBER-Richardson appear to be highest in Otter Lake with other sizeable populations in emergent wetlands. Wood frog numbers in seasonal wetlands are highly influenced by standing water levels. Breeding, productivity, and abnormality surveys have been conducted over the past three years on over 50 water bodies through a cooperative agreement with Alaska Pacific University. The surveys have indicated that wood frogs have been detected in approximately two-thirds of all water bodies sampled across JBER (APU, 2014). Study results of wood frog distribution, productivity and abnormality results are provided in Appendix A: References.

Macroinvertebrates

Macroinvertebrates were identified as important indicator species, and they have been identified in the ADF&G Alaska Wildlife Action Plan as ecologically important species. The dependence of insects on water quality is well established. Streams and rivers are an important habitat with the orders *Ephemeroptera, Plecoptera*, and *Trichoptera* (EPT) indicating high water quality when present. A comprehensive survey of benthic macroinvertebrates on JBER was conducted during the 2015-17 field seasons. See Appendix F for a list of genera present on JBER. Wetlands are identified as another important habitat type for macroinvertebrates. The order *Odonata* was selected for lentic aquatic systems due to their visibility and ease of sampling in both larval and adult stages. Baseline data for this group of insects, however, is limited for this area of Alaska and military lands specifically. There is a need to conduct a baseline survey to establish composition and spatial and temporal distribution of *Odonata,* identify habitat correlations, and to develop a species monitoring protocol. A baseline population diversity and abundance indicator will provide a metric for water quality indicating ecosystem health.

Marine Mammals

CIBW, harbor seals, and harbor porpoise are commonly detected on or adjacent to JBER. These species have been detected several kilometers upriver in Eagle River, and thus, several kilometers onto JBER. Monitoring these species is critical for JBER to comply with the MMPA and, in the case of the Cook Inlet beluga, comply with the ESA. Both laws require analysis of the potential impacts to marine mammals resulting from military activities, especially as a result from noise.

Belugas and harbor porpoise rely almost exclusively on sound to forage, navigate, and avoid predators in the extremely turbid waters of Knik Arm. Exposure to anthropogenic noise can have serious effects on these animals, which can include: hearing fatigue (TTS) and hearing damage (PTS). The onset of PTS or TTS as a result of anthropogenic noise is considered a Level A (Harmful) and Level B (Harassment) take, respectively, and are strictly prohibited (without authorization) under provisions of both the MMPA (porpoise, seal, and beluga) and ESA (beluga).

NMFS recently published new criteria for evaluating the potential for onset of PTS and TTS (NMFS 2016). These criteria require sound data measured in specific metrics (i.e., peak SPL and Sound Exposure Level), which are unfortunately different than measurements required in the past.

A joint team from the U.S. Air Force, Army and Navy, in addition to members from the National Marine Mammal Foundation, Colorado State University, and the Alaska Sea Life Center, conducted underwater acoustic measurements of explosive detonations (ordnance and C-4 equivalents) placed within ground impact areas of ERF on 18 and 19 July, 2018 at multiple, concurrent locations in Eagle River and Eagle Bay. The detonations were conducted under an informal consultation with the National Marine Fisheries Service under section 7(a)(2) of the Endangered Species Act (NMFS PCTS # AKR-2018-9779). Measurements were obtained for 60-mm high explosive (HE) mortars [0.9 lb. (0.4 kg) net explosive weight (NEW)]; 105-mm HE rounds [8.4 lb. (3.8 kg) NEW] and C-4 equivalents; and 155-mm HE rounds [15.7 lb. (7.1 kg) NEW]. The distances from the detonations and the measurement sites during this test were between 160m and 990m in Eagle River and between 1000 and 2200 m in Eagle Bay.

Peak sound pressure levels (SPL), unweighted sound exposure levels (SELs), and weighted SELs (per marine mammal hearing group) were provided in a report for each detonation and measurement location and it was noted that the values measured for all detonations during the test were below the threshold for the onset of TTS and PTS for all hearing groups measured (mid frequency, high frequency, pinniped) (U.S. Navy, 2019).

See Sections 7.4 and 7.5 for program management of these species. Marine mammal monitoring methodology and results are detailed in Appendix I.

Other Birds and Mammals

Management of other birds and mammals not discussed above is primarily limited to protection from poaching and management/protection of habitats. Management activities may involve moving small birds and mammals if these species conflict with the BASH program, or become a nuisance in housing or facilities after coordinating all actions with ADF&G.

On JBER-Richardson small game and waterfowl harvest is allowed. Principal small game animals harvested are snowshoe hare and spruce grouse. Waterfowl hunting is allowed north of Eagle River. No trapping is allowed on JBER, other than that discussed below for beaver control. By state law, it is legal to harvest coyote and red fox on JBER-Richardson under a hunting license. Harvest numbers of small game, waterfowl, and furbearers are tracked using the iSportsman system exit survey.

Wildlife Conflict Management

Wildlife is protected under a number of statutes, such as the ESA, MBTA, State of Alaska fish and game laws, Bald and Golden Eagle Protection Act, etc. The following are specific examples employed by JBER to avoid wildlife-training conflicts:

- USARAK Regulation 350-2 prohibits Soldiers from intentionally targeting wildlife when conducting firing activities and from harassing wildlife during maneuver activities.

- Army minimizes activities or operations directly and negatively impacting fish and wildlife during sensitive time periods or seasons.
- Army will not intentionally fire into the open waters of Eagle River at any time.
- Army will not fire 120 mm or 105 mm high explosive rounds into ERF when belugas are present in Eagle River (as outlined in JBER's revised BA dated December 2015).
- Eagle nesting surveys are completed and disseminated annually to the relevant offices.

The JBER BASH program is described in Section 7.12, Bird/Wildlife Aircraft Strike Hazard (BASH).

Nuisance Bear Management

JBER has an extensive bear-human conflict management program in place. The nuisance bear management program is a combination of public education, waste management, and enforcement. All MCAs receive bear safety and food-conditioned bear procedure training. Conservation Law Enforcement and MCAs handle nuisance bear problems, respond to reports of bears in developed areas and conduct hazing, and other bear management efforts.

Radio collaring of brown bears occurred in 2005, aiding in understanding the presence of brown bears on JBER lands. Nuisance behavior and location are tracked by databases. Currently nuisance bears found in housing or developed areas are hazed out of the area, if possible.

In the 1990s, a black bear study (Bostick 1997) was completed to determine basic population parameters and test various types of nuisance bear management techniques. Over the course of the seven year study, 23 black bears were radio collared and monitored; and nuisance bears were subjected to different types of adverse conditioning. Results of the study identified physical types of adverse conditioning to be the most effective. The study provided recommendations concerning bear management on military lands within the Anchorage area.

The following are activities currently implemented on JBER for the management of nuisance bears:

- Public bear awareness education, proper waste management education, and enforcement of feeding laws and regulations.
- Provide high risk or high nuisance wildlife call locations in regards to damaged, non-bear resistant dumpsters to 773d CES, Contracting and Waste Management.
- Apply risk classifications to known nuisance bears.
- Conservation Law Enforcement officers respond to reports of nuisance bears.
    - Nuisance bears that are located by CLEOs or MCAs are hazed until they no longer pose an immediate threat to human safety or property.
    - Hazing techniques include (but are not limited to) pepper-spray, pepper-balls, rubber slugs, cracker shells, and loud noise. Nuisance bears are also opportunistically marked with paint-balls so that repetitive nuisance behavior by an individual bear can be monitored and documented.
- Bears that are monitored and documented demonstrating repetitive nuisance behavior, or that pose a high-risk to human safety may be recommended for lethal removal. Removal of nuisance bears is done at the discretion of and in collaboration with ADF&G.
- Collaborate with ADF&G, CSU and University of Alaska Anchorage to analyze DNA collected from nuisance black bears on the JBER main cantonment. Results from these efforts will inform future management actions.

- CLEOs and JBER Biologist participate in the Anchorage Bear Committee.
- Implemented a black bear hunt through ADF&G draw hunt. Results from this hunt will be monitored to inform future hunt recommendations and nuisance bear management.
- JBER continually strives to reduce wildlife conflict risk. Means and methods of reducing risk is discussed in conjunction with ADF&G biologists.

Minimizing nuisance wildlife conflict is an ongoing, dynamic process. Currently one of the top management concerns regarding nuisance bear activities is solid waste issues. In 2011, JBER spent $50,000 on bear-resistant dumpsters for the cantonment areas to help alleviate this problem. In 2019, JBER allocated $100,000 to purchase additional bear resistant dumpsters. Additionally, 673d CES, 773d CES, and 673 CONS began a working group to discuss and develop actions to help reduce wildlife conflict associated with base dumpsters and solid waste issues. 673d CES is also working to reduce wildlife conflict at Otter Lake with 673d FSS by planning to add bear resistant food storage lockers in 2020.

Wild and Feral Canids

Foxes and coyotes are occasionally problems in housing areas. These conflicts are often caused by the feeding of these animals, either deliberately or inadvertently. Numerous pets have likely been killed by foxes, coyotes, and wolves. Conflict management includes public education concerning feeding wildlife and aversive conditioning. Leg-hold traps and snares have been used to remove foxes and coyotes associated with the airfield by USDA-APHIS-Wildlife Services but those capture devices cannot be used in most problem areas due to safety considerations. Translocation or euthanasia of foxes or coyotes requires approval by ADF&G.

Feral dogs are occasionally a problem. Feral cats are effective predators, directly competing with native mammals, and are considered invasive species. They exist in small numbers on JBER. Efforts are taken through the 773 CES Pest Management Section to eliminate feral cats and control stray dogs. When possible, dogs and cats are captured and taken to the Anchorage Animal Control facility or JBER Veterinary Services. Section 7.11, Integrated Pest Management further discusses feral animal control.

Urban Moose Conflict Management

Moose present a threat to life and property of personnel by frequently wandering through the developed portions of JBER. Conservation Law Enforcement, MCAs, and occasionally 673d Security Forces Squadron personnel respond to calls from quarter's occupants and haze moose away when there is a clear threat to personnel or dependents. Critical times of year are in early spring during heavy snowfall years and late-May and June when cow moose are present with calves. Moose have become aggressive with responding agents. Several individuals in the Anchorage area have been severely injured or killed by moose.

Property damage also occurs as a result of moose-vehicle accidents. Even at the relatively slow speeds posted on JBER, 2-6 accidents occur each year, primarily during winter when darkness and road conditions reduce visibility and make stopping more difficult. Vehicle damage can range from slight to total. The Alaska Department of Transportation and Public Facilities estimates that each moose/vehicle collision in rural Alaska averages $15,000 in property damage, medical bills, etc. (Sinnott 1995b). The moose sometimes suffer minor injuries, but more often are killed or suffer serious injuries and have to be destroyed by responding personnel. Road-killed moose are the property of the state, and the Alaska Department of Public Safety maintains a list of charitable organizations in the community, which are contacted on a rotating basis to salvage the meat.

Prevention of future moose-human conflicts will focus on habitat improvement designed to draw moose from conflict areas and increased efforts at public education concerning critical times of year, problems created by feeding moose, and how to prevent and react to conflict situations. Urban forest practices in cantonment areas include prohibition of planting new fruit-bearing trees in wildlife and bird exclusion zones. An effort to kill and remove 985 fruit bearing trees in the BASH zone around the Elmendorf Airfield in 2018 and 2019 resulted in immediate and significant reduction in wildlife conflict incidents compared to areas where fruit bearing trees remained (Figure 7-1). Additionally, moose habitat enhancement efforts should be located where they are likely to draw moose from the airfield and residential areas.

Information is provided through newcomers briefings for all active duty personnel, and their families are also encouraged to attend. Several notices are also placed in the JBER online newspaper annually to make personnel aware of the potential hazards moose represent. Increased enforcement of feeding regulations is also recommended, as some aggressive moose have a history of having been hand fed.

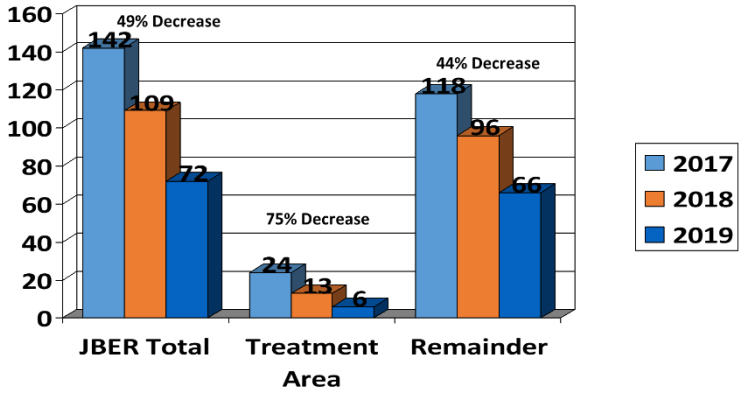


Figure 7-1: Moose Conflict Responses: 2017-2019

Beaver

Beaver cause problems on the JBER by plugging culverts and cutting trees. The plugging of culverts has resulted in the flooding of some parking areas and roads, causing a substantial increase in maintenance costs. Beaver have caused damage to trees, leaving hazards along roadways and trails that required clearing for safety.

Preventative measures to minimize beaver damage include painting or fencing large trees near beaver lodges, installing beaver-resistant culverts and dams, and in cases where individual beavers are causing damage the removal of beaver under an ADF&G depredation permit. These permits can be issued outside the local Game Management Unit trapping season, as their population in the Anchorage area is very healthy. Where possible, beaver are trapped within the legal trapping season by a small number of volunteer trappers that meet the following criteria: experienced trapper, attendance at Alaska Trapper's Association trapper school, possession of all required state licenses, and willing to assist in conducting fall cache surveys. Beaver control has also been conducted in the past by issuance of depredation permits from ADF&G to MCAs, USDA-APHIS-WS, or volunteer depredation trappers. Since depredation trapping occurs as problems arise during summer, the pelts are in poor condition. Meat is retained as bear bait and pelts are turned over to ADF&G.

In 2019, bird biologists from USFWS and ADF&G identified an important shorebird nesting and foraging area that was flooded by a large beaver dam constructed in the southwest corner of Otter Lake. Since this area provides habitat for multiple priority species, JBER is developing a management plan that includes water level monitoring and installing a Clemson beaver pond leveler to provide adequate water levels for both shorebirds and salmon during critical life stages.

Birds

The construction of nests by Cliff Swallows on facilities creates an annual nuisance and health concern. Droppings are unsightly and are a growth medium for fungi that can cause the respiratory infection, histoplasmosis. Swallows are heavily infested with mites that enter the quarters when the birds leave the nest. Although mites do not attack people, their presence causes considerable distress to occupants. Cliff Swallow nesting has diminished greatly in recent years as a result of a more aggressive removal of nests prior to egg laying (J. Morrill, Wildlife Services, and personal communication with H. Griese).

Control measures include building modifications, removal of food and nesting habitat, and direct removal of nests in the spring during nest construction. 773 CES Pest Management Section personnel knock down nest concentrations under authority of a permit from the USFWS. This is the most effective means of reducing the problem, but has met with criticism when eggs or young are destroyed.

Gulls are an occasional problem during the nesting season, particularly around warehouses and open bay buildings. Pigeons are also a problem in these areas. The 773 CES Pest Management Section is responsible for control of these birds (See Section 7.11, Integrated Pest Management).

7.1.4 Ecosystem Management

The fish and wildlife habitat on JBER managed lands is not managed for individual species or specific population levels. JBER Natural Resource managers use ecosystem management to maintain biological diversity rather than focusing on specific species habitat needs. JBER's policy is to effectively manage JBER lands for wildlife habitat, timber, erosion control, and military cover and concealment. Ecosystems are managed through the Natural Resources and ITAM programs.

Scientifically-sound inventory and monitoring protocols are necessary to compare and validate changes to justify future management actions and serve as the foundation for effective natural resource management. Accurate population and habitat information is needed to foster the exchange of information with other resource management agencies, aid in the continuation of knowledge through installation personnel changes, and further the effort to reduce repeated efforts and thus cut the cost of managing JBER natural resources. In addition to protocol development, several other tasks must be completed to enhance the effectiveness of the JBER natural resources program including:

- compile and assimilate all available natural resources (species and habitats) inventory, survey, monitoring results to date;
- evaluate inventory and monitoring efforts to date;
- define future inventory and monitoring needs (i.e., species of special concern, managed species, wildlife conflict, etc.), and;
- develop statistically valid inventory and monitoring protocols for future efforts, stressing cohesion among projects, departments, and outside agencies.

JBER has established Long-Term Ecological Monitoring (LTEM) plots representative of the entire installation. The inventory and monitoring of these plots are used to monitor the health and changes to the entire installation ecosystem. An extensive vegetation and ecotype survey was conducted throughout the Elmendorf area in 1982-1983 (Tande 1983) and throughout the Richardson Training Areas in 1994 and 2003. As part of this survey, aerial photography used to map vegetation types was ground-truthed. Vegetation plot monitoring began in the late 1990s with using a protocol established by Tande (2000), generally following the Forest Inventory Analysis (FIA) protocol. This protocol was followed between 1999 and 2001 across 30 permanently established long term ecological monitoring sites. Between 2001 and

2007, the Fort Richardson Army established 50 permanent and variable plots to conduct forest stand inventory and health monitoring. In 2013, HDR updated and revised the protocol, to consolidate the Richardson and Elmendorf plots, standardize the methodology, and add monitoring protocols for small mammals and birds on the same plots. A total of 119 LTEM sites have been permanently established, stratified across all major land ecotypes and through all areas of JBER. Ten percent of these are monitored annually on a ten-year rotation (HDR 2013). LTEM sampling in accordance with the current protocol and ten-year rotation plan has occurred since 2013. Additional plots proposed to be included in the LTEM sampling includes portions of Eagle River Flats and additional sites in alpine areas.

This management strategy allows JBER to articulate and map the vegetation and habitat associated with priority management species identified in Table 7-1. JBER biologists work with established scientists and biologists through cooperative agreements and interagency partnerships to monitor and manage habitat consistent with established methods. Field monitoring, in the form of on-the-ground vegetation and wildlife surveys, are a means to provide resolution to questions of diversity, abundance, and occupancy of the habitats identified through remote sensing or other appropriate techniques.

In 2014, vegetative studies on elevational changes in shrub cover; succession of woody vegetation in wetlands, and silviculture monitoring was conducted on JBER (Dial *et al*., 2015). While not conclusive, the studies searched for correlations between vegetative changes at high elevations and in wetlands with long term responses to climatic changes. Alpine training areas present logistical complications to maintaining current ecological, hydrological, and biological field data. Aerial imagery may be helpful, but does not allow for monitoring wildlife or for evaluating ecological features where field data may be lacking. These recent studies indicate that climate change is having a profound impact on ecosystems at higher elevations. The last comprehensive alpine ecological survey was conducted by Walker (1997). Field surveys of the alpine ecology in the Snowhawk Valley were conducted in 2016 and 2017 in order to support scoping of a comprehensive Alpine Biodiversity Study. Field surveys of wetlands, waterways, and vegetative communities were conducted beginning in 2016 throughout alpine habitats, and will be completed in 2020.

7.2 Outdoor Recreation and Public Access to Natural Resources

This section applies to all AF installations that maintain an INRMP. JBER is required to implement this element.

7.2.1 Policy and Background

A basic tenet of ecosystem management is the consideration of some form of human consumptive and non-consumptive use. JBER strives to maintain an interactive relationship with local communities by providing as many opportunities for public access as military training, security, safety, and environmental conditions allow. This section discusses programs that directly relate to natural resource management and supporting the morale of our troops. Recreation on JBER primarily includes fishing, hunting, camping, wildlife viewing, photography, hiking, off-roading, boating, winter sports, and wood cutting. A brief discussion of the history of outdoor recreation on JBER is in Appendix H.

The INRMP will only address Class II (dispersed recreational areas) and Class III (special interest areas) recreational areas. Examples of Class II areas include: hunting, fishing, bird watching, boating and hiking. Examples of Class III areas include: valuable biological, cultural, or scenic features that warrant special protection and access control, e.g., fish spawning grounds, wildlife viewing areas or homestead remnants.

Pursuant to the Sikes Act, INRMPs must provide for public access to the military installation that is compatible and appropriate with sustainable use of natural resources and does not interfere with military readiness. Recreational activities are permitted in portions of the undeveloped areas of JBER-Elmendorf and training areas on JBER-Richardson as long as there are no conflicts with the military mission or training activities. This is for the safety of the public as well as military members and to maintain the integrity of the military training experience.

Pursuant to16 USC 670a-f (Sikes Act), installations are authorized to collect, spend and administer fees for hunting, fishing, or trapping on military lands. AFI 32-7064 also states, "Administrative and management costs associated with hunting, fishing, trapping and the management of outdoor recreation access must be fully reimbursed by users fees." DoDI 4715.03(6)(c) states, "Hunting, fishing and access permitting and fees, if collected, must be deposited and used pursuant to the Sikes Act and should be used only on installation where collected." The Sikes Act, 16 U.S.C. 670a(b)(3)(B), allows hunting, fishing and other outdoor recreation fees be reimbursed to the base where they were generated. Such fees are used on the installation from which they are collected for the protection, conservation, and management of fish and wildlife, including habitat restoration and improvement, biologist staff and support costs, and related activities, but for no other purpose.

7.2.2 Public Access

While the Air Force and Army have been training Airmen and Soldiers around the world for more than a century, they also have provided access to quality recreational opportunities for military personnel, their families, employees, and the general public. In 2017, 4,794 users purchased recreation permits and logged over 21,000 user days recreating on JBER. 96% of permit holders were affiliated with the military while the remaining 4% were nonaffiliated civilians. However, all recreational access is dependent on compatibility with military readiness and security. 673 ABWI 32-7001 outlines different levels of public access for JBER-Elmendorf and JBER-Richardson. After 9/11, access to JBER-Elmendorf became more restrictive and is limited to persons with DoD affiliation in accordance with JB Elmendorf-Richardson Instruction 31-113, *Installation Access*. Public access to JBER-Elmendorf Permittees requires a sponsor holding a DoD identification card. An additional exception is made for special draw permit moose bow hunters after completing an orientation and additional security check. A similar exception is being considered for the special draw black bear hunters. Coordination with SFS will occur with any changes proposed for access or area modifications to hunting areas. Access to JBER-Richardson is available to persons with DoD affiliation as well as members of the general public.

The primary concern related to public access for outdoor recreation is safety. Those unfamiliar with the area and/or military operations and regulations may wander into off limits or other restricted areas perhaps putting themselves in danger or causing disruptions to military activities. To mitigate this hazard, JBER worked with iSportsman programmers to develop an online interactive map that allows users to determine their exact location in relation to training areas and other property boundaries. The interactive map also displays openings and closures of all JBER lands. This information is updated in real time by Range Control.

Traditionally, there have been ample opportunities for the public to participate in recreational activities on JBER-Richardson lands. In maintaining a liberal policy of public access, JBER-Richardson relies on a responsible public to adhere to installation policies designed to promote physical security, minimize safety hazards, and protect natural and cultural resources. All recreation activities must be conducted in accordance with applicable rules and regulations.

Civilians and military personnel requesting recreational access to JBER lands and waters must obtain a Recreation Access Permit. This permit provides conditional authorization to enter the training lands and is valid for one calendar year. All recreational users must log in to the iSportsman program to ascertain which training areas are available for recreational use. Individuals are prohibited from entering areas other than those indicated as open. Individuals are also prohibited from entering any of the areas indicated as closed by placard, blockade, verbal warning, red flag or other means of communication. Authorization for access is subject to change based on the current Force Protection Condition levels and mission training requirements.

All recreational users south of the Glenn Highway must log in on the iSportsman recreational access permit system. In addition, all recreational users requesting access north of the Glenn Highway and who do not possess an authorized DoD Identification Card/JBER-Richardson installation pass or are not on the JBER-Richardson Installation Access Roster must go to the Visitor's Center at the main gate to obtain a visitor's pass. Recreational visitors to JBER-Richardson may check in to a maximum of two training areas listed as opened to recreation on the recreational access permit system. All recreational visitors on JBER training areas (TA) must log out and physically vacate the areas by 2300 hours on the day of use. Training areas reopen at 0600 for recreation.

7.2.3 Hunting and Fishing

Hunting and fishing may be permitted so long as harvest rates are sustainable and accordant with the carrying capacity of specific wildlife habitats in order to maintain viable population levels in accordance with ADF&G and consistent with the sustained yield principle. Membership in an organization, including rod and gun clubs, will not be a prerequisite to obtain permits or authorization to hunt or fish on JBER lands.

Hunting

Hunting is an important natural resources-based form of outdoor recreation on JBER lands. Hunting on JBER is conducted under regulations promulgated by the Alaska Board of Game and administered by ADF&G. The Alaska Board of Game process ensures public input in adopting regulations and a sustainable harvest of game species. JBER falls within Game Management Unit 14C, which encompasses 7 different management areas, and follows the corresponding regulations and harvest objectives. JBER manages hunting in terms of areas available, dates within ADF&G seasons, safety requirements, permit and reporting requirements, and other parameters to avoid conflicts with the military mission and provide safe, high quality recreational experiences.

Hunting on JBER includes opportunities for both large and small game in accordance with ADF&G regulations. Moose and black bear hunting requires a special ADF&G draw permit. As specified in ADF&G regulations, there is no prioritization for hunting opportunities on JBER and anyone eligible to hunt in Alaska can participate in the 1) application of drawing permits and 2) small game and fur animal hunting, as long as they obtain a recreational access permit and can meet basic security review requirements. See Section 7.2.5: Outdoor Recreation Management for more information on the outdoor recreation permits and fee structure.

Opportunities differ between JBER-Elmendorf and JBER-Richardson. In addition to ADF&G regulations found in Alaska Administrative Code (5AAC) and State statutes (Title 16), hunting and fishing regulations specific to JBER-Elmendorf are delineated in 673 ABWI 32-7001, Conservation of Cultural and Natural Resources. 673 ABWI 32-7001 conforms to state laws, but it outlines additional and more restrictive regulations for JBER-Elmendorf usage. Firearm restrictions on JBER-Elmendorf limit hunting

opportunities to an archery-only draw hunt for moose. Opportunities on JBER-Richardson are more expansive including draw permit moose hunting on JBER-Richardson for both archery and muzzleloader. Small game and waterfowl hunting is permitted on JBER-Richardson with waterfowl hunting restricted to areas north of Eagle River. Falconry is no longer authorized on JBER lands.

673 ABWI 32-7001 authorizes and discusses black bear hunting on JBER-Richardson. As documented in the 2014 INRMP, ADF&G and JBER collaboratively agreed to pursue a potential ADF&G-permitted black bear hunt on JBER-Richardson using only shotgun with slugs. In March 2015, the Alaska Board of Game increased black bear hunting opportunities in Game Management Unit 14C by including JBER. The method of take authorized was use of a shotgun with JBER's additional requirement to use non-toxic slugs during the hunt. The black bear hunt began spring 2017. For safety purposes during military training activities, portions of JBER are closed to the public while training occurs. Due to military training requirements, access to portions of JBER for the 2016 black bear hunt was curtailed for the majority of the hunting season for safety to the military and public. To provide hunters with the greatest opportunity to have a successful hunt, JBER Conservation submitted a proposal to extend the open season dates for the black bear hunt. The Alaska Board of Game approved this proposal at their March 2019 meeting in Anchorage. The black bear season on JBER is now Sept. 1-June 15. Black bear harvest statistics for JBER can be found in Table 7-2.

Reliable estimates of harvest rates and knowledge of population dynamics are necessary requirements for sound management. Therefore, it is important for JBER to be able track game population levels and harvest rates as they pertain to the installation and to provide such metrics to ADF&G. JBER currently tracks harvest of big and small game species. Big game hunters are required to report their harvest to JBER staff which is then submitted to ADF&G. Small game hunters are requested to report their harvest through JBER's electronic recreation management system (iSportsman). Historical records indicate an average annual harvest of 250 spruce grouse, 100-500 snowshoe hare, and ten ptarmigan (U.S. Army Garrison, Alaska 2007a). From 2015-2017, an average of 201 grouse, 50 snowshoe hare, 20 waterfowl, four ptarmigan and 58 "other" game species were reported harvested annually. An average of 51 moose were harvested annually from 2001-2016. Current moose harvest statistics can be found in Table 7-3.

Table 7-3: Black Bear Hunt Statistics for Hunt #DL455 on JBER

Year	# of Permits	# of Hunters	Harvested
2016*	25	10	3
2017*	25	11	1
2018*	25	8	2
2019**	25	18	4

* Based on Regulatory Year, spring only ** Beginning in 2019, the hunt was scheduled to start 01 September and continue through the following June 15.

Table 7-2: Moose Hunt Statistics on JBER*

Year	# of Permits	# of Hunters	Harvested
2016	122	105	46
2017	121	103	43
2018	121	109	54
2019	121	102	37

*Based on Regulatory Year, hunt dates 1 Sep -15 Jan

Prior to joint basing moose hunting occurred on Fort Richardson prior to 1965, but early records were not maintained. From 1965 to 1974, several hunts were organized and carried out. During 1975 through 1981, no moose hunting occurred. From 1982 to 1986 moose hunters using rifles were guided by ADF&G staff and Fort Richardson game wardens. In 1987 guided hunts were discontinued, and an archery-only moose hunt was initiated. In 1989 a black powder rifle hunt was added. On EAFB moose were not available for hunting prior to 1990. At the request of ADF&G, an archery hunt for moose was initiated in 1990 to reduce moose numbers on military lands. The permit hunts on adjacent Fort Richardson alone were not effective enough in reducing moose numbers, due to movement of the moose onto EAFB lands during hunting

periods. Separate archery and black powder hunts continue today under the ADF&G designated JBER Management Area. Because of a perception of increasing wounding rates, a proficiency skills test was initiated for all permittees. Results of the proficiency testing are compared to resulting wounding rates.

Moose hunting areas are shown on Figure 7-2 and black bear hunting areas are shown on Figure 7-3. The opening of two hunt areas near the JBER-Elmendorf cantonment area and housing has been successful in minimizing problem moose prior to winter. In addition to hunting mortality, several moose each year are destroyed after being struck by cars or trains though the occurrence of nuisance moose during winter on JBER has been reduced by the late season hunt. Meat from non-hunting mortalities is donated to needy individuals or organizations through the Alaska State Troopers (AST). Non-hunting mortality is reported to ADF&G.

Figure 7-2: Moose Hunt Areas on Joint Base Elmendorf-Richardson

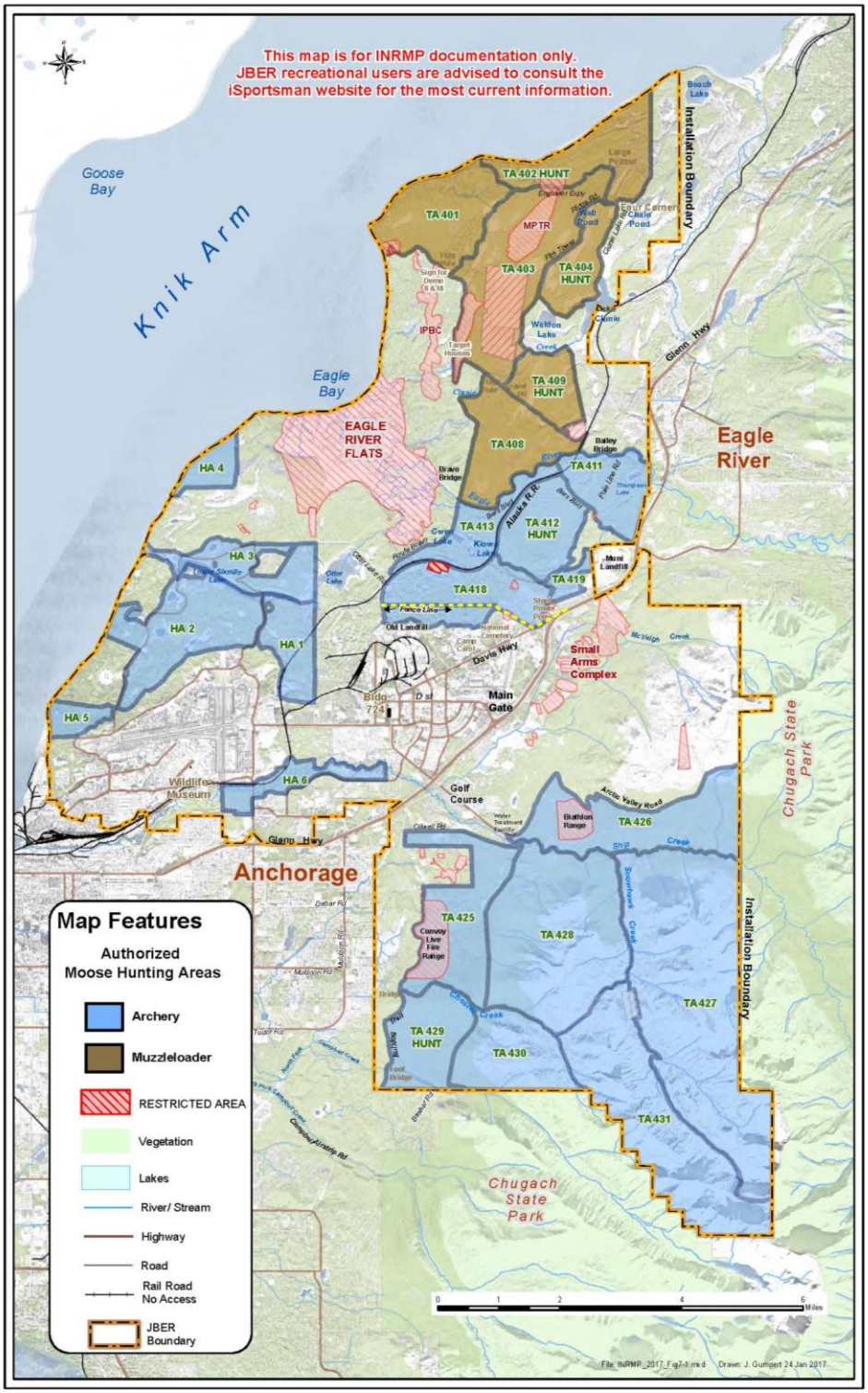
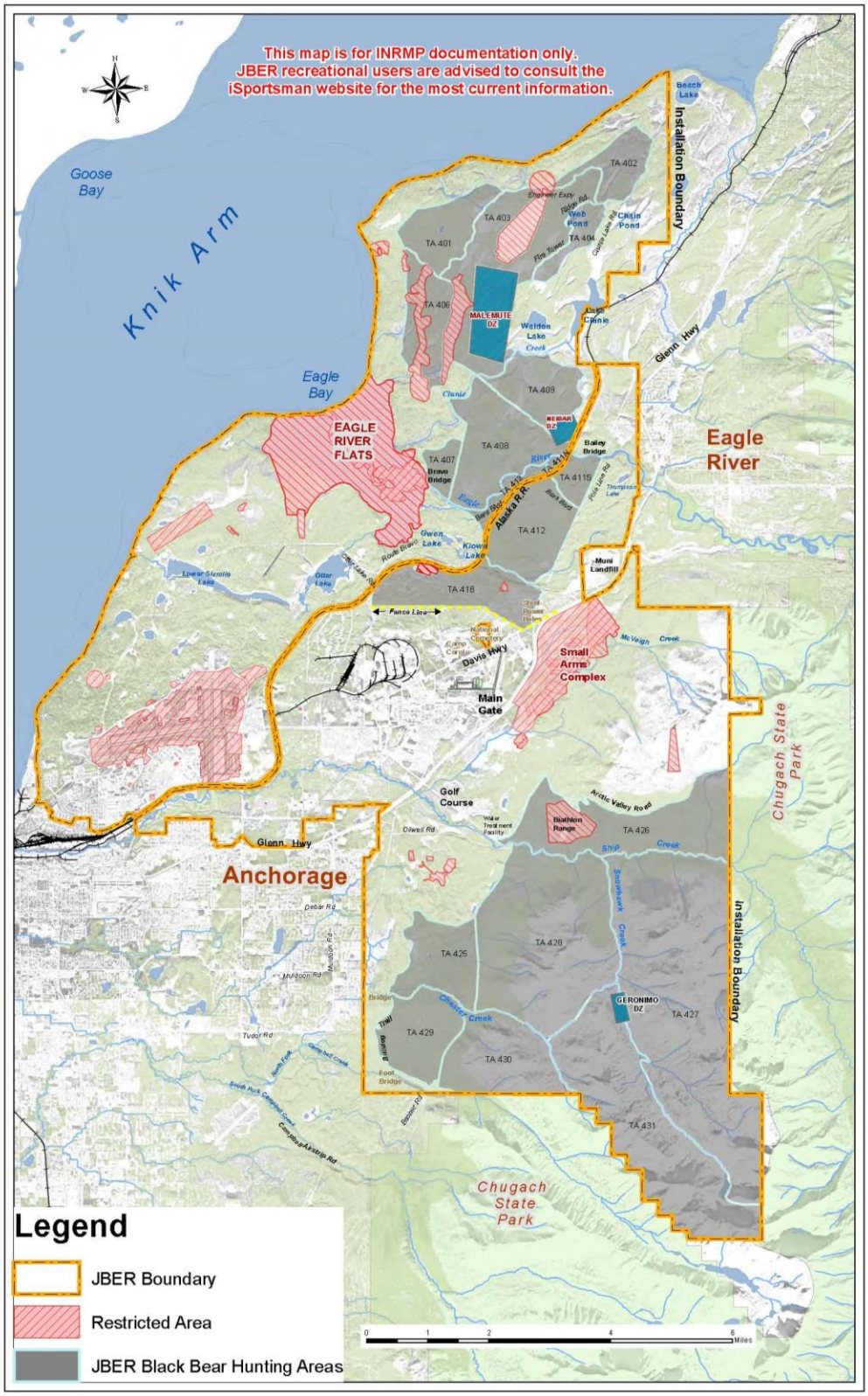


Figure 7-3: Authorized Black Bear Hunting Areas on JBER



Fishing

Fishing is extremely popular year-round on JBER and is centered primarily on stocked lakes. JBER is part of the ADF&G Anchorage Management Area for sport fisheries. There are 30 stocked lakes in this management area with 11 on JBER. Stocking numbers are based on ADF&G-estimated carrying capacity and estimates of fishing pressure. The stocking program has changed greatly over the years. Although past stocking programs released Arctic char, Arctic grayling, lake trout, and steelhead trout, the program currently stocks only rainbow trout, Arctic char and landlocked salmon. A component of fisheries management is collaboration with ADF&G Sport Fish Division to assess the stocked lakes on JBER to provide information to support management decisions for stocking strategies. This survey effort is discussed in Section 7.1.2, Fisheries Management.

Ice fishing is allowed on most JBER lakes from mid-November through late-March under state regulations and bag limits. Driving privately owned vehicles (gross weight 1,500 pounds or over) onto frozen lakes is prohibited for safety reasons.

Two sections of Ship Creek and upstream of Bravo Bridge on Eagle River are also open to fishing under state regulations and bag limits. Sixmile, Otter and EOD creeks are closed to fishing. To better estimate fishing pressure, users can self-report their fish harvest through creel surveys conducted through iSportsman. From 2015-2017 an average of over 4,000 fish (90% of which were rainbow trout) were reported harvested annually from JBER. Permit requirements are discussed in 7.2.5 Outdoor Recreation Management.

The saltwater salmon fishing season, which extends from about 15 July to 1 September, draws numerous anglers from both the JBER community and the general public however, land-based access to the most of the shoreline is restricted. The 20-mile stretch of JBER shoreline is open to fishing under state saltwater fishing regulations and falls under state jurisdiction below the tide line for management purposes. Enforcement of fishing regulations at this site is complicated due to land status.

Fishing at the mouth of Sixmile Creek is legal up to the high water marker jointly installed by the state and Natural Resources personnel. Fishing at this location is popular, however, exact numbers of salmon harvested here are unknown. To better understand salmon harvest rates, creel surveys are conducted through iSportsman.

Subsistence

JBER consists of mostly public domain federal land withdrawn for military purposes. Federal regulations do not provide for subsistence priority on lands withdrawn for military use. 50 CFR 100.3(d), published 27 December 2005, in the Federal Register states: (d) The regulations contained in this part apply on all other public lands, other than to the military, U.S. Coast Guard, and Federal Aviation Administration lands that are closed to access by the general public, including all non-navigable waters located on these lands.

7.2.4 Seasonal Activities

Summer activities include Off Road Vehicle (ORV) use, boating, hiking, wildlife viewing, nature and wildlife photography, biking, berry and mushroom gathering, archery, and limited camping. JBER has been used for such activities as marathons, hiking, backpacking, mountain and road cycling, camping, berry picking, scouting, dog trials, and Special Olympics. Pets must be under either voice or leash control in all areas and must be leashed in developed recreation sites and waterfowl nesting areas.

The following recreational activities are prohibited on JBER: Swimming in any lake, stream, creek or reservoir, horseback riding, removal of minerals (including gold panning, dredging, or mining of any kind) or fossils, collection of plant seeds or other plant propagules for personal or commercial use, boating on Ship Creek, trapping, geocaching, falconry (including active hunting, training or collecting eggs/chicks from nests), operation of unmanned aerial systems (UASs), and trap or target shooting (other than at approved MWR facilities).

Winter activities include skiing (cross-country and downhill), snowmobiling, snowshoeing, sledding, ice skating, winter biking, and dog sledding. Skiing facilities include a downhill ski slope at Hillberg Lake. The Community Services Flight maintains downhill and cross-country facilities at Hillberg Lake Recreation Area and cross-country facilities at Eagleglen Fitness Park. The Five Mile and Bulldog trails are also available for cross country skiing, and the Dyea Ski Area is available for downhill skiing. JBER-Richardson has over 50 miles of cross country ski trails. These are used primarily for military training, but also are available for recreational use. Some of the most popular are the Red, Green, Blue, Yellow, Recreational, and Biathlon Ski trails (U.S. Army, Alaska 1998).

Areas for ice skating on Hillberg Lake, and occasionally Green Lake, are cleared of snow, and several sledding hills are scattered through housing areas. Snowshoeing, ice fishing, and ice skating occur sporadically throughout winter, as there is only a slight demand for these activities. Permits are required to gather firewood and to cut a Christmas tree.

Trail-related activities on JBER include snowmachining, off-roading with four-wheelers, hiking, snowshoeing, and cross-country skiing. JBER-Elmendorf has an extensive trail system, including Knik Bluff Trail, Upper Sixmile Trail, Spring Lake Trail, and an extensive snowmachine trail system. Summer trails, with exception of the ORV trail, are non-motorized, multiple-use trails. Most trails are also open during winter, but with exception of the snowmachine trail system, are not maintained. About 45 miles of snowmachine trails are available throughout JBER-Elmendorf. Refueling is not permitted while snowmachining on lakes. Snowmachine trails are much more extensive than summertime off road vehicle trails, since wetlands are frozen, and damage by snowmachines is minimal. Trails are maintained jointly by Natural Resources, 773 CES, and volunteers. Off-road vehicle restrictions and use classifications are included in Appendix H.

The recreation trail along the western side of the Glenn Highway on JBER-Richardson is the most popular non-motorized route on the installation and is also used as a commuter route for bicyclists during all seasons. It receives almost continuous use from walkers, joggers, bikers, etc. in summer and cross country skiers and bikers in winter. Some trails provide access to the Chugach State Park, crossing portions of JBER-Richardson, and are used primarily by hikers and mountain bikers. An important and heavily used trail to the Ship Creek drainage in Chugach State Park originates on JBER-Richardson below Site Summit. A two-mile trail also exists to provide access to a remote cabin in the Chugach Mountains.

Areas Suitable for Outdoor Recreation Activities

Most lands outside of developed areas are open to recreation activities. However, there are some areas that are off-limits to hunting, fishing, or other recreational activities and are officially designated and marked. Also, hunting is restricted to certain areas as shown on Figures 7-2 and 7-3. General recreation facilities on JBER include four campgrounds, several picnic areas, and several winter and water sports areas, e.g., Hillberg Recreation and Ski Area.

Allowable Use Guidelines

Allowable use guidelines define maximum recreational usage rates for facilities and management areas. Usage rates vary by activity type. Limitations and restrictions on public use of military lands depend on the type of military use. Military use can be broken down into four general categories that affect access.

Training areas and non-firing facilities: Public access into training areas is allowed, subject to safety restrictions and military security, when access does not impair the military mission. Compatible uses generally include natural resources management, habitat improvement, and consumptive use.

Firing ranges, surface danger zones, and non-dudded impact areas: Public access into firing ranges, surface danger zones, and non-dudded impact areas is normally not allowed due to conflicts with the military mission. However, natural resources monitoring, range maintenance, fire prevention and suppression, hunting, and fishing are allowed when feasible.

Dudded impact areas: Public access into dudded impact areas is prohibited because of the hazard of unexploded ordnance. Compatible uses include remote monitoring natural resources and military impacts and prescribed burning to reduce fire hazards and improve habitat.

Wildlife-Related Activities

Wildlife viewing and photography are popular in summer. Many JBER residents drive back roads in evenings, hoping for a glimpse of a moose or bear. Section 7.15, Public Outreach discusses kiosks, interpretive signs, etc. to enhance these outdoor experiences on JBER. Recreators should remember to keep a safe distance from wildlife and be aware of inherent dangers associated with recreating in moose and bear country. Guidelines from ADF&G on moose and bear safety should be followed. Recreators should also be aware that photographing anything associated with the military is strictly prohibited. This includes but is not limited to: aircraft, vehicles, troops, buildings, etc. Photographing wildlife or natural areas on JBER is permitted.

The Watchable Wildlife program provides wildlife viewing opportunities for soldiers, civilians, Alaska residents, and visitors, as well as benefiting public relations. Watchable Wildlife programs include wildlife viewing platforms, nature trails, interpretive signs, brochures, facilities, audio visual productions, public presentations, and cooperative publications with local, state, and federal agencies. This program provides recreation and enhances environmental awareness among participants.

A wildlife viewing platform is located at the entrance to Lower Sixmile Lake, where visitors can see spawning and migrating salmon from July through September. JBER Fisheries worked with a local Boy Scout Troop during the fall of 2019 to construct a foot bridge over the Otter Lake outlet and conduct trail maintenance to the North Otter Lake Wildlife Viewing Platform. The new foot bridge at the lake outlet provides viewing opportunities of the salmon migrating to spawn in Otter Lake. An additional wildlife viewing platform is located at Upper Otter Lake, providing viewing opportunities of birds, fish and wildlife in that area.

Water Sports Activities

Water resources on JBER include natural lakes and ponds, man-made impoundments, streams, and saltwater shoreline. Water-related activities include fishing and boating. Additionally, most outdoor recreation facilities, such as campgrounds, chalets, and picnic areas, are found around lakes and impoundments. Canoes, float tubes, and other non-motorized watercraft are allowed on all JBER lakes. However, boats of any design and any other flotation devices are not authorized on Ship Creek, North Fork

Campbell Creek, or any other stream on JBER, with exception of Eagle River. Lower Eagle River is rated as Class II whitewater (Embrick 1994). At high water, some reaches of the river may be low Class III. All recreational users (including boaters) must obtain an iSportsman permit and use the iSportsman access permit system.

Motorized boating is restricted to electric trolling motors. When necessary for installation or removal of flight line floats on Sixmile Lake, outboard motors may be used with authorization from Natural Resources.

All personal use boats and rafts must adhere to Alaska state law for safety and registration requirements on JBER. In addition, JBER requires that all individuals, while operating the boat or raft, wear Coast Guard-approved personal floatation devices, regardless of age.

Special Group Activities - Camping

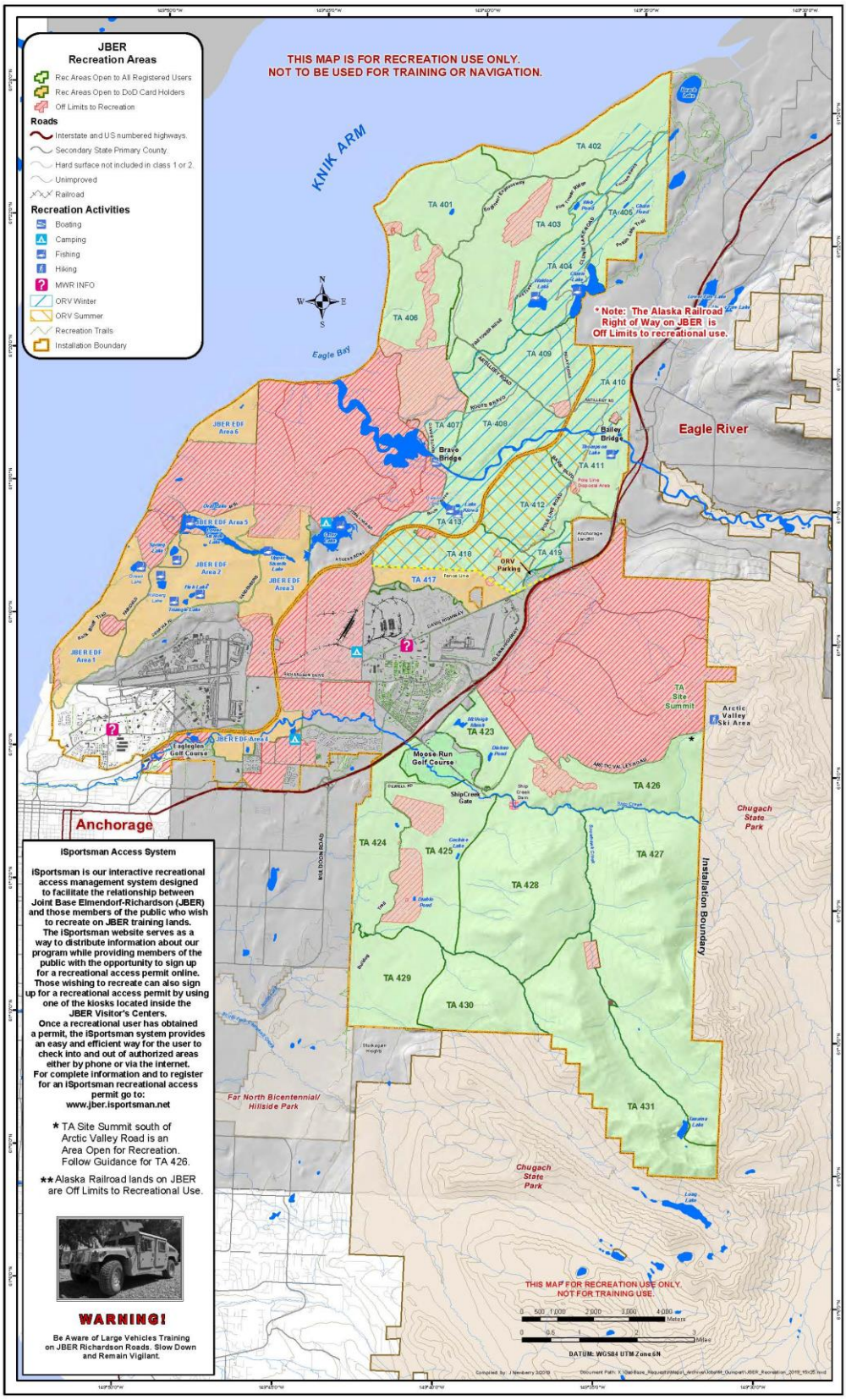
Per ABWI 32-7001, overnight camping is allowed only at three established camping areas: Black Spruce Travel Camp, Fam Camp, and Otter Lake. The Black Spruce Travel Camp and Fam Camp are full service overnight camping facilities. The cabin in Snowhawk Valley is for official use only, not for recreational use. Recreational tent camping on JBER has been restricted to special groups, such as Boy and Girl Scouts and church groups. Primary concerns for tent camping on JBER include fire safety and conflicts with bears. Boy Scouts were granted an easement to develop a Boy Scout-only campground near Triangle Lake, but they never acted on that grant. Girl Scouts have historically used a small five site campground near Green Lake. Green Lake is equipped with fire pits and grills and could be renovated and used as a general purpose tent camping area, but the abundance of black bear attracted to the nearby chalet dumpsters creates a potentially dangerous conflict. Any tent camping site developed on JBER should be thoroughly evaluated and well planned with designs to provide bear-proof food storage and dining. Rules for food use and storage must be clearly defined and enforced.

Management of Outdoor Recreation and Participants

There are a number of elements involved in the management of outdoor recreation and participants. Recreational facility inventory, recreational user monitoring, and recreational impact monitoring are program components. Monitoring recreational use on JBER to determine impacts on the ecosystem is an important facet. Monitoring includes field and user surveys to determine location, type, duration and frequency of use. Recreational use of military land creates impacts on military training lands, primarily a result of legal recreational use and illegal trespass of recreational vehicles.

Recreational user monitoring on JBER includes monitoring users during hunting and fishing seasons, recording and maintaining a database of users through the electronic recreational access permit system (discussed in Section 7.2.5), and conducting recreational user surveys. The iSportsman system database is a useful tool to measure the amount of recreational use. The system records user days and the general location of use on the installation. The system also collects the zip code of the recreational user upon registration and allows managers to assess the population segments utilizing JBER recreational areas. For certain activities such as woodcutting, small game hunting, and fishing, a required user survey provides important data to land managers.

Figure 7-4: Recreation Areas on Joint Base Elmendorf-Richardson



On-the-ground monitoring assesses environmental impacts from recreational use. Recreational use impacts usually result from off-road recreational vehicle use, but can also result from campsites, river use, and foot use along stream and lake banks. Impacts on JBER should be identified, delineated, mapped, and prioritized for repair. Additional recreational use monitoring should concentrate on assessing use in critical areas. Special consideration is given to protection of these critical areas (e.g., nesting sites, highly erodible areas) from negative outdoor recreation impacts.

7.2.5 Outdoor Recreation Management

Moose hunting and fishing are by far the most popular resource demands by recreational users. Hunting opportunities cannot support the current demand for moose; thus, hunter numbers and season lengths must be limited. Demand for hunting of other species on JBER can be met by available resources. Fishing resources support demand on JBER.

Demand for non-consumptive recreational uses (e.g., hiking, camping, wildlife viewing, and cross country skiing) is seasonal and is being met.

Periodically there is demand for certain types of land uses which may not be appropriate (e.g., unrestricted use of off-road vehicles, mountain bike trails, extension of snowmachine trails across JBER-Richardson) and are not permitted. Prior to authorizing such activities, environmental impact analyses must be conducted.

Identifying appropriate outdoor recreational opportunities and reviewing the mission impacts of ongoing recreational activities to ensure the activities do not interfere with Base training mission is an essential INRMP element. Outdoor recreational services are provided by various organizations, including by 673d Civil Engineer's Natural Resources Section and 673d Force Support Squadron. Ensuring repetitive services are not provided by both organization is important customer service obligation.

Generally, recreational areas with facilities designed to support intensive recreational activities, e.g., camp grounds, picnicking, paved walking/jogging or cross-country ski trails or river raft tours are managed by 673d Force Support Squadron. Natural Resource manages dispersed recreational activities, e.g., fishing/hunting, hiking, berry or mushroom harvesting, sightseeing or bird watching.

Refinement and clarification of roles and responsibilities of these organizations related to outdoor recreation activities on JBER is an ongoing process. Other items of importance to address include an evaluation of the fee structure and permit system, issues related to consumptive and non-consumptive uses, ADA requirements for facilities, etc.

One comparable responsibility is trail maintenance. Remote unimproved trails are generally a Natural Resource responsibility, while paved trails are a Force Support Squadron responsibility. ORV or hiking trail maintenance is the responsibility of natural resources staff. Trail maintenance duties include signs, bridges, and brush clearing. Force Support Squadron staff are responsible for grooming all cross-country ski trails and maintaining Eagleglen trails. The Natural Resources office will accomplish remote trail tasks when staffing and funds are available.

Mutually beneficial outdoor recreational opportunities include construction or maintenance of fishing docks, lake access, portage sites, bear resistant food storage lockers, and informational kiosks. Consideration should include making docks handicapped-accessible particularly at Hillberg and Lower and Upper Sixmile lakes.

In many cases gates will prevent unauthorized access by vehicles, while allowing foot and bicycle traffic; buried posts may also be used to restrict access. Gates should be locked, with key access available for enforcement and work crews who require access for duty purposes. This system is similar to that used on JBER-Richardson and should alleviate much illegal four-wheeling and damage currently taking place.

Other opportunities for recreation facility improvements include the following:

- The Clunie Lake area could be improved by graveling the parking area, providing seasonal sanitation facilities, and installing barriers to keep vehicles out of wetlands.
- Bear resistant food lockers at Otter Lake to reduce wildlife conflict
- Waldon Lake has a good parking area, but adjacent natural areas are being degraded by uncontrolled, unauthorized uses, such as illegal waste disposal and camping. A boardwalk or portable pier for anglers could be installed to enhance fishing opportunities.
- Thompson Lake requires the installation of barriers around common parking areas to reduce degradation to wetlands and shoreline.
- Improvements to Gwen Lake should concentrate on shore rehabilitation due to extensive damage from both beaver activity and human foot traffic. Development of a trail and possibly boardwalks in marsh and wetland areas could greatly improve angler access.
- Hardened foot trails need to be upgraded at several lakes on JBER to increase safety and access over muskeg surrounding stocked lakes. This action will improve fishing access.
- Informational kiosks conveying educational content on conservation practices such as wildlife interaction, preventing the spread of noxious and invasive weeds, and protection of wetlands and water resources.

Outdoor Recreation Permits and Fee Structure

AFI 32-7064, *Integrated Natural Resource Management* directs installations that administrative and management costs associated with hunting, fishing, trapping and the management of outdoor recreation access should be fully reimbursed by user fees. JBER requires recreational access permit to separate and safeguard the military training from recreational activities.

Permits

All persons (enlisted, military-affiliated and civilian) wishing to recreate on JBER must obtain a recreation permit (iSportsman permit) through the iSportsman system (jber.isportsman.net). Recreators must have a valid iSportsman permit and sign in/out using the iSportsman system prior to recreating, with the exception of MWR sponsored facilities. Recreation on military lands is subject to availability and dependent on military security/training requirements. Some activities require an additional permit. This includes, but is not limited to: personal use firewood cutting, Christmas tree cutting, moose hunting, bear hunting, and special group camping. Information on how to obtain permits is on the JBER iSportsman website.

All hunters on JBER must have all required state and federal hunting licenses and stamps and state-issued hunter safety cards in possession while hunting. A state fishing license is required on JBER. Public access to JBER is based on the current security status of the installation. Access is only allowed during normal or routine security operations.

Individuals desiring to obtain a JBER moose or black bear hunt permit must:

1. Successfully draw a State of Alaska moose or black bear hunting permit,

2. Show proof of successful completion of a State of Alaska-approved Basic Hunters Education course (may be from any state but must meet Alaskan standards),
3. In addition to hunters education, moose hunters must also complete a State of Alaska approved bowhunter or muzzleloader education course, depending on which hunt they have drawn,
4. Purchase all appropriate state licenses and tags (i.e., non-resident moose or black bear tags),
5. Pass a proficiency test administered by JBER,
6. Attend a hunt orientation presented by JBER,
7. Obtain a iSportsman permit, and
8. Pay a moose permit ($150) or black bear permit ($125) conservation fee to JBER.

JBER moose and black bear hunts are intensively controlled; requiring hunter completion of several administrative and procedural steps prior to issuance of a permit. Hunts are unguided and not regulated in terms of area selection or hunter density. Harvested moose or black bear may be checked at the kill site by either natural resources personnel or by Conservation Law Enforcement personnel. Checks allow for collection of data (sex, age class, antler size, general health, exact location) and samples (as appropriate) as well as provide an opportunity for a check of hunter compliance with pertinent policies and regulations. Hunters are required to report wounded animals.

User Fees

Pursuant to 16 USC 670a-f (Sikes Act), installations are authorized to collect, spend and administer fees for hunting, or fishing on military lands. AFI 32-7064 also states, "Administrative and management costs associated with hunting, fishing, trapping and the management of outdoor recreation access must be fully reimbursed by users fees." The Sikes Act, 16 U.S.C. 670a(b) (3)(B), allows hunting, fishing and other outdoor recreation fees be reimbursed to the base where they were generated. Such fees are used on the installation from which they are collected for the protection, conservation, and management of fish and wildlife, including habitat restoration and improvement, biologist staff and support costs, and related activities, but for no other purpose. JBER initiated access fees for certain recreational activities in 2001 for example, in coordination with ADF&G, JBER began charging moose hunters an access fee. In 2015, JBER initiated a $10 recreational access permit fee and a reduced fee of $5 fee was established for seniors and disabled individuals. Roughly 6,000 permits are sold each year.

Section 7.8, Forest Management discusses procedures for commercial timber sales and personal use firewood sales on JBER. These procedures ensure that the U.S. Treasury receives proceeds from wood product sales on BLM lands in accordance with federal regulations, while also ensuring that the Air Force receives sufficient timber receipts to fund forest management activities and regeneration costs.

On 26 October, 2018, JBER stopped issuing free woodcutting permits. Beginning on 1 November, 2018, woodcutting permits are sold at $17.50 per half cord and $35.00 per full cord. JBER sales of timber, firewood, and Christmas trees are required to comply with DoDI 4715.03 and AFI-32-7064. Approximately 200 half-cord and 200 full-cord permits are sold annually.

Reimbursable Conservation Program Funds

Proceeds are deposited into reimbursable conservation program accounts and can be withdrawn to be reinvested in installation natural resources programs, as outlined by AFI32-7064. Two separate accounts are maintained with different limitations. Per DoDI 4715.03, forestry funds go into the Military Service's forestry account in accordance with Section 2665. Recreational permit access fees are collected in iSportsman through pay.gov. Program funding is consolidated at AFCEC and returned to JBER annually, as required by AFI 32-7064 and the Sikes Act. The average annual recreational access revenue generated

is approximately $55k. This revenue is used to support and improve the iSportsman recreational access program.

7.3 Conservation Law Enforcement

This section applies to all USAF installations that maintain an INRMP. JBER is required to implement this element.

7.3.1 Policy and Background

A critical component of the JBER natural resources management program is conservation law enforcement. Once termed Game Wardens, today's Conservation Law Enforcement Officers (CLEOs) are responsible for enforcing a myriad of federal, state, and local natural and cultural resource laws and regulations. Gone are the days when Game Wardens simply conducted compliance inspections of hunters and anglers to ensure they were licensed and did not exceed daily bag limits. CLEOs are frequently involved in the protection of rare or unique species and their habitat, the illegal disposition of hazardous and solid wastes, air and water quality issues, and the protection of historic and pre-historic cultural resources.

Without professional natural resources enforcement personnel in the field, and successful prosecution, natural resources management activities are ineffective. Such features as harvest controls, protection of sensitive areas, pollution prevention, hunting and fishing recreation, non-game protection, and others are dependent upon effective law enforcement. In regard to conservation law enforcement on JBER, JBER and the State of Alaska operate with concurrent jurisdiction.

Conservation law enforcement has a long history of providing service to EAFB and Fort Richardson. The MCA program has a 26-year history at EAFB and the surrounding community. Military Police game wardens provided similar service to Fort Richardson with the exception of 1999-2005 when Fort Richardson implemented a contract to provide civilian conservation enforcement. Military Police game wardens were reinstated from 2005-2014. The JBER Conservation Law Enforcement section has evolved and been redefined to incorporate community policing practices with more encompassing duties, including educational outreach programs, minimizing wildlife conflict risk, and protection of environmental, cultural, historic, and natural resources.

7.3.2 Authority and Jurisdiction

The JBER Conservation Enforcement section is within Natural Resources. The section is made up of personnel who have met or will meet law enforcement training requirements outlined in AFI 32-7064 and DoDI 5525.17 or serve as MCAs. These personnel work under the supervision of a fully certified CLEO, as outlined in DoDI 5525.17, AFI 32-7064, ABWI 32-7001, and OI 32-700.

JBER is located within the State of Alaska. The State is responsible for the management of fish and wildlife populations (including management of hunting, fishing and trapping activities) throughout the State, including on military installations. In accordance with the Sikes Act, (16 U.S.C. Section 670, (4)(A)(ii)), which states that:

> *nothing in this title – enlarges or diminishes the responsibility and authority of any State for the protection and management of fish and resident wildlife;*

JBER operates under a concurrent jurisdiction system with ADF&G and AWT in regard to fish and wildlife enforcement.

Conservation enforcement authority stems from Public Law 86-797 (Sikes Act), 18 USC *§* 13 (Assimilative Crimes Act), and 10 USC *§* 2671, Military Reservations and Facilities: Hunting, Fishing and Trapping.

- The 2014 Sikes Act Improvement Act includes two specific professional natural resources enforcement items:
    - Required enforcement of applicable natural resource laws (including regulations); and
    - Expansion of Department of Defense authority stating that, *All Federal laws relating to the management of natural resources on Federal land may be enforced by the Secretary of Defense with respect to violations of the laws that occur on military installations within the United States.*
- The Assimilative Crimes Act, 18 USC *§* 13, *makes state law applicable to conduct occurring on lands reserved or acquired by the Federal government as provided in 18 USC §7(3), when the act or omission is not made punishable by an enactment of Congress.*
- Military Reservations and Facilities: Hunting, Fishing and Trapping.
    - 10 USC § 2671, paragraph (a)(1) *require that all hunting, fishing and trapping at the installation or facility be in accordance with the fish and game laws of the state in which it is located;* and
    - 10 USC § 2671, *paragraph (c) whoever is guilty of an act or omission which violates a requirement prescribed under subsection (a)(1) or (2), which act or omission would be punishable if committed or omitted within the jurisdiction of the state in which the installation or facility is located, by the laws thereof in effect at the time of that act or omission, is guilty of a like offense and is subject to a like punishment.*

DoDI 5525.17 Conservation Law Enforcement Program (CLEP), outlines personnel and training requirements, authority powers and jurisdiction, Federal laws with enforcement requirements, charging documents and procedures to notify magistrate court of misdemeanors, OSI, USFWS and AUSA for felonies, and enforcement coordination and agreements.

AFI 32-7064 Integrated Natural Resources Management, paragraph 7.3. Conservation Law Enforcement states: *Commanders are responsible for the enforcement of state and federal fish and game laws on AF installations. In accordance with the Sikes Act (16 U.S.C.§ 670a(b)(1)(H), installations must address the enforcement of applicable natural resources laws in the INRMP. DoDI 5525.17, Conservation Law Enforcement Programs (CLEP) provides guidance for conservation law enforcement on Department of Defense installations.*

> *7.3.1. Cooperative Law Enforcement. Commanders should provide reasonable access to federal and state conservation officers for the purpose of fish and wildlife law enforcement on AF installations. Commanders are authorized to enter into law enforcement support agreements on a reimbursable basis with federal and state agencies having responsibility and jurisdiction for conservation law enforcement.*

Memorandum of Understanding among DoD, USFWS, and International Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resource Management Program on Military Installations. In addition to outlining how cooperative management will take place, this states that:

> *The states in general possess broad trustee and police powers over fish and wildlife within their borders, including -absent a clear expression of Congressional intent to the contrary -fish and wildlife on federal lands within their borders. Where Congress has given federal agencies certain conservation responsibilities, such as for migratory birds or species listed as threatened or endangered under the Endangered Species Act, the states, in most cases, have cooperative management responsibilities.*

JBER operates under a concurrent jurisdiction system in coordination with other federal, state, and local law enforcement agencies, including 673d Security Forces Squadron within JBER borders. Agencies involved in natural and cultural resources enforcement on JBER include USFWS, Alaska Department of Public Safety/Alaska Wildlife Troopers, ADF&G, State of Alaska Department of Law, 673 ABW Judge Advocate's Office, 673 CES Natural Resources, NMFS, and BLM.

Other references: 16 USC 470aa-470mm, Archaeological Resources Protection Act (ARPA); AFI 51-201 Administration of Military Justice; AFI 51-202 Non-Judicial Punishment; AFI 51-206 Use of Magistrate Judges for Trial of Misdemeanors committed by Civilians; and AFI 32-7065 Cultural Resource Management.

7.3.3 Military Conservation Agent Program

Military Conservation Agent Program MCAs are selected from applicants from active duty 673 ABW and supported and tenant units. They volunteer their time to serve as additional duty MCAs. The MCA program was initiated as a means of providing Natural Resources with additional manpower to enforce laws and regulations, respond to wildlife problems and incidents, educate the public, and patrol EAFB lands. Prior to 1991 MCAs received little or no training and were not authorized to enforce regulations, write citations, or carry firearms. The first class of enforcement-qualified MCAs were trained and certified by Alaska's Bureau of Wildlife Enforcement in 1992, and annual training classes have been conducted since. For more information on MCA training see Section 5.1.1.

There are three levels of MCAs. Level 1 MCAs are allowed to ride along and assist fully qualified agents but have no enforcement authority. Level 2 agents are those who have been trained and certified by the state and designated in writing by the 673d CES commander annually, in accordance with ABWI 32-7001. They are authorized to enforce laws and regulations, write citations, carry firearms, and verbally detain personnel that are to be transferred to 673d Security Forces Squadron control. Level 3 agents are supervisory agents. This program has had a significant effect on JBER-Elmendorf's ability to enforce natural and cultural resources laws and regulations. Prior to the initiation of this program, enforcement was sporadic at best, due to manpower and funding constraints among the various agencies responsible. Since 1995 MCAs have provided an average of three man-years annually.

Once MCAs are trained and certified as Enforcement Agents by the State of Alaska and Natural Resources, they are authorized to enforce state fish and game laws, federal environmental laws, and DoD and Air Force regulations on JBER. Their scope of authority within that jurisdiction is similar to that of other federal land management agencies. Federal citations are handled through the Federal Magistrate's Office via 673d Security Forces Squadron, and issued for violations of state/federal fish and game laws in accordance with 10 USC 2671, 16 USC 670 (Sikes Act), DoDI 5525.17, and AFI51-206. In certain situations involving violations of state fish and game laws/regulations, CLEOs reach out to the AST and citations are issued/handled through the State court system.

Unlike CLEOs, MCAs have a limited scope of authority. MCAs are authorized to issue bailable citations only. Felony charges and mandatory court citations are handled by the CLEO's. MCAs are not full time

law enforcement personnel and therefore are not trained or authorized to apprehend, detain, initiate traffic stops, or perform complex investigations. Verbal detention is allowed only until fully qualified law enforcement personnel arrive to take control of the situation. MCAs do not carry hand cuffs, batons, etc. MCAs are authorized to patrol the restricted access areas of JBER only, and may accompany full time law enforcement personnel during patrols outside the restricted access areas.

7.3.4 Conservation Law Enforcement Investigators/Park Rangers

Natural Resources currently has two full-time GS-1801 Conservation Law Enforcement investigators and a GS-0025 Park Ranger assigned to natural/cultural resources enforcement. Enforcement duties include conducting short- and long-term investigations, preventative enforcement, public education, issue of citations, patrols, and wildlife incident response. These individuals also serve to recruit, train, equip, and supervise up to 50 MCAs. Conservation Law Enforcement personnel also conduct newcomers briefings, wildlife safety briefings, and assist the natural resources technician with permit issue and the biologists with resource monitoring.

7.3.5 Cultural Resources Enforcement

Cultural resources enforcement is not a significant problem at JBER. However, several incidents have occurred at remote sites. Conservation Law Enforcement personnel are or will be trained in Archeological Resources Protection Act crimes as well as Native American Graves Protection and Repatriation Act incidents. Trespassing at the Nike site has been an ongoing problem. JBER Law Enforcement personnel periodically check the site as well as other known archeological sites on JBER.

7.3.6 Other Enforcement Areas

The Conservation Enforcement Section also enforce various natural resources and outdoor recreation activities, including wood and Christmas tree cutting (permit required), water sports, all-terrain vehicle operation, snowmachining, and safety issues. Problem areas include cutting firewood without a permit, selling firewood, and extensive illegal and unsafe ORV operations. Public outreach, force protection, and compliance and safety checks for day use areas, sport fishing, boating, and other users, such as for jogging, hiking, skiing, berry picking, etc. are also performed. Providing an enforcement presence regarding the CIBW habitat has become an added responsibility.

The Conservation Enforcement Section is also involved in non-enforcement activities on JBER, such as search and rescue, health and safety checks, and nuisance wildlife. Search and rescue on JBER averages two incidents per year. The Conservation Enforcement Section maintains Search and Rescue Incident Command credentials and appropriate certifications. Health and safety checks occur during patrols routinely checking vehicles parked in remote portions of JBER to ensure public safety, especially during adverse weather conditions. JBER adheres to the Living with Wildlife Memorandum of Understanding between ADF&G, Fort Richardson, and EAFB (See Section 2.4.1, *Natural Resource Constraints to Mission and Mission Planning*). Nuisance wildlife calls include dispersing moose, bears, wolves, and smaller mammals and are handled using procedures developed between JBER natural resources personnel and ADF&G. Wildlife conflicts are further discussed in Section 7.1.3, Wildlife Management.

7.3.7 Prosecution of Natural and Cultural Resource Violations

In accordance with the authorities outlined in Section 7.3.2, JBER is predominantly a concurrent jurisdiction installation. The Alaska Wildlife Troopers and JBER have agreed to provide for concurrent State and federal enforcement jurisdiction for violations of State fish and game regulations. Violators of

State and federal natural and cultural laws and regulations on JBER are subject to prosecution in Alaska and Federal courts. Active duty military personnel, reservists, and guard personnel under title 10 orders who violate JBER regulations or natural and cultural resource laws and regulations in addition to being subject to prosecution in Alaska and Federal courts, are also subject to administrative and disciplinary action under military regulations and the Uniform Code of Military Justice (UCMJ). Violations of natural resource laws include such acts as fishing or hunting without a license, fishing in closed areas, or negligently feeding game.

Trespassing

Crossing the JBER boundary or the internal boundary of an off-limits area without approval constitutes trespass. Little of the JBER-Richardson boundary is fenced or posted with boundary signs, which adds to the problem. However, trespass is often premeditated. Posting the boundary would reduce accidental trespass, but the effect on premeditated trespass would be minimal. Boundary marking can only be effective in concert with enforcement efforts and successful prosecution associated with premeditated trespassing.

Numerous trails and waterways create easy access for an individual to enter JBER. A recreational access system is available and requires all users to sign in and out of recreational areas on JBER. On JBER-Richardson users may only sign into and access those training areas that Range Control considers safe for recreational activities on that day. However, electronic survey counters indicate many recreators do not sign in and enter training areas on their own accord. Surveys were conducted between November 2008 and February 2009 on five trails around Bulldog Trail (bordering Muldoon Street) and during March- April 2009 on Artillery Road (bordering Eagle River). Survey results indicated that 75 and 50 percent, respectively, were unauthorized trespassers. Barrier fencing was installed across Artillery Road; this action virtually eliminated the trespassing concerns in this area. Another survey was conducted at the south Bulldog trailhead from 28 February 2017 through 31 July 2017. The results of this survey indicated 2168 individuals entered the installation from this area, only 224 were authorized. 1231 (63%) of those individuals entered when the area was closed to recreation. See the table below for trespass warnings/citations issued from 2008-2018.

Table 7-4: JBER Trespass Warnings/Citations 2008-2019

2008	48	**2011**	338	**2014**	125	**2017**	114
2009	304	**2012**	182	**2015**	255	**2018**	119
2010	193	**2013**	167	**2016**	172	**2019**	128

Routine patrols in training areas south of the Glenn Highway were virtually eliminated April 2014 after losing four Military Police positions. Recent patrols and the use of game cameras indicate an increase in recreational activity. All users contacted in this area during 2016 patrols were issued warning citations for trespassing.

Off-Road Vehicle Activity

Illegal off-road vehicle activity is a persistent problem on JBER. This includes off-roading by trucks, jeeps, four-wheelers, dirt bikes, and snowmachines. Off-road vehicle activity is particularly critical during summer due to the potential for damage to wetlands and oil and fuel contamination of lakes and streams (anadromous streams in particular). Illegal off-roading, depending on the area, can result in loss of driving privileges on JBER, fines, or a court appearance. This activity is enforced by the use of trail cameras, routine patrol, Range Control, or witness reporting.

Wildlife Violations

Two major problems are poaching and feeding wildlife. Poaching is not uncommon during the salmon season (approximately 1 July through 15 September) based on anonymous tips, field contacts, and citations issued. Most poaching occurs at night or at low tide at the mouth of Sixmile Creek where it empties into the Cook Inlet. Individuals have been reported illegally taking as many as 50 salmon at this location, which is on State of Alaska tidelands. Conservation Enforcement personnel have no enforcement authority on the tidelands, creating a serious resource concern. Some poaching also occurs at the salmon census weir, on the spawning grounds in Upper Sixmile Lake, and in the portion of Ship Creek adjacent to the Eagleglen Fitness Park. In the past, several moose carcasses have been found under suspicious circumstances. Incidents involving illegally harvested moose, brown and black bears, and illegal trap lines have been jointly investigated with Alaska Wildlife Troopers and successfully prosecuted.

Feeding of wildlife, intentionally or negligently, is a significant problem especially in housing areas. Feeding contributes to wildlife conflict problems by habituating animals to humans. Feeding includes unsecured garbage, unsecured pet food, bird feeders during summer, dirty barbecue grills, etc. This is a difficult area to enforce, but state law requires a $300.00 fine for those in violation of negligent feeding laws ($330.00 on federal land which includes a court fee/surcharge); intentional feeding is a Class A misdemeanor (5 AAC 92.230). Means to minimize wildlife feeding problems on JBER include public education through media outlets and Newcomer's Briefing and responses to nuisance calls in housing areas, which include determination of the cause of the animal's presence.

7.3.8 Manpower, Funding and Equipment

Providing adequate support for the Conservation Law Enforcement program is an ever challenging issue. The program has three full-time paid positions. All other support is provided by MCAs. Recently, with the increase in deployments and other national and JBER events, the ability to retain qualified MCAs has diminished. JBER must continue to provide adequate conservation enforcement to be within Sikes Act compliance, which will require additional full time manning.

The MCA program is important in day-to-day operations at Natural Resources. Assuming that the MCA program continues to function as it does now, averaging three man-years annually, and assuming comparable pay to entry-level state Wildlife Troopers, the MCA program is estimated to provide over $200,000 per year of volunteer time and effort to Natural Resources.

In spite of the success of the Conservation Law Enforcement program, it has periodically been hampered by limited funds and equipment. Three four-wheel-drive vehicles, along with several four-wheelers and snowmachines are available through Natural Resources. Safety equipment, such as firearms, ammunition, shared ballistic vests, radios, and pepper spray is also provided. MCA badges are provided by Natural Resources, but the duty uniform is provided by the individual. Given the increasing prominence of this program and the degree to which Natural Resources have come to rely upon this section, adequate funding must be sustained.

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

This section applies to AF installations that have threatened and endangered species on AF property. This section is applicable to JBER.

7.4.1 Policy and Background

The ESA (Title 16 USC, sections 1531-1544) requires protection and conservation of federally listed threatened and endangered plants and animals, and their habitats. Conservation includes the use of all methods and procedures that are necessary to bring any threatened and endangered species to the point where the measures pursuant to the ESA are no longer necessary.

The goal of the JBER Threatened and Endangered Species Management Program is threefold: 1) conserve and maintain self-sustaining populations of threatened and endangered species, consistent with military policy, mission sustainability, and carrying capacity of the ecosystem; 2) avoid jeopardizing the continued existence of threatened and endangered species within JBER, in part through analyses and studies aimed at investigating the effects of anthropogenic activities on ESA species; and 3) aid in the recovery of CIBW by contributing to the scientific knowledge base of the species and by maintaining or enhancing prey species habitat/production.

The focus of the JBER Threatened and Endangered Species Management Program is to maintain mission flexibility through the conservation and management of federal and State-listed species.

7.4.2 Protection of the Cook Inlet Beluga Whale on JBER

Section 2.3.4, Threatened and Endangered Species and Species of Concern briefly discusses CIBW as an endangered species and the critical habitat for the CIBW distinct population segment. This section discusses actions taken with regard to possible resumption of year-round, live-fire training at ERF Impact Area. The actions included a draft environmental impact statement (U.S. Army, Alaska 2010a) and a biological assessment (U.S. Army, Alaska 2010b) which resulted in a BiOp (NMFS 2011). The BiOp concluded that implementing the proposed action under Alternative 2 is not likely to jeopardize the continued existence of the CIBW, nor destroy or adversely modify its critical habitat. Since the issuing this BiOp, changes to the proposed project and the publication of new acoustic guidelines have prompted new research and a new NEPA process with the associated section 7 and MMPA analyses.

CIBW Conservation Measures

The following conservation measures are employed for the protection of the CIBW, as well as, other marine mammals in Knik Arm.

Enforcement of ESA and MMPA by JBER Conservation Enforcement Program through:

- close coordination with NMFS Enforcement;
- routine training of JBER Civil Engineer Group;
- restrict boat launching from JBER lands in Knik Arm, with exception of national security or activities coordinated with NMFS; and
- no tracked or wheeled maneuvering permitted within a 50-meter (164 ft) buffer around all streams, lakes, and any open, flowing water located on JBER lands during the summer, and all appropriate state and federal permits obtained prior to any in-water activities occurring in anadromous waterways.

Educate JBER residents and visitors on presence and protection of endangered species and marine mammals through:

- include species information and ESA restrictions in Newcomers' brief;
- briefing for Commanders, range control, and flight operations; and

- news media articles on any aspect of the JBER CIBW program or projects involving primary biological features (PBF), as appropriate. Primary Biological Features replaced the old term, Primary Constituent Elements. For the purposes of this document, PBF and PCE are considered synonymous.

Monitor/study the following:

- CIBW usage of Knik Arm and Eagle River.
- timing and extent of ice cover on the tidally-influenced portion of Eagle River;
- salmon escapement on or through JBER and smolt production on JBER spawning grounds (See Section 7.1.2);
- stormwater discharges, specifically focusing on deicer and suspended solid (sediment) concentrations, identified in the current JBER Storm Water Pollution Prevention Plan; and
- marine fish assemblage in Knik Arm and the Eagle River estuary.

Increase scientific knowledge base on CIBW, their habitat, their prey, and potential stressors by:

- assisting with beluga or beluga-related studies and conservation efforts in Knik Arm to the greatest extent possible as dictated by funding, staffing and military constraints.
- Investigate beluga foraging ecology within Knik Arm and Eagle River
- incorporating improved methods and technologies allowing for greater detection and ethological sampling. Potential methods include photo-identification, using high-definition cameras, thermal imaging (e.g. FLIR), active acoustic monitoring (e.g. DIDSON), passive acoustic monitoring, bathymetry mapping, etc.; and
- measuring noise levels (in-air and in-water) of specific military training activities, as applicable;

Consider the viability of the following:

- enhancing spawning substrate in appropriate locations (See Section 7.1.2),
- conducting stream bank restoration and erosion control projects on anadromous streams and shorelines on JBER to minimize effect on beluga whale habitat and their prey (See Section 7.1.2).

Protective actions required by the ESA section 7 Informal consultation on winter firing into ERF Impact Area:

- JBER will not intentionally fire munitions into Eagle River or any open body of water at any time [JBER Integrated National Resource Management Plan (INRMP)].

- JBER will not intentionally fire munitions into areas outside military reservation boundaries (Army Policy and U.S Army Alaska [USARAK] Regulation 350-2). Eagle Bay is outside reservation boundaries.

- Harassment of fish and wildlife is prohibited. Any action that disturbs fish and wildlife is considered harassment by federal and Alaska State law. Harassment includes such activities as pursuit with vehicles or aircraft, feeding, and shooting of wildlife. Individuals who harass fish and wildlife are subject to prosecution (Federal and State Law reflected in USARAK Regulation 350-2).

- Range safety regulations (DA Pam 385-63) dictate that every training activity include a surface danger zone (SDZ) tailored to the selected target(s) and specific to the weapon system to be utilized. The SDZ defines the area which contains all rounds and their effects to a 1:1,000,000 probability. Once the SDZ has been reviewed and approved by Range Control, the unit leadership converts this into specific firing limits for both lateral and vertical displacement (deflection and quadrant) to ensure all rounds land and effects are contained within the specified SDZ. The SDZ may not extend beyond military boundaries (e.g. into Eagle Bay) (DA Pam 385-63 Range Safety).
- These policies and regulations are designed to ensure that units fire strictly at authorized targets and that the arrangement of those targets is carefully designed such that all rounds and their effects are contained, to a very low probability of failure, within a known and carefully mapped out area.
- The establishment of habitat protection buffers within which no targets may be located. Buffer distances will be re-evaluated as new information becomes available. These buffers are:
    - A 500-m (1,640-ft) wide swath of land extending along the shore of Eagle Bay.
    - A 1,000-m (3,280-ft) wide swath of land extending along the shore of Eagle Bay when 120-mm mortar HE rounds are used.
    - A 130-m (426-ft) wide swath extending outward from each bank of Eagle River, beginning from the mouth at Eagle Bay and extending upstream to a point 100 m (328 ft) above the confluence with Otter Creek.
    - A 50-m (164-ft) wide swath extending outward from each bank along the main Eagle River channel beginning at the point 100 m (328 ft) upstream from the Otter Creek confluence and extending upstream to the Bravo Bridge.
    - A 50-m (164-ft) wide swath extending outward from each bank of Otter Creek beginning at the confluence with Eagle River and extending upstream to the ERF Impact Area boundary to include a tributary for the protection of essential fish habitat.
    - In addition, firing into Eagle River and Otter Creek channels during all conditions, is prohibited.
- JBER will continue to work cooperatively with NMFS to monitor beluga whales in Eagle Bay and Knik Arm. Monitoring will continue to be refined to improve the ability to detect belugas.
- JBER will conduct monitoring during the summer/fall to identify the presence of beluga whales in Eagle River.
- JBER will continue to implement the most current INRMP. The INRMP contains specific actions to protect, inventory, maintain, and improve wildlife habitat and fisheries resources and protect water quality.
- JBER will continue to comply with federal and state laws and regulations relating to fish and wildlife conservation and management.
- JBER will continue to observe the ban on using white phosphorous in wetlands.
- Long term monitoring for white phosphorous will continue as outlined under the Comprehensive Environmental Response, Compensation, and Liability Act Record of Decision.

- JBER will continue implementation of existing environmental programs.
- ERF is permanently off limits to maneuver training and all recreation.
- JBER will not provide recreational boating access to Knik Arm and Eagle Bay from JBER land.
- JBER will continue to prohibit rafting access to the ERF Impact Area.
- Eagle River will remain unobstructed to normal passage of beluga whales through the entirety of ERF. Army activities will not cause any impedance to either ingress or egress of beluga whales along the stretch of Eagle River from Bravo Bridge downstream to the mouth at Eagle Bay.
- JBER proposes to fire only under frozen conditions (generally November-March), a time period when beluga abundance in the action area is low and when adult salmon numbers are expected to be low to nonexistent. Thus, the likelihood of having a beluga present in either Eagle Bay or River during firing is greatly diminished.
- JBER will post remote cameras throughout the winter, along Eagle River at summer CPOD sites and review the imagery in the spring upon completion of the action.
- Indirect live-fire weapons training using weapons systems and munitions would continue to be conducted only during winter months when the following ice cover requirements are met: (1) 5 cm (2 in) or more of ice cover to enable firing of 60-mm and 81-mm mortars (U.S. Army Garrison 2001), and (2) 12.7 cm (5 in) or more of ice cover to enable firing of 105-mm howitzers and 120-mm mortars (U.S. Army Garrison 2005).
- As explained in the 1991 Environmental Assessment, only variable or mechanical time (air burst) or point detonating super quick fuses will be employed in the ERF to minimize artillery and mortar rounds from penetrating the ice layer and exposing and redistributing white phosphorus.

7.4.3 Harbor Porpoise

Harbor porpoise are occasionally sighted and have been detected acoustically in both Eagle River [(up to 4.2 km (2.6 miles) upriver)] and Eagle Bay, Knik Arm. Although, only individual harbor porpoises have been observed in this area, it is possible that animals were missed due to their cryptic nature and the turbidity of the water. Harbor porpoise are known to travel in small groups, up to 10 animals, across their range (Leatherwood *et al.* 1982) but in Knik Arm reported group sizes are 1-5 animals (Shelden *et al.* 2014).

A detailed description of harbor porpoise presence on JBER (Eagle River) and waters adjacent to JBER are in Appendix I.

7.4.4 Harbor Seal

Harbor seals are commonly observed at the mouth of Eagle River and are occasionally observed within Eagle River as far upstream as Bravo Bridge, and (at high tide) within Otter Creek. No more than four harbor seals have been observed in the Eagle River/Eagle Bay at any given time.

A detailed description of harbor seal use on JBER and waters adjacent to JBER, and the monitoring methodology employed by JBER are in Appendix I.

7.4.5 Bald and Golden Eagles

Bald Eagles are year-round residents of JBER, with the highest numbers and visibility occurring between May and October. JBER offers attractive habitat for Bald Eagles; rivers, lakes and forests are abundant. Field surveys have identified up to 47 Bald Eagle nests on and adjacent to JBER; 17 of which were active in 2019 (Table 7-5, Figure 7-5). The nests are either directly adjacent or are situated near water bodies or the Municipality of Anchorage landfill where eagles generally feed. Eagles feed heavily on fish along JBER's coastline and in JBER lakes, rivers, and streams during summer and ducks in the Ship Creek drainage during winter. Certain eagles also feed on garbage at the Municipal landfill throughout the year but especially in winter.

Golden Eagles also reside on JBER, often seen soaring, hunting, and perched in Snowhawk Valley and Chester Valley. One Golden Eagle nest was documented in Snowhawk Valley for the first time in 2019 (Figure 7-5). Golden Eagles nest in cliffs and feed primarily on small mammals, birds, insects, and carrion.

Table 7-5: Bald Eagle Nest Status

Year	# of nests observed	# of active nests	% fledgling success
2015	38	16	50
2016	41	16	19
2017	47	16	56
2018	45	17	47
2019	44	17	47

Eagles are specifically protected by the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c). Federal agencies are required to support the intent of the Bald and Golden Eagle Protection Act by integrating conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on eagles when conducting agency actions. To avoid disturbing nesting Bald Eagles, the USFWS has developed National Bald Eagle Management Guidelines (May 2007). JBER intends to adhere to the Bald Eagle Management Guidelines and to communicate with USFWS when newly discovered nesting location present mission or eagle safety concerns.

The following table is taken from the National Bald Eagle Management Guidelines (May 2007). Numerical distances shown in the table are the closest the activity should be conducted relative to the nest.

Table 7-6: Recommendations for Some Category A and B Activities

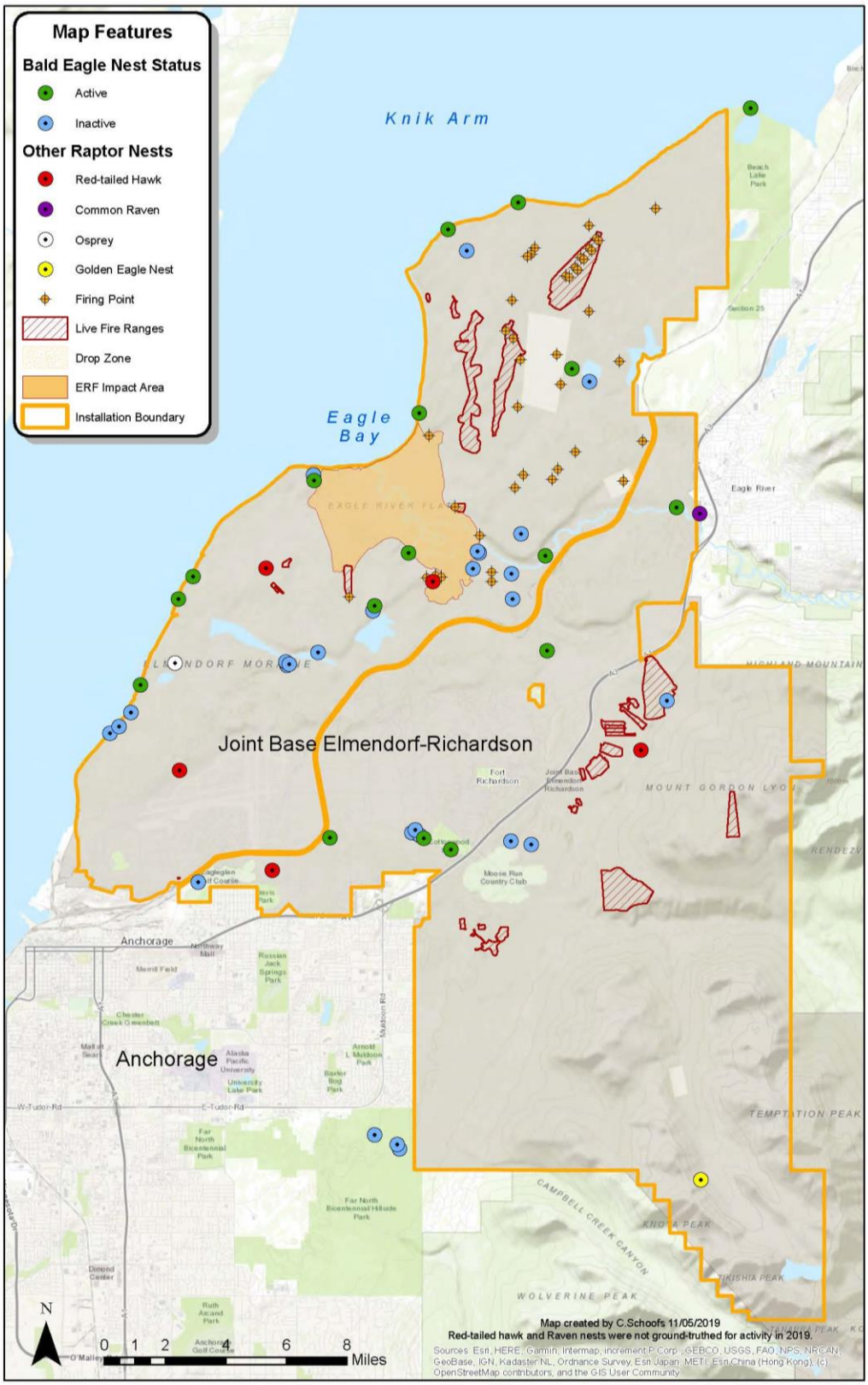
	If there is no similar activity within 1 mile of the nest	**If there is similar activity closer than 1 mile from the nest**
If the activity will be visible from the nest	660 feet. Landscape buffers are recommended.	660 feet, or as close as existing tolerated activity of similar scope. Landscape buffers are recommended.
If the activity will not be visible from the nest	Category A: 330 feet. Clearing, external construction, and landscaping between 330 feet and 660 feet should be done outside breeding season. Category B: 660 feet.	330 feet, or as close as existing tolerated activity of similar scope. Clearing, external construction and landscaping within 660 feet should be done outside breeding season.

In 2009 the USFWS announced a final rule on two new permit regulations to allow for the take of eagles and eagle nests under the Bald and Golden Eagle Protection Act. The final rule (50 CFR Parts 13 and 22 *Eagle Permits: Take Necessary to Protect Interests in Particular Localities*) was published in the Federal Register on September 11, 2009. The permits authorize limited, non-purposeful take of Bald Eagles, authorizing individuals, companies, government agencies (including tribal governments), and other organizations to disturb or otherwise take eagles in the course of conducting lawful activities.

Most permits issued under the new regulations would authorize disturbance. In limited cases, a permit may authorize the physical take of eagles, but only if every precaution is taken to avoid physical take. Removal of eagle nests would usually be allowed only when it is necessary to protect human safety or the eagles. In the unlikely event that take of eagles or removal of eagle nests become necessary, JBER must apply for a take/removal permit by coordinating with USFWS for technical assistance in assembling the permit application.

The USFWS has since revised the regulations, effective 2017, of eagle non-purposeful take permits and eagle nest take permits. The revisions include changes to permit issuance criteria and duration, definitions, compensatory mitigation standards, criteria for eagle nest removal permits, permit application requirements, and fees. The intended revisions were to allow for clarity to the eagle permit regulations, improve their implementation, and increase compliance, while maintaining strong protection for eagles.

Figure 7-5: Bald Eagle Nests on Joint Base Elmendorf-Richardson, 2019



7.4.6 Species of Special Concern

Species that are candidates for federal listing as threatened or endangered are not protected under the ESA (until officially listed). JBER will strive to minimize impacts that may result in the need to list candidate species as threatened or endangered. Affirmative action to conserve candidate species can preclude the need to list such species. JBER will document the distribution of candidate species on the installation and monitor their listing status. One species occurring on JBER, the Rusty Blackbird, listed as a Focal Species of Conservation Concern by the USFWS (USFWS 2011).

The DoD Legacy Program FY 2014 project, proposed by Steve Matsuoka (USFWS), entitled "Highlighting the benefits of military lands to declining boreal wetland birds" includes three areas of emphasis: species at-risk, species of concern, and declining species and habitat. According to the proposal:

> *Boreal wetland birds are among the continent's most rapidly declining avifauna. However, many of these declining species still breed commonly on military lands in Alaska. We propose to survey these species at breeding sites on Joint Base Elmendorf-Richardson (JBER) in Anchorage, Alaska, and then track their migratory movements throughout the annual cycle. Citizen scientists and university students will aid in all aspects of this study. Our surveys will identify important wetland habitats for boreal bird species, and will foster better public understanding of the benefits of ecological management of military lands in Alaska. We will track birds during migration to identify important habitats at key stopover and wintering areas, and therefore allow conservation on military lands in Alaska to be directly linked to conservation throughout these species' annual ranges. This work will be closely coordinated with studies on these species in other parts of their North American ranges, and will aid in range-wide and full life-cycle stewardship of these declining birds.*

Species of particular concern in this study are the Rusty Blackbird (*Euphagus carolinus*), Lesser Yellowlegs (*Tringa flavipes*), Olive-sided Flycatcher (*Contopus cooperi*), Solitary Sandpiper (*Tringa solitaria*), Blackpoll Warbler (*Setophaga striata*), Violet-green Swallow (*Tachycineta thalassina*), and Tree Swallows (*Tachycineta bicolor*).

Figure 7-7: Nest locations of SOSC and focal species, 2016-2018 on Joint Base Elmendorf-Richardson (McDuffie and Johnson, 2019)

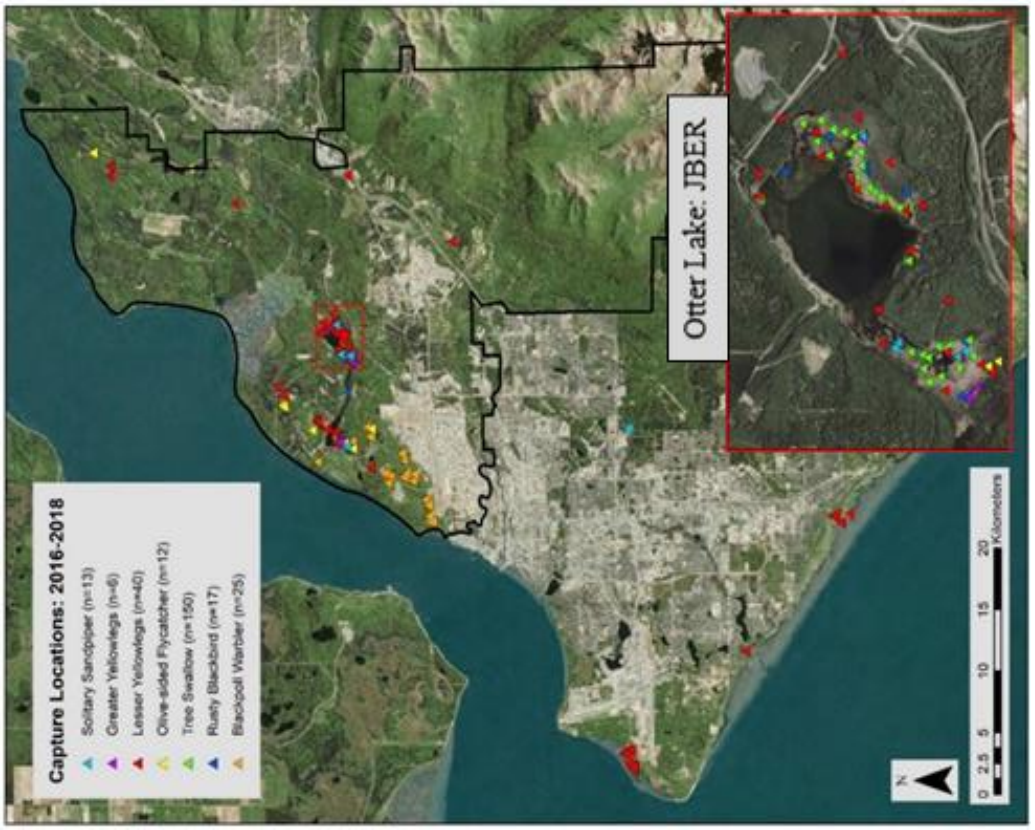


Figure 7-6: Capture locations of SOSC and focal species, 2016-2018 on Joint Base Elmendorf-Richardson (McDuffie and Johnson, 2019)

In addition, other organizations maintain lists of rare and imperiled species, such as the Audubon Society watchlist (Butcher *et al*); USFWS Birds of Conservation Concern (USFWS 2019); and the University of Alaska – Alaska Center for Conservation Science rare species. In addition to species lists, DOD Partners in Flight has developed migratory bird conservation strategies (DODPIF 2014).

Prior to 2011, species of special concern included those that were state-listed. However, in August 2011 ADF&G eliminated their species of special concern and endangered species lists. ADF&G maintains a website for the State Action Plans (ADF&G 2015). ADF&G uses the Alaska Wildlife Action Plan to assess the needs of species with conservation concerns, and to prioritize conservation actions and research. Whenever feasible, JBER will cooperate with state authorities in efforts to conserve these species. Section 2.3.4, Table 2-14 identifies species in the Alaska Wildlife Action Plan recognized for Joint-Base Elmendorf-Richardson.

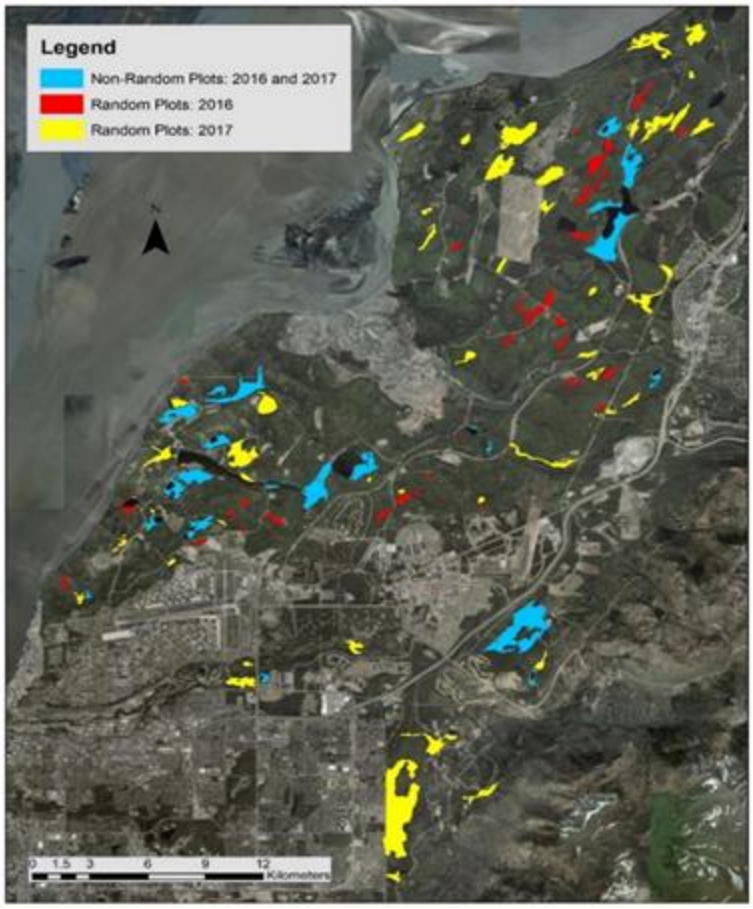


Figure 7-8: Boreal wetland sampling units/polygons surveyed during May and June 2016 and 2017 on Joint Base Elmendorf-Richardson (McDuffie and Johnson, 2019)

7.5 Water Resource Protection

This section applies to USAF installations that have water resources. This section is applicable to JBER.

7.5.1 Policy and Background

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.

The Section Hydrology discusses surface water resources on JBER. Figure 2-15: Watersheds, Surface Waters, and Topography on Joint Base Elmendorf-Richardson shows JBER watershed and significant surface water features, and the Section Hydrology discusses lesser surface water bodies on JBER.

7.5.2 Water Resources Management

Water resources management actions on JBER are centered on storm water planning and management, erosion control, best management practices, and impact area management. Best management practices address methodologies, techniques, and equipment and personnel requirements. Stormwater pollution prevention and erosion control are closely tied. Surface water management consists of protecting creek sides, stream banks, and lake shores and immediately adjacent areas that are easily damaged. Managing water quality consists of developing and implementing best management practices designed to reduce chemical release from expended munitions in impact areas. For example, moving targets away from open water and wetlands reduces the likelihood that releases may occur. JBER's Storm Water Pollution Prevention Plan and Storm Water Management Plan include best management practices to ensure sediment and other runoff does not enter into wetlands or other waters of the U.S.

7.5.3 Surface Water Quality Monitoring

Surface water quality within JBER's cantonment area is managed by the 673 CES/CEIEC Compliance. As an operator of industrial facilities, JBER is required to operate under the Alaska Department of Environmental Conservation's Multi-Sector General Permit (MSGP) for Storm Water Discharges Associated with Industrial Activity. Under the MSGP, JBER is responsible for ensuring storm water runoff (rain, snow, snowmelt) that comes into contact with industrial activities (aircraft refueling, quarrying operations, hazardous waste storage) and associated materials does not adversely affect water quality of receiving water bodies. A key condition of the MSGP is the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). JBER's SWPPP is available for review at http://www.jber.jb.mil/Services-Resources/Environmental/NEPA. The SWPPP describes the installation's storm water conveyance system, potential pollutant sources, storm water control measures, water quality monitoring procedures, and facility inspections.

As an owner and operator of a municipal separate storm sewer system (MS4) within an urbanized area, JBER is also required to operate under the Alaska Department of Environmental Conservation's Permit for Storm Water Discharges from Small MS4s. The MS4 permit is intended to minimize the discharge of storm water pollutants from the installation's storm water conveyance system to Ship Creek, Knik Arm, and other receiving water bodies. A key condition of the MS4 permit is the development and implementation of a Storm Water Management Plan (SWMP). JBER's SWMP is available for review at JBER's SWPPP at http://www.jber.jb.mil/Services-Resources/Environmental/NEPA. The SWMP describes how JBER samples and characterizes its storm water discharges, how it manages facilities, roads, and airfields with the potential to drain to JBER's MS4, and how it performs storm water pollution prevention public outreach.

Storm water discharges covered by other permits, such as industrial activities under the MSGP or construction activities addressed under the Alaska Department of Environmental Conservation's Alaska Construction General Permit, are also subject to compliance with JBER's MS4 Permit. Stormwater sampling locations (MSGP and MS4) are shown in Figure 7-9, Stormwater Monitoring Locations on Joint Base Elmendorf-Richardson. JBER currently meets all state and federal pollutant discharge elimination system discharge requirements.

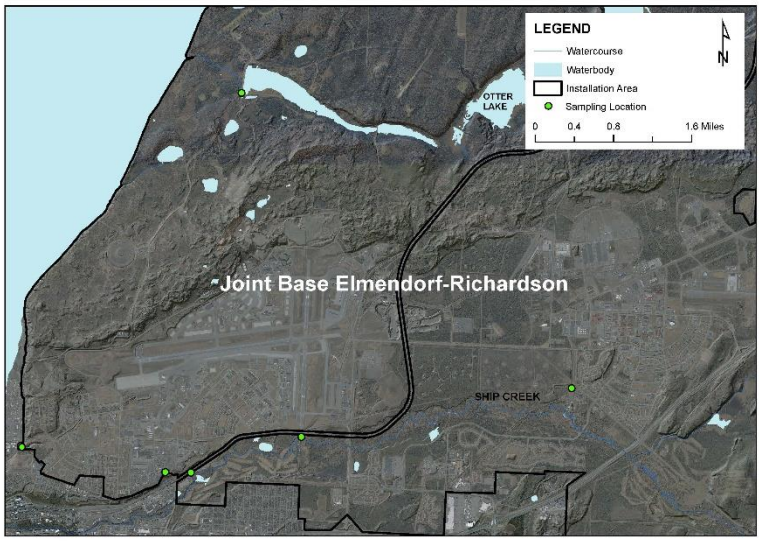


Figure 7-9: Stormwater Monitoring Locations on Joint Base Elmendorf-Richardson

7.5.4 Drinking Water Quality Monitoring

JBER's water is supplied primarily by Ship Creek, which traverses JBER from east to west. The Ship Creek dam, with a structural height of 50 feet, forms a reservoir that impounds an estimated 6.5 million gallons of water at maximum capacity. The dam and intake facilities are located near the base of Ship Creek Canyon. A majority of the domestic water for JBER comes from the reservoir. Anchorage also receives part of its water supply from Ship Creek. The JBER water treatment plant draws water from the Ship Creek Reservoir and filters and treats the water before delivering it to residential and industrial sites on JBER (Pacific Air Forces 1998). Treatment includes extraction of sediments and minor chemical processing with chlorine and fluoride. Three groundwater wells, each approximately 100 feet deep, serve to augment production from the main water treatment plant whenever additional flow is required during periods of high demand (typically during the summer months) or there is an operational need. Water from the wells is virtually pollution-free due to protection of the deep aquifer by a dense confining substratum (Gossweiler 1984). More information regarding Ship Creek and the Ship Creek Dam is available in *Chronology of Water Use and Water Rights on Ship Creek* (Quirk 1997).

To maintain the water quality of the installation potable water sources, JBER has limited development along Upper Ship Creek above the dam and around its three main groundwater wells. JBER also limits development and Army training in the vicinity of both Ship Creek and the north fork of Campbell Creek to the greatest extent possible to protect surface water quality (U.S. Army, Alaska 1998). The ITAM LRAM also program plays a major role in protecting water quality on JBER-Richardson.

7.5.5 Groundwater

The groundwater program is important to natural resources management, but it is not considered a Natural Resource function. Rather, it is a responsibility of the compliance and/or restoration program. However, a brief summary of groundwater monitoring is provided as it is an important environmental compliance activity. Aquifers underlying JBER are discussed in Section 2.2.4, Hydrology.

Groundwater monitoring data on JBER-E indicated localized shallow aquifer contamination which was not impacting deeper aquifers. The Bootlegger Cove formation appears to serve as an effective barrier between

the aquifers (Brabets 1998). Industrial activities associated with JBER-R have had some minor effects on groundwater. These effects are associated with underground storage tanks, facilities where chemicals were stored, and places where chemicals were dumped. These areas are being monitored intensively, and there has been no indication of deep groundwater pollution. Pollution has been minor and localized, and there has been no significant risk to human health.

7.6 Wetland Protection

This section applies to USAF installations that have existing wetlands on USAF property. This section is applicable to JBER.

7.6.1 Policy and Background

The JBER policy concerning wetlands is to protect and conserve wetlands in a manner that incurs no net loss of wetland acreage or wetland functions unless necessary to support mission requirements. Appendix C includes discussion of regulations regarding protection of wetlands. Mission-dependent project planning requires that proponents first avoid wetlands to the maximum extent practicable, then minimize impacts where they must occur. Avoidance and minimization of impacts to wetlands must occur regardless of whether the wetland is under federal jurisdiction, pursuant to Section 404 of the Clean Water Act or not. Finally, where impacts to wetlands under federal regulatory jurisdiction are unavoidable, authorization for necessary impacts and subsequent compensatory mitigation must be secured, when applicable.

The USACE is the ultimate authority for regulation of wetlands. All wetlands on JBER are potentially jurisdictional and must be verified by the USACE prior to impact, in order to determine mitigation requirements, if any. A wetland delineation must be conducted during the growing season, and a request for a jurisdictional determination made to the USACE. Jurisdictional determinations are good for a maximum of 5 years. If impact to the wetland is planned outside of the 5-year timeframe, a new jurisdictional determination may be required.

In addition to wetland mapping and inventory, Wetland functional assessments are a tool used to evaluate the functions and values that wetlands have within the managed landscape. The Anchorage Wetland Assessment Methodology was developed in 1982, updated in 1996 and largely revised in 2012, adding the "Credit-Debit" method for calculating compensatory wetland mitigation. In 2016, an effort by JBER was initiated to adapt the AWAM for use on JBER. Resources and criteria were updated and functions were tailored specifically to military land use on JBER and specific ecological and wildlife management objectives. Functional assessment data from both tabletop and field assessments can be used to monitor changes in wetland functions over time. From the results of the functional assessment methodology, a Debit-Credit (D-C) evaluation can be derived to facilitate development planning in instances where wetland impacts may be unavoidable and compensatory mitigation may be required. The method provides a mathematical means of expressing adverse impacts as debits and beneficial impacts as credits. Several factors taken into account include:

- the pre- and post-project relative ecological values of the site and surrounding area;
- the nature and extent of disturbance already affecting the site and surrounding area;
- the extent, nature, and permanence of anticipated direct and indirect adverse impacts;
- the type and extent of improvements in function expected to result from restoration, enhancement, and creation/establishment projects; and

- the extent of the threat of future development or other adverse impacts at proposed preservation sites.

The functional assessment, as well as the Long Term Ecological Monitoring protocol, are used together to provide a consistent approach to both evaluating and monitoring wetlands. Additionally, the Debit-Credit approach may be applied to assist in managing planning efforts. Where wetland impacts may be unavoidable, the D-C approach classifies wetlands into high function (Class A), moderate functioning (Class B), and low functioning (Class C) wetlands and assigns a Relative Ecological Value (REV) for each wetland, up to a value of 1. Compensatory mitigation credits may be calculated using this approach and purchased from a local wetland mitigation bank.

Permits for fill of wetlands may be required under Section 404 of the Clean Water Act. The permitting process allows JBER to mitigate unavoidable permanent and/or temporary, direct and/or indirect impacts to wetlands during military, recreation, maintenance, and fire suppression activities. USACE is the authority for ensuring compliance with requirements of Section 404 of the Clean Water Act, which regulates use of wetland areas. As such, USACE may conduct follow-up inspections to ensure compliance with issued permits.

Compensatory mitigation is only required for loss of jurisdictional wetlands. Similarly, Clean Water Act Section 404 permits are only needed when fill is being placed in a jurisdictional wetland. EO 11990 requires a Finding of No Practical Alternative for all construction activity in a wetland including both jurisdictional and non-jurisdictional wetlands. However, any net loss of wetlands, jurisdictional or otherwise, should be mitigated whenever possible.

7.6.2 Riparian Area Management Setback Requirements

According to the Water Quality Management for National Forest System Lands in Alaska (2006), riparian areas serve to restore sediment, contribute to the maintenance of desired water temperature, provide aquatic and riparian ecosystem habits for fish, wildlife, and recreation; protect channels and streambanks; stabilize the floodplain; and provide a long-term source of large organic debris to the stream channel system. JBER has adopted the following setbacks, where mission essential elements are not compromised.

Vegetative Buffer

State BMPs [AS 41.17.115 (Intent for riparian areas)] require the following:

A) Harvest of timber may not be undertaken within 100 feet immediately adjacent to an anadromous or high value resident fish water body;
B) Between 100 and 300 feet from the water body, harvest of timber may be authorized but must be in accordance with BMPs for maintenance of important fish and wildlife habitat.
C) Necessary removal of trees along riparian or wetland areas, such as for flight line safety within designated Clear Zones, must be conducted in such a manner that the soil within the designated setback is not disturbed.
D) Clearing near streams and in wetlands and along riparian areas, where necessary, should be conducted in winter.

The Municipality of Anchorage's Coastal Plan requires the following:

A) 100-ft setback from anadromous streams
B) 85-ft setback from headwaters and tributaries of anadromous streams
C) 65-ft setback from all other waters.

Wetlands that are of high function (D-C: Class A) require a 25-ft setback. Wetlands of moderate function (D-C: Class B) require a 15-ft setback.

Clear cuts are not authorized in buffer lands where the forest is in general good health. Selective cuts with artificial seeding or hand planting can be used as required to maintain the forest stands in these areas.

Exceptions to the buffer policy may be granted for the development of recreation areas, road construction, or for other mission requirements. Any impact to wetland/riparian areas due to building of structures, roads, or trails or habitat modification will go through the NEPA process and Section 404 to evaluate and mitigate impacts.

Vehicle Maneuvering

Army USARAK Regulation 350-2 requires the following:

Vehicles will remain on marked trails and designated routes except when directed otherwise during tactical deployment. Vehicles will drive on established roads during administrative time. During breakup (usually 1 April through 15 May), all vehicles are restricted to established roads and dry trails. During summer months (usually May through September), cross-country movement is permitted in all areas except designated creek bottoms, lakes, streams, and open, flowing water. No tracked or wheeled maneuvering is permitted within a 50-meter buffer around all streams, lakes, and any open, flowing water during the summer unless crossing at a 90-degree angle to the stream. Fish spawning streams will not be crossed during summer. Vehicular stream crossing is allowed in winter months (usually October through March) at permitted ice bridge sites and other areas if there is no flowing water. Tactical turns, such as missile avoidance or neutral steer turns, will be avoided unless absolutely necessary.

7.6.3 Wetland Inventory and Monitoring

Wetland inventory and monitoring provide an indicator of ecosystem integrity, status of sensitive plant species and communities, and data required to comply with wetland-related laws, executive orders, directives, and other regulations. In addition, inventory and monitoring help to determine areas where improvements or rehabilitation are needed to maintain ecosystem integrity and to support military activities or may be used over time to monitor changes in function or persistence as a result of development or climate change.

Wetlands have been inventoried on JBER using both tabletop and field delineation methods. Annually, as regions of JBER are studied, project actions are taken, or regulatory determinations are made, improvements to the accuracy of the inventoried wetland boundaries are made and the GIS data is updated, as practicable. According to the U.S. Army Corps of Engineers, however, the "official" wetland map is still maintained by the U.S. Forest Service, National Wetland Inventory. The most recent update to that map was made in 2009. Supplemental wetland inventories accomplished on JBER are discussed in Section 2.3.5, Wetlands and Floodplains, and can be used, with substantive field observations, to validate or invalidate or amend the NWI, as appropriate.

A wetland inventory revision was conducted by JBER (MWH, Inc. 2012) and has been updated annually with new information, however, this inventory is not to be confused with the process to delineate wetlands or establish jurisdictional authority. Figure 2-18 shows wetlands on JBER according to the 2012 JBER update. Because many of JBER's wetlands are small, unmapped areas can be overlooked when conducting planning using aerial photos and GIS maps. On-the-ground field verification, conducted during the growing season, is critical to ensure that small wetlands are not overlooked.

Distinct, but complementary to the wetland boundary determination, wetland functional assessments are conducted to establish qualitative and quantitative benchmarks for monitoring the functions and values of wetlands within the landscape. The JBER Wetland Functional Assessment was derived from the Municipality of Anchorage's method by JBER Natural Resources, CSU-CEMML, and the USACE to assess the biological, hydrological, habitat, and social functions of wetlands within JBER. Wetlands in the Eagle River watershed were assessed in 2016-2017. Wetlands in the Knik Arm- South watershed were assessed in 2017. Wetlands in the Ship Creek Watershed were assessed in 2018. Wetlands in Snowhawk and Chester Creek watersheds were assessed in 2018-2019.

Mission support priorities have required wetland investigations in some unique habitats on JBER. Chapter 2 includes detailed descriptions of the Elmendorf Moraine-Kettle Lakes, the Eagle River Flats, and, Alpine depressions and swales. Other areas, however, lack reliable information on the presence or absence of wetlands, including wetlands in black spruce dominated forests and slope-discharge wetlands that form on hillslopes and in subalpine areas. Ground truthing efforts to verify the presence or absence of wetland characteristics in the problematic areas needs to be conducted to improve the accuracy of the monitoring and planning tool. Sampling of several black spruce dominated areas mapped as wetlands occurred in 2016-2017 in Knik Arm and Eagle River watersheds, with many sites failing to meet wetland criteria. Wetlands within the JBER installation boundary in the Snowhawk, Chester, and Ship Creek watersheds were investigated in 2018-2019.

In 2017, several wetland delineations in kettle depressions were performed and verified by the USACE to be isolated. Wetland delineations were specifically conducted in 2017 for the Vigilant Shield Exercise Site (POA-2017-415), located near Hillberg Lake and for Bryant Army Airfield Flight Line Safety Project (POA-2017-511), located within the BASH area around Bryant Army Airfield. For Project Vigilant Shield, Hillberg Lake and the wetland it directly drains to, which were included in the JBER wetland inventory, were determined by the USACE to be jurisdictionally isolated. The other two wetland areas identified in the field delineation, but not in the JBER wetland inventory, were also determined to be isolated. For Project Bryant Army Air Field Flightline Safety, some of the areas that were mapped as wetlands were determined through field investigations to in fact be upland, which was validated by the USACE. In fact, one such area had been previously validated as upland. (POA-2011-1124). The BAAF stormwater pond is anticipated to be isolated, having been constructed incidentally from gravel pit operations in the 1980s. A second wetland area located just outside the Richardson Visitor's Center, near the Glenn Highway was conducted by the USACE for connectivity to McVeigh Marsh and/or Ship Creek. An approved Jurisdictional Determination was made in2018.

The question of correcting National Wetland Inventory (NWI) maps arose with consideration of the several wetlands that were incorrectly identified as wetland in the NWI, as well as the several wetlands dominated by black spruce, that are being determined in the field as uplands. The USACE has indicated that unless the NWI is updated, the JBER maps are not necessarily considered "official", and any areas determined to be "upland" by the USACE in an approved jurisdictional determination are still subject to review every five years.

"Uplands", tracked in the inventory include 18.05 acres of isolated wetland filled for a flightline safety project in 2016 and 2017 and 0.012 acres of wetlands filled in construction of TA 425 Access. The remaining approximately 13 acres are wetlands that were investigated in the field and determined not to meet wetland criteria. These polygons will remain in the inventory however, until the National Wetland Inventory is updated.

7.6.4 Wetland Management

Wetland management on JBER is primarily through protection and conservation practices to ensure avoidance and minimization of impacts to wetland acreage or function to the maximum extent practicable. Conservative management of wetland areas requires coordination with regulatory agencies and all projects, including construction projects that may permanently or temporarily and either directly or indirectly affect wetlands must be coordinated with the Environmental Impact Analysis Process (EIAP) Planner (673 CES/CENPP). Construction that takes place in or near wetlands must utilize best management practices, such as silt curtains or fence to minimize silt movement as a result of construction or repair work.

As necessary, work in wetlands should incorporate best management practices to mitigate permanent, temporary, direct, and/or indirect impacts.

A) Where work in wetlands is necessary or has occurred, coordination with 673d Natural Resources is required;
B) Where clearing of vegetation is required for operational efficiency; trees should be hand felled or cut only above the ground surface; preferably during winter months to minimize the impacts to soils and ground cover in wetlands;
C) Riparian area management setback requirements (Section 7.6.2) must be adhered to where work in wetlands abuts lakes, streams, or other surface waters;
D) Equipment operating in authorized areas will be cleaned prior to deploying into a wetland or natural area such that it is free of seeds, propagules, or other fragments of vegetation which may vector invasive species into wetlands or other natural areas;
E) Areas where soil disturbance has occurred must be immediately seeded with a native wetland seed mix in accordance with Section 7.7.7. herein, and monitored until 70% coverage has been achieved;

Impacts to wetlands are minimized through the EIAP, which must occur before approving any project having the potential to alter regulated wetlands, streams, or tributaries on JBER. DoDI 4715.03 (February 14, 2011) states off-site mitigation/banking is encouraged as sound conservation planning. A feasibility analysis of on-site versus off-site mitigation/banking options is necessary before implementation of this type management could be undertaken.

Education is an important aspect of wetland management. Natural Resources and ITAM will continue to incorporate wetland conservation education into environmental awareness programs to prevent avoidable impact to wetlands from mission and recreation related activities. To that end, project managers will be educated to coordinate early on with Natural Resources personnel to assess adverse impacts of their projects and seek timely permit applications. The ITAM program's SRA component provides environmental awareness to reduce damage to wetlands within training lands from maneuver or other training activities.

Some wetland protection measures conflict with the JBER BASH plan. Those water bodies within the Waterfowl Exclusion Zone (WEZ) (Figure 7-13) around the airfield attract birds, waterfowl specifically. BASH procedures call for hazing and occasionally depredating birds in these wetlands. The intent of conserving wetlands is multi-faceted, but protection of wetlands that provide habitat for water birds must be weighed carefully against the health and safety of mission operations. If a wetland occurring in the WEZ serves to attract birds that are then destroyed, the wetland value is diminished substantially. The "snow-melt pond" at the western end of Runway 06 is an example of an attractive wetland that results in large numbers of birds being hazed or killed. While this wetland would be valuable in most other locations, it serves only to increase bird mortality. Action begun by the Port of Alaska to extract gravel resources in this and other wetland areas near the airfield may remove wetlands but may also work to diminish mortality of

a large number of birds annually. Mitigating the impacts to birds at this hazardous location is completed through conservation of waterbodies outside the WEZ, where birds may find safe refuge that does not affect the military mission.

Wetland enhancement and rehabilitation may be conducted on JBER to repair and restore wetland functions affected by military and non- military activities. Military mission-related wetland projects need to be coordinated through the 673 CES Natural Resources and the ITAM program LRAM component. Techniques for repairing damage include installing waterbars, re-contouring areas to match the surrounding area, rolling back the vegetative mat, and revegetation using native plant species.

7.6.5 Riparian Area Management

Riparian areas on JBER include Eagle River, Otter Creek, Ship Creek, Snowhawk Creek, Jerry's Creek, South Fork Chester Creek, North Fork Campbell Creek, Sixmile Creek, Fire Creek, Moonshine Creek, Clunie Creek, and EOD Creek. Primary efforts to protect these areas include restricting access, restricting development and disturbance, such as logging, and streambank stabilization efforts. Any activities occurring in a stream must be coordinated with the ADF&G Habitat Division and the USACE. Construction work is often timed to minimize in-stream work when salmon are present.

44 CFR Part 9 and Part 60 (pursuant to EO 11988), Floodplain Management and Protection of Wetlands requires federal agencies to take action to reduce the risk of flood loss; to minimize the impacts of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains in carrying out their responsibilities for managing federal lands. Before taking an action, JBER must determine whether the proposed action will occur in a floodplain and, if so, alternatives to avoid adverse effects must be considered. Incompatible developments in floodplains must also be considered. Currently, there are insufficient map resources available to determine the extent of floodplains on all waters on JBER. Floodplain maps and hydrologic models of the type and accuracy used by FEMA to delineate floodplain boundaries are not available.

Floodplain boundaries within the installation boundary have only been estimated along Ship Creek. Current floodplain extents shown for Ship Creek are clearly inaccurate, visible when current imagery is overlaid with the "floodplain" polygon. JBER will review the potential for impacts adjacent to and within floodplains on a project by project basis using current LiDAR, aerial imagery, and field investigations, when necessary, to determine the potential for projects to affect or be affect by flooding. JBER is in need to produce, at a minimum, concept floodplain maps using current field data to include surveyed ordinary high water mark (OHWM) as well as surveyed elevations of flood event evidence observed in the field. Such evidence may include, but is not limited to drift lines, debris lines, water marks, and scour marks; particularly those that can be attributed to specific storm events where the flood stage was recorded. As resources allow, priority waterbodies in need of floodplain assessment, will be investigated. Priority waterbodies include Ship Creek, Campbell Creek, Brandon's Creek, Chester Creek, and their major tributaries.

7.7 Land Management

This section applies to USAF installations that perform ground maintenance activities that could impact natural resources. This section is applicable to JBER.

7.7.1 Policy and Background

In accordance with AFI 32-7064, Air Force 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 (26 April 1994). The Presidential Memorandum directs federal agencies to:

- use regionally native plants for landscaping;
- design, use, or promote construction practices to minimize adverse effects on the natural habitat;
- prevent pollution by reducing fertilizer and pesticide use, using integrated pest management, recycling green waste, minimizing runoff, and similar practices;
- implement water efficient practices; and
- create outdoor demonstrations incorporating native plants and other similar practices.

Other laws, orders, directives, policies, and regulations that affect grounds maintenance and landscaping on JBER are included in Appendix E, Flora of Joint Base Elmendorf-Richardson.

7.7.2 Management Issues and Planning

Grounds management is not a responsibility of Natural Resources on JBER. However, Natural Resource staff play a collaborative role in grounds management, meeting annually with other flights, including 773d CES/CEOIE and 773d CES/CEOH, to lay out seasonal priorities for tree planting, landscape and forest area management, and management of invasive weeds. Improved grounds throughout the cantonment provide habitat for many wildlife species thus forest patches are maintained in a natural state where practicable. JBER's status as a Tree City USA requires landscape tree management and tracking of expenditure and effort to install, maintain, and remove landscape trees. Natural areas within improved grounds provide opportunities for education and outreach as well as provide scenic beauty, protection of water, air, and soil, and habitat for wildlife. Natural areas serve as buffers around waterways to manage stormwater, improve water quality, and prevent erosion. Grounds maintenance and landscaping includes water conserving landscape design, use of native or regionally adapted plants in developed areas, reduction of fertilizer and pesticide use, and invasive species control. Cooperative management of grounds and urban forests within the cantonment area will ensure that the public and environmental functions of the landscape are enhanced.

Vegetation clearing, site preparation, or other construction activities that may result in the destruction of active bird nests or nestlings would violate the MBTA. In south-central Alaska, USFWS recommend these activities not be conducted during 1 May - 15 July. Timing guidelines are not regulations, but are intended to help comply with the MBTA. Some species and their nests have additional protections under other federal laws, including those listed under the ESA and Bald and Golden Eagle Protection Act.

It is critical JBER provides timely vegetative clearing to support military training. Public law allows and defines *Military readiness activity, as Pub. L. 107–314, §315(f), 116 Stat. 2458 (Dec.* 1 *2, 2002) [Pub. L.§319 (c)(1)],* includes all training and operations of the Armed Forces; 2) that relate to combat, and the adequate and realistic testing of military equipment, 3) vehicles, weapons, and sensors for proper operation and suitability for combat use. It does not include (a) routine operation of installation operating support functions, such as: administrative offices; military exchanges; commissaries; water treatment facilities; storage facilities; schools; housing; motor pools; laundries; morale, welfare, and recreation activities; shops; and mess halls, (b) operation of industrial activities, or (c) construction or demolition of facilities listed above. To further clarify this, JBER believes military readiness activities include (1) air and ground

maneuver training, (2) live fire demolition, direct and indirect fire activities, (3) range construction, range upgrade and range maintenance activities which are required for military operational readiness, and (4) those vegetation management activities which directly support readiness activities and soldier safety such as prescribed burning and mechanical or hand thinning to reduce fire danger in range training areas.

Biological/Physical Constraints

Land management practices on JBER are constrained by topography, soils, and climate. The majority of improved and semi-improved lands are found on the thin, gravel soils common on alluvial and outwash plains. Low annual rainfall and poorly developed soils place great stress on new plantings. Low soil temperatures can restrict root formation to the upper 18 inches of soil. Relatively low soil fertility mandates fertilization, particularly on such areas as golf courses. Lawns established on these soils are often subject to drought during early to mid-summer. Transplanting works well with native species, but non-native species often require extra care, grow more slowly, and occasionally cannot survive the local conditions. Section 2.2.3, Geology and Soils discusses soils inventories that have occurred on JBER lands and includes a soils map and soils series information.

Landscape management is also constrained by biological forces. The most abundant tree species native to Southcentral Alaska, within the ecoregion of JBER, include black and white spruce, paper birch, and cottonwood (or balsam poplar). Section 2.3.2 includes a broader description of forest ecotypes on JBER. Spruce are particularly vulnerable to spruce beetles and spruce budworms and paper birch to birch leaf-roller and birch leaf-miner. 2016 began a devastating outbreak of spruce beetles, with 2019 being the first year mortality of landscape trees from spruce beetle attack was observed. Significant loss of spruce in remnant natural areas and in the greater forested training areas occurred with progressive intensity beginning in approximately 2017. While non-native species of trees have been planted historically in the landscaped areas of JBER, the general policy for planting is with preference to native trees. This limits the species preferred for planting considerably, and with particularly active outbreaks of disease, driven much by changes in climate, begs the question of how to improve the diversity and resiliency of local community forests.

Landscape Planning

Landscape standards include the selection, placement, and maintenance of plant material on JBER. Landscape Standards are included in the JBER Airfield District Areas Development Plan, developed cooperatively between 673d CES/CENPP and the JBER Facilities Board, on which the 3rd Air Base Wing and Flight Safety serve. A plant palette and plant categories are included and designed to help landscape designers select the best plant for each particular set of design requirements. Plants must be hardy enough to survive the harsh Alaskan climate yet do not create BASH and wildlife attractants near housing. Planting of berry-producing trees and shrubs is highly discouraged anywhere on JBER, and strictly prohibited within BASH and WEZ.

Landscaping on JBER should be compatible with adjacent surroundings and complementary to architectural features and the overall natural setting of the area. Native plants are preferred and caution will be taken so that no new noxious or invasive species are introduced, and that species that have been introduced and escaped or pose a noxious weed threat, including European bird cherry or Japanese knotweed, are controlled.

The Landscape Management Plan, incorporated into Section 7.7.6, and the Airfield Landscape Standards must adhere to the USAF Landscape Planting Standards, with adaptations suited to the local climate, as

recommended. Included in the plan and standards are a list of acceptable native trees and shrubs, including suitable native and/or non-invasive alternatives to commonly planted non-native landscape trees.

7.7.3 Airfield/BASH Program

Vegetated areas and other low lying areas where ponding may occur around active airfields are managed under the BASH Program to discourage wildlife use. The JBER BASH program is described in Section 7.12, Bird/Wildlife Aircraft Strike Hazard (BASH).

BASH and BEZ/WEZ are established areas in and around airfields and cantonment areas where natural or established elements attractive to birds or wildlife are discouraged or prohibited as a means to protect public safety, operation efficiency, and mission sustainability. 3rd Wing Instruction 91-212 includes the "BASH" plan. Relevant stipulations are detailed in Section 5 "Habitat Modification".

- When possible, large lawns should have trees and shrubs dispersed at 6-10 plants per acres to discourage geese.
- Mature berries can attract several species of birds during fall and winter. Minimizing their presence within the BEZ/WEZ is a BASH objective. Berry/fruit producing trees within the BEZ will be phased out by the year 2015. No new berry/fruit producing trees or shrubs will be planted within the WEZ. All new trees and shrubs will be non-berry producing species. As funds allow, berry/fruit producing trees and shrubs will be replaced with non-berry/fruit producing species.
- The shrubland vegetation objective is to provide over 60% canopy coverage by shrubs and small trees to discourage raptors from hunting small mammals and to discourage the growth of grasshoppers.
- Shrubs will be encourage/planted to fill gaps to reach a desired canopy coverage of at least 60%. Shrubs will include native, non-berry producing trees and shrubs that easily regenerate after aggressive cutting which include alder, willow, poplar, and birch. Shrubs will need to be cut to 6-8 inches above the ground on a 2-3-year rotational basis. Cutting should be conducted in early April prior to ground thaw and before leaf-out.

Management of fruit producing trees in BASH/WEZ has been a priority set in accordance with the BASH Plan. Because Mountain Ash produce dense clusters of berries capable of attracting large flocks of migratory birds, these pose a significant threat to near airfield-safety. As of 2018, there were over 400 fruit bearing trees in BASH areas and nearly 1500 in waterfowl exclusion zone. Removal of these trees has been prioritized in BASH and then in WEZ areas, except in areas under control of Aurora Housing. In 2018-2019, contracted efforts to apply herbicide to 965 mountain ash, bird cherry, apple, crabapple, and pear trees was executed under a Cooperative Agreement with the Palmer Soil and Water Conservation District. Removal of the trees was coordinated with 773d CES/CEOHG.

7.7.4 Moose Run Golf Course

JBER golf courses are maintained by golf course grounds crews. Management procedures include seeding, mowing, irrigation, fertilization, aeration, and weed and disease control. Major natural resource related issues include stream bank stabilization, water quality, BASH, wildlife conflict and preservation of fish habitat in this area. European bird cherry (EBC) has spread throughout low lying areas all along the riparian edge of Ship Creek. Survey of EBC upstream of Vandenberg Road has not yet been conducted, but EBC may occur as far upstream as Moose Run Golf Course. Erosion control efforts along Ship Creek within Moose Run Golf Course are also management targets. As EBC is controlled, native trees and shrubs should

be planted to replace them. Vegetation buffers should be re-established along the entire watercourse and mowing ceased to allow for establishment of shrubs and trees.

7.7.5 Eagleglen Fitness Park

Major natural resource related issues include water quality, BASH, wildlife conflict, invasive species control, and preservation and improvement of fish habitat in this area. The fish habitat improvement issue in this area is of special concern due to a likely increase in bear/human conflict if more fish return to the area in turn drawing more bears to the area. EBC has spread throughout low lying areas in Eagleglen Fitness Park, including along the riparian edge of Ship Creek and around ponds. Survey of EBC began in 2015 and treatment of a portion of the park occurred in 2016-2018. Additional efforts are needed to continue controlling the occurrence of EBC in this greenbelt, but a significant increase in mortality of these trees has been achieved. Areas of Eagleglen Fitness Park may be good candidates for restoration, as the area is no longer used as a golf course. Erosion control efforts along Ship Creek within the park are also management priorities. As EBC is controlled, native trees and shrubs should be planted to replace them. Vegetation buffers should be re-established along the entire watercourse and mowing ceased to allow for establishment of shrubs and trees.

7.7.6 Urban Forestry

The urban forest includes individual trees as well as groupings and small tracts of remnant forest scattered among complex and varied land uses in and adjacent to improved and semi-improved grounds as well as woodland borders. Urban forests are valued primarily for their non-consumptive contributions to quality of life such as aesthetic beauty, improved air and water quality, and erosion protection.

Urban forestry on JBER is coordinated between Natural Resources 673d CES/CEIEC and Grounds 773d CES/CEOH, with assistance to manage invasive species supported by Pest Management 773d CES/CEOIE. A comprehensive inventory of the landscaped areas on JBER was initiated in 2014, and survey efforts continued through fall 2018. The urban forestry inventory was used to develop a comprehensive JBER Urban Forest Management Plan according to the USAF Landscape Design Guide, the official standard for landscape architecture and planning for JBER. This plan partitions cantonment areas into five main Urban Forest Tracts, which will be re-inventoried and subsequently managed on a rotational schedule, such that inventory and management in all cantonment area tracts is completed every five years.

Urban Forest Inventory entails a physical site visit, inspection and documentation of tree height, diameter at breast height (DBH), crown condition, and assessment of overall condition (good, fair, poor, dead), needs for maintenance or removal, and assessment of potential conflicts with infrastructure or other hazards. The data gathered in the inventory will be integrated into the geospatial attributes maintained by Geobase and then used to generate a maintenance plan to be executed in the subsequent year.

The general landscape standards are described in the JBER Airfield District Area Development Plan (11 September 2019). Planting densities within the BASH and WEZ are defined in 3rd Wing Instruction 91-212. The USAF Landscape Design Guide (September 1998) provides the general guidance for landscape architecture and planning, inclusive of the urban forest. From these resources, the Urban Forest Management Plan was developed.

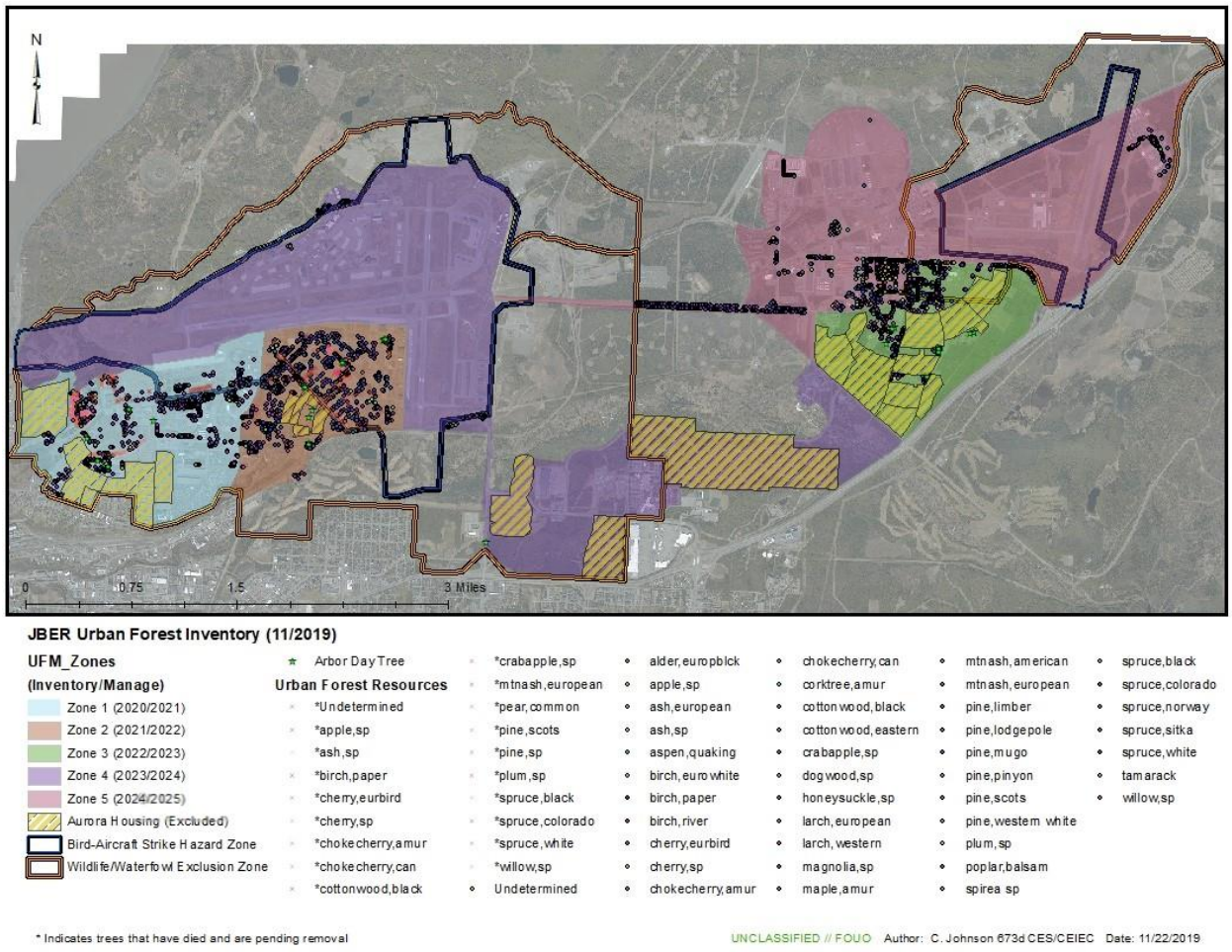


Figure 7-10: Urban Forest Management Zone Map on Joint Base Elmendorf-Richardson

Natural Resources personnel are responsible for planning, making recommendations, and periodic monitoring for urban forestry on JBER. 773d CES/CEOHG provide support for implementing the urban forestry plan in coordination with Natural Resources, typically through the work order process. Management of urban forests includes removal of hazard trees, growth support for newly planted trees, limbing trees, and other tasks as identified to be necessary to mission support. Because management tasks are tracked as part of the Tree City USA program, which JBER has been a part of since 1996, activities should be tracked and reported to the base Urban Forester.

JBER's commitment to the value of urban forests is reflected in its status as a "Tree City U.S.A." by the National Arbor Day Foundation and the State of Alaska Department of Natural Resources, Division of Forestry, Office of Community Forestry. This designation requires establishment of a Tree Board, $2.00 per capita expenditures on urban forest management, and recognition of National Arbor Day, celebrated on the 3rd Monday in May, in Alaska. JBER's commitment to Arbor Day is included in Section 7.15.3. Prior to Joint Base, both Elmendorf and Richardson were independently recognized; Fort Richardson beginning in 1996 and Air Base Elmendorf in 1997. Once joint-based; the earlier date was adopted and the efforts merged.

7.7.7 Management Strategies for Vegetation Establishment

Species selected for vegetation establishment must be in compliance with the AFCEC Landscape Development Plan as well as other related directives. The BASH program (see Section 7.12) also includes requirements for vegetation management. Urban forestry is discussed in Section 7.7.6, Noxious Plant/Invasive Species Management, 7.11.4, Landscape Planning and 7.7.2, Urban Forestry. For now, JBER managers recommend following State of Alaska and Cooperative Extension Service guidance on what species can and cannot be planted in this area.

Grass

The best time for lawn establishment is May 15 - June 15. Hydro seeding allows an extension of that period; however, creating young grass during Canada goose dispersal period and migration (August 12- October 15) creates a high risk attraction when conducted within the Bird Exclusion Zone/Waterfowl Exclusion Zone. Thus, seeding plots over 400 square meters within the BASH zones should be planned for June but no later than 15 July.

Fertilizers must have nitrogen-phosphorus-potassium ratios of at least 8-12-6. Soil preparation is critical to success. Disturbed sites should have soil tilled to a depth of four inches, and four inches of topsoil should be used to cover the sub-grade. Fertilizer should be thoroughly mixed in, and final grades and elevations should make allowance for placement of sod. Where revegetation is being made with soil naturally high in organics and in natural areas, fertilizer may not be warranted, and may give the advantage instead to weeds. Where appropriate, fertilizer may be omitted, but sites must be monitored for establishment until coverage of at least 70% is achieved. Recommended native seed mixes should be used where practicable. Refer to the table below for a recommended native seed mix. Seed mixes should be applied at a rate of 43 pounds per acres in dry areas and 30-35 pounds per acre in wet areas. If used in a restoration effort, seed mixes may be amended with non-grass herbs such as field locoweed, lupine, Arctic wild chamomile, or wormwood.

Table 7-7: Native Seed Mix Recommendation for JBER Airfields

Species	Wet Areas (% of Mix)	Dry Areas (% of Mix)
"Arctared" red fescue	20%	50%
"Nortran" tufted hairgrass		20%
"Wainwright" slender wheatgrass		15%
"Norcoast" Bering hairgrass	35%	
"Eagan" American sloughgrass	30%	
"Sourdough" bluejoint grass	10%	
Annual rye (cover)	5%	15%

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

The best time for lawn establishment is May 15 - June 15. Hydro seeding allows an extension of that period; however, creating young grass during Canada goose dispersal period and migration (August 12- October 15) creates a high risk attraction when conducted within the Bird Exclusion Zone/Waterfowl Exclusion Zone. Thus, seeding plots over 400 square meters within the BASH zones should be planned for June but

no later than 15 July. Late season seeding near the time of first snowfall may help to stabilize seed in place for overwintering, where it will emerge in saturated ground conditions early the following season before geese and other grass eating fowl appear. Hydroseeding or seeding under fiber mats especially in high traffic or sloped areas can help to encourage growth.

All restoration and/or revegetation projects where seeding, planting, or transplanting is required must include a management plan to ensure proper support and monitoring until 70% of the intended cover crop is established. This will include monitoring growth and watering as needed.

Trees and Shrubs

Trees and shrubs can be successfully planted throughout the growing season; however, spring and fall have the highest success rate, since the climate in Southcentral Alaska is drier in the early part of the growing season and wetter in the latter part. Nursery-grown seedlings or saplings should be planted before June 15, but may require more attention to watering, since little rain typically falls prior to mid-July. Wild seedlings can be planted in the spring or fall. Cuttings may be planted as late as July 1, provided adequate moisture exists. Trees planted after August will typically receive more seasonal rainfall and thus may not require as much attention. Fertilizers used for trees and shrubs must have nitrogen-phosphorus-potassium ratios of at least 5-10-5. The University of Alaska Fairbanks Cooperative Extension and Alaska Department of Natural Resources Division of Forestry & Division of Agriculture maintain a list of Landscape Plants for Alaska at https://alaska.plants.org/.

7.7.8 Vegetation Maintenance Programs

Mowing

JBER-Elmendorf lawn areas are mowed from May 1 to about mid-September. The 773 CES mows common areas, parade grounds, athletic fields, and the airfield area. Airfield mowing procedures are detailed in the BASH plan for 3WGI 91-212, Bird and Wildlife Aircraft Strike Hazard (BASH) Program (9 May 2012). BASH is further discussed in Section 7.12, Bird/Wildlife Aircraft Strike Hazard Management. Force Support Squadron personnel mow golf courses, ball fields, and recreation areas. Areas are mowed weekly or as required. Golf courses are mowed twice weekly, except for greens that are mowed daily. Mowing schedules for areas near the airfield have been modified due to BASH considerations. These areas are mowed once per summer and then left to grow, with the objective of growing grass tall enough to deter geese use. Routine grounds maintenance on JBER-Richardson is completed under contract. Mowing may also be used as a means to control weeds such as reed canary grass, when conducted prior to flowering heads going to seed.

Chemical Control

Chemical control on JBER focuses primarily on dandelions and other broadleaf weeds. Herbicides include KROVAR I® and WEED-B-GON®. All herbicides are applied as a ground spray, with areas being treated including airfield overruns, dikes, lawns, and a small portion of antenna fields. In addition to dandelion and weed control applications, the golf course is also sprayed with a mix of fungicides to control snow mold. The mix is varied to prevent development of resistance. No fungicides are sprayed on the fairway itself. Chemical control operators are from the 773 CES/CEOIE Pest Management Section, and must be trained and certified in accordance with Air Force standards.

Irrigation and Fertilization

Irrigation is performed primarily at the Moose Run golf course from 15 April to 1 October, using permanent, buried systems of pop-up sprinklers. Greens and aprons are watered twice daily; other areas are watered daily. Fertilization is currently limited to the golf courses.

7.7.9 Environmental Considerations

Erosion Control

Erosion control is required to comply with the Clean Water Act and the Sikes Act, which requires "no net loss" in the capability to support the military mission. Conducting erosion control and stream bank stabilization is required by Public Law 106-65 (Military Land Withdrawal Act) as mitigation for the Land Withdrawal Legislative Environmental Impact Statement to implement the INRMP. Also AFI 32-7064 requires that land management programs include soil erosion control.

Soil is damaged through compaction and erosion. Compaction has not been a concern on JBER- Elmendorf for the most part since most traffic (foot or vehicle) is limited to roads and trails. Erosion is a much bigger concern, especially in connection with roads, military training trails, and disturbed stream banks. During road maintenance on JBER-Elmendorf, efforts are made to correct drainage problems that may lead to erosion along roads. An area of concern with regard to steam bank stabilization is that removal of the natural vegetation along Ship Creek associated with the golf courses Efforts are ongoing to introduce more soil-holding vegetation along this area. Stream banks are addressed on a case-by-case basis. Banks that show signs of sloughing are high priority for bank stabilization through creation of bulkheads or re-vegetation efforts.

Between 2015 and 2017, erosion control walkways have been installed at Fish Lake, Spring Lake, and Green Lake to protect sensitive floating mat and mineral soil shorelines from damage incurred by recreators accessing shorelines.

EAFB soil management efforts were concentrated in the cantonment or built-up areas. However, stabilization of the stream bank along Ship Creek has occurred throughout the last decade. Erosion control is practiced primarily on the golf courses, along the banks of Ship Creek. Methods used follow ADF&G stream revegetation guidance. Because this maintenance was required annually, a stream bank stabilization study in this area was completed in 2001.

Soil resources management on FRA consisted primarily of prevention activities and restoration of disturbed areas. The ITAM Plan (U.S. Army, Alaska 2011) contains best management practices, which are in concert with storm water prevention techniques. Restoration of disturbed areas was conducted by FRA erosion control and stream bank stabilization programs, as well as, the mission-related LRAM component of the ITAM program.

The LRAM decision-making process involves identifying sites that are most in need of repair or maintenance as a result of damage caused by maneuver training. Priority is given to sites with erosion problems or access improvement projects that directly support soldier training take priority. The sensitivity of nearby areas to siltation is considered, since eroding soil will be deposited at some point down-slope. Most erosion control not associated with LRAM involves road drainage correction or maintenance. Road drainage maintenance is important for controlling sedimentation.

Sources of dust, runoff, silt, and erosion debris on JBER are controlled to prevent damage to land, water and air resources, equipment, and facilities. A protective vegetative cover is maintained over all compatible

areas. JBER uses bio-engineered erosion control practices when possible, including live plantings, root wads, coir logs, and spruce tree revetments, to provide erosion protection and habitat for fish and wildlife. Other materials used for erosion control include gravel, fabrics, mulch, and other materials that are environmentally safe and compatible with the site and approved by the ADF&G, Office of Habitat Management and Permitting. When bare ground is required to accomplish mission objectives, other soil conservation measures, such as check dams, wind breaks, and diversions, are used to control dust, erosion, and sedimentation.

Pollution Prevention

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

Wetland/Floodplain Protection

Wetlands in developed areas receive the same protection that they do elsewhere. As part of the environmental impact analysis process, all activities that may affect wetlands are carefully screened to ensure that impacts are avoided or minimized. Appropriate coordination with federal or state agencies is conducted prior to activities occurring, as required by federal and Air Force regulations. When activities take place in these areas, silt curtains, silt fences, coir logs or other affective best management practice measures must be used to limit the movement of silt generated by construction or repair activities. Activities requiring access through wetlands or temporary impacts to wetlands are best conducted when the ground is frozen and the least amount of damage will be incurred to the soil surface. Timber mats or other ground surface protection may be required for use when temporarily working in wetlands, especially during the growing season. Utility and maintenance work in wetlands is typically covered under a USACE General Permit, which may only require a brief pre-construction consultation. All federal general permit conditions, as well as Alaska Regional Permit Conditions will apply.

Compliance with federal regulations is monitored by the Environmental Flight as well as federal and state agencies. Further details on wetlands protection can be found in Section 7.6, Wetland Protection.

7.7.10 Gravel Resources

JBER supports most installation-wide construction and paving maintenance with local gravel resources. Gravel resources have also been provided to the Port of Alaska and the U.S. Army Corps of Engineers. Section 2.4.3 discusses issues associated with gravel extraction on JBER. A Gravel Reclamation Priority Plan was prepared in 2019. All extraction sites will be required to meet best management practices and reclamation requirements outlined in the plan. The gravel resource maybe used for military-related construction purposes, all other uses must be approved by the BLM.

On EAFB gravel extraction sites ranged in size from less than a quarter acre to pits in excess of 50 acres. Historically, gravel extraction occurred in most land management units, except the EOD Creek unit. During 2006 EAFB operated four gravel extraction sites, covering 90 total acres. Four gravel extraction sites encompassing 24 acres were reclaimed between 1995 and 2005. There were four inactive sites requiring reclamation of 8 acres. Future gravel expansion is expected to encompass an additional 90 acres in the next 10 years.

Coordination

Siting of gravel pits, concrete and asphalt debris sites, and clean fill disposal sites must be coordinated with 673 CES Natural Resources. Other land management activities under this plan must be coordinated with Community Planning, Environmental Management, Pest Management, Civil Engineer Operations, and Force Support Squadron, as appropriate, depending on the type of activity.

7.7.11 Mineral Leasing

Mineral resources on public lands withdrawn for military purposes in Alaska are managed by BLM under federal regulations found in 43 Code of Federal Regulation (CFR) Subchapter C. Sale or free use of mineral materials require NEPA review and JBER concurrence. Unauthorized use of mineral materials is considered trespass and will be resolved jointly by the military and BLM.

JBER has the following minerals management objectives:

- Manage the mineral resources on JBER lands in the best interest of the public within the framework of the military mission; and
- provide the military with a source of materials for military construction projects.

The BLM identifies three categories of mineral resources on federal lands:

1. *Locatable minerals* include most metals, metallic ores, and some non-metallic minerals. If the land is open to mineral location under the federal mining laws, private citizens may stake or "locate" a claim, perform assessment work, and develop the resources. Valid mining claims can result in private ownership of the mineral resources. Withdrawn JBER areas have been closed to mineral location since the 1950s. There are no valid or existing claims within the withdrawals.

2. *Leasable minerals* include oil, gas, coal, geothermal resources, oil, shale, gilsonite, phosphate, potassium, and sodium. These mineral resources are leased from the federal government for a period of time and do not become the developer's property. JBER withdrawn areas have been closed to mineral leasing since the 1950s. There are no valid leases on withdrawn lands.

3. *Saleable minerals* consist basically of construction materials, such as sand, gravel, riprap, cinders, pumice, clay, limestone, and dolomite. They are purchased outright from the federal government. Saleable materials on the withdrawals have been used locally by JBER and other authorized agencies, but they have not been extracted commercially since the lands were first withdrawn in the 1950s.

There has been no interest in oil and gas exploration on JBER because no oil-bearing basins are known to underlie the installation. Potentially significant mineral and organic resources include coal, gravel, sand, and peat. The most valuable and desirable mineral resource is gravel used in highway, utility, and building construction projects. Small sources of sand can be found on the installation. Peat is found in wetlands, and it has been extracted from several areas for landscaping applications.

7.8 Forest Management

This section applies to USAF installations that maintain forested land on USAF property, including JBER.

The primary objective of forest management on JBER is to maintain and enhance the ecological integrity of forested landscapes for supporting the military mission, biodiversity conservation, and maintenance of ecosystems services. Forestlands will be managed for a variety of purposes under the concept of integrated resources management.

7.8.1 Policy and Background

DoD Instruction 4715.03, Natural Resources Conservation Program, AFI 32-7064, Integrated Natural Resources Management, and the Sikes Act require management of woodlands, forests and landscaping.

These regulations apply to all DoD operations, activities, real property, and property interests owned, leased, permitted, or controlled in the United States, including public lands withdrawn from all forms of appropriation pursuant to public land laws and reserved for use by DoD, as well as State lands used for military training and testing.

DoDI 4715.03 (4.a.1.a) states marketable forest products requiring removal, including those on lands designated for privatization, must be disposed of by the Military Service or the values of the forest products will be deposited into the Military Service forestry account. Marketable forest products shall not be abandoned, destroyed, or donated. Forestry products may be sold for salvage when their condition or value is adversely affected by natural disasters, insect damage, or other events. Forest products include, but are not limited to, standing timber/trees, downed trees, and pine straw.

The DODI and AFI requirements is applicable to forestry products outside of the areas withdrawn by PLO 2676 and 2962.

Roles and Responsibilities

The management of the forestry program on JBER is the responsibility of the Natural Resources section of the 673d Civil Engineer Squadron.

The BLM retains vegetative rights on much of JBER forest lands under various Public Land Orders. Previously, any management activity involving forest management or removal of vegetation on those lands must be coordinated through BLM and receipts deposited in the General Fund. Proceeds of sales from lands owned by the Air Force are retained by the Air Force and deposited in DoD forestry accounts. In 2018, BLM and JBER managers developed an MOU regarding timber management. The stewardship agreement allows JBER to manage forestlands on the installation and retain all funds generated by sales of personal use firewood (contracted or permitted) on both Fee Simple and withdrawn (BLM owned) lands. This may be accomplished through timber sales by contractual agreement, personal-use firewood permit sales, or Christmas tree permit sales. Fees charged by JBER for forest products are deposited into the forestry account as required (see DoDI 4715.03 and AFI 32-7064). Fees fund silviculture treatment efforts, support staffing needs, maintain/procure equipment, and otherwise support the forest management program. These funds will make up a portion of the financial shortfall to be used for forest enhancement and regeneration. These funds are potentially reimbursable and can be used by the installation to support forestry management. JBER and BLM completed and signed the MOU (BLM MOU AK-2018-013; JBER-IAA-N214-FY18), in September 2018. BLM coordination will continue to occur prior to any commercial harvest of timber products from JBER. Other large timber sales may still be subject to receipt by BLM, unless otherwise negotiated

The following procedures will be included:

- Commercial timber sales will be restricted to the portion of JBER owned by the Air Force, with timber receipts going to the Air Force.
- Timber sales on BLM lands will be coordinated with the BLM and administered by Natural Resources.

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

Beginning 1 November 2018, a fee-based personal use woodcutting program was launched in iSportsman. One full cord of wood is assessed a fee of $35.00. A half-cord quantity is also available for $17.50. Limits to the number of permits allowed was changed from three per year to that quantity which a user needs for personal use only.

7.8.2 Forest Management Program Overview and Current Practices

The forest management program is required to support and enhance the immediate and long-term military mission and meet natural resource stewardship requirements set forth in federal laws. Objectives and benefits of forest ecosystem management include sustainment of viable and diversified training lands to meet the military mission, biodiversity of wildlife species and habitat, including habitat for threatened, endangered and species of concern, outdoor recreation opportunities, wildlife habitat, soil conservation and watershed protection, including erosion control, improvement of air and water quality, sustained production of commercially valuable forest products, and noise abatement.

Management of the forest ecosystem is one of the most critical aspects of land management on the installation due to the high percentage of forested land and its importance to military training. The management of forest resources on JBER must consider ecosystem management principles of preservation and manipulation of habitat, conservation of wildlife, outdoor recreation, and public safety. Under an ecosystem management-based system, harvest levels are determined by management needs, with wood products produced as a by-product of those activities. Harvest levels will normally be far below those levels allowed for maximum sustained yield.

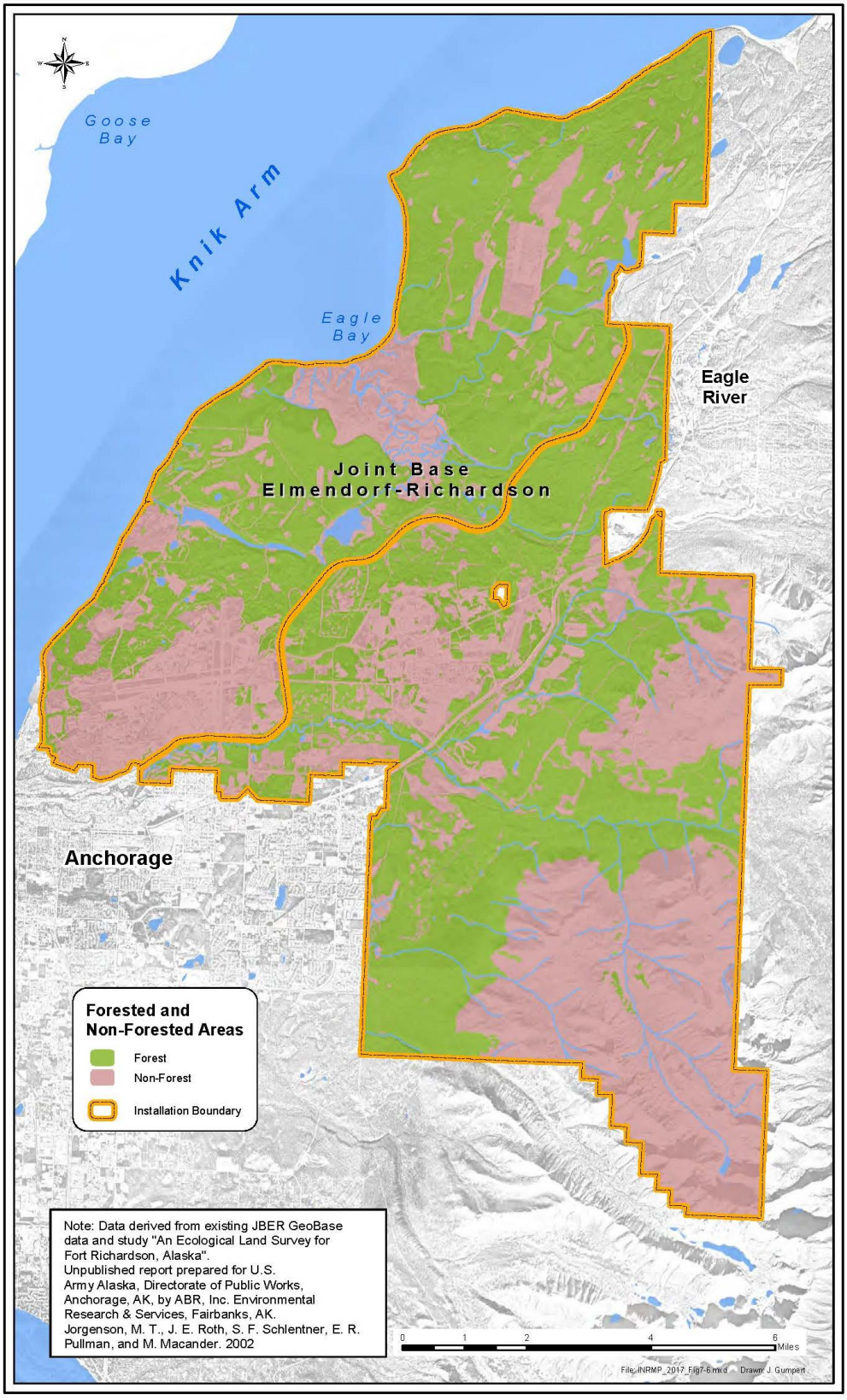
Forest Inventory

Prior to joint basing, an initial timber cruise on EAFB occurred in 1982-1983 as part of a Natural Resource Inventory (Rothe *et al.* 1983), as well as pre-sale timber cruises in 1992, 1995, and 1997. Point sampling cruises were also conducted for all commercial timber sales thereafter.

In 2012, timber surveys were completed to estimate the value of timber being given away to the public as a result of infrastructure expansion projects. Additionally, in 2013, 687 random cruise points were visited and tree metrics were collected. This data was used to model timber volumes on JBER based on LiDAR and aerial imagery (Smeltz, 2014). Additional field survey was conducted during a forest carbon inventory conducted in 2017-2018 (Dial et al., 2018). In addition, forest health and change over time is monitored using the LTEM plots. LTEM plots are inventoried annually, and data analyzed, to assess ecosystem health and trends. The best available estimate of the total forest biomass available for JBER was derived from LiDAR, however, continued data collection at LTEM plots may be used to refine and validate these estimates.

Changes in spruce growth within wetlands, replacement of hardwoods in beetle-killed spruce dominated areas, and low to tall woody vegetation replacement of dwarf vegetation in alpine areas have been documented (Dial, 2015).

Figure 7-11: Forested and Non-Forested Areas at Joint Base Elmendorf-Richardson



A breakdown of cover types is shown in Table 7-8. The white spruce-paper birch-aspen cover type comprises the largest proportion of forest with 16,913 acres. The paper birch-aspen cover type is the second most abundant covering 11,170 acres. Other cover types are much smaller as indicated in the table below. Urban forested areas on JBER account for 4,642 acres.

Table 7-8: JBER Cover Types and Acreages

Forest Cover	Acres
Stand Type	
White Spruce	1,207
Paper Birch-White Spruce	4,078
White Spruce-Paper Birch-Aspen	16,913
Balsam Poplar	770
Paper Birch	542
Stand Type	
Paper Birch-Aspen	11,170
Quaking Aspen-White Spruce	410
Black and White Spruce-Paper Birch-Aspen	1,432
Black Cottonwood-White Spruce	280
Alder/Bluejoint Grass*	1,532
Other Coniferous*	748
Total Commercial Forest Acreage on JBER	**37,054**
Total Forest Acreage on JBER	39,053
Total Non-Forest Acreage on JBER	34,053
Military Support Facilities/Developed/Cantonment	13,526
Urban Forested Acreage on JBER	4,642

* Not included in the total commercial forest acreage

On JBER timber stand ages range from 25 to 225 years on. Most 50-125 year stands were established after natural or man-caused fires, which burned between the turn of the century and the mid-1930s. Stands less than 50 years old were established after site disturbances during or after World War II and the early years of installation development. Stand data on the military training areas have not been associated with age ranges. Determining stand age distribution for all of JBER is one goal of the forestry program.

Alaska Statutes 44.37.200-220 identifies need to prepare an assessment and report on the feasibility of carbon sequestration and carbon-trading systems in Alaska. In 2018, a study of the total forest carbon content within JBER's forested lands was completed. In the future, JBER plans to assess the feasibility/viability of establishing a carbon sequestration or carbon-trading program. The goal of this project is to accurately reflect the JBER carbon footprint (deficit), carbon credit projections from forested habitats, and develop a strategic action plan to gain carbon credits or reduce the JBER footprint, if possible.

Additionally, the University of Alaska Fairbanks Cooperative Extension – Cooperative Alaska Forest Inventory (CAFI) project has established three long-term monitoring plots on JBER which are revisited every five years. The CAFI is a comprehensive database of boreal forest conditions measured at over 615 plots distributed across the interior and Southcentral regions of Alaska, including the Kenai Peninsula. Repeated periodic inventories on CAFI permanent plots provide valuable long term information for modeling forest dynamics such as growth and yield in boreal forest systems. A report is produced by the University of Alaska Fairbanks Cooperative extension periodically.

The USDA Forest Service also maintains long term forest monitoring plots on JBER through their Forest Inventory and Analysis (FIA) program. The FIA program is part of a national effort to evaluate the status

and condition of the nation's forest ecosystems. Permanent research plots were selected along a grid system and are marked with silvicultural monuments, typically a tag nailed to a tree. The data collected on the plots are not identified specific to the property, nor is the exact location disclosed, even to the land owner, pursuant to 7 U.S.C. Section 2276. The information is summarized, analyzed, and published in statistical and analytical reports by the USDA Forest Service. Sites are revisited approximately every ten years.

Commercial Timber Sales Program

The principal focus of forest management is to support the military mission while remaining consistent with long-term ecosystem-based management goals that put ecological sustainability objectives above revenue optimization goals (see DoDI 4715.03). Wood production is still an important consideration in that the revenue generated is reimbursable directly to JBER and is used to implement ecosystem restoration projects; however, maximum production is not an installation goal.

Commercial logging started in 1992 with approximately 31 acres logged above Upper Sixmile Lake. A second timber sale occurred in 1995, consisting of 38 acres. A third sale, located near Green Lake (approximately 40 acres), was initiated in 1997, but received no bids and the sale never occurred. Currently, there are no commercial timber sales occurring or planned on JBER. Limited personnel and budget have since restricted the number of sales. Combined with failures to illicit bids on commercial timber sales, these program constraints severely limits the opportunities for commercial timber harvests in the foreseeable future. Further, the ongoing spruce beetle epidemic will likely limit the availability of commercial forest products.

Consideration of future commercial harvest practices would follow reasonable estimates of the annual allowable harvest is a guide for future harvest activities. Calculations are based on the simple area cut method, which divides the total productive forest area by the rotation age. The result of this method gives the acreage that can be harvested in a year. The acreage is multiplied by the weighted average volume per acre to determine the annual harvest.

It is recommended that no more than 50 percent of the ten year estimated annual harvest occurs within a 10-year period due to aforementioned factors restricting harvestable timber resources; considering temporary or permanent habitat loss since last estimates were obtained; potential future losses due to joint basing and mission support; protection of important habitat for threatened, endangered, candidate, and sensitive species; and maintaining important wildlife habitat corridors.

Harvest Methods

Clear-cuts, seed tree cuts, and selective cutting are options which could be used to regenerate forests. Methods will depend on site conditions and location. The following guidelines will be used:

- Design of treatment in training areas will be influenced by the guidance document entitled: Tactical Concealment Area Planning and Design Guidance Document, 1999.
- Design of treatment areas is critical. In general, treatment areas should be circular or square rather than long and narrow to maximize response to light and moisture regimes. Borders should appear natural.
- Areas should be 5-40 acres. If areas larger than 20 acres are treated, islands of vegetation should be left for resting areas and escape cover.
- If birch is a desired regeneration species, 7-10 seed trees per acre should be left.
- A minimum of 8 snag trees per acre should be left, and snags and seed trees should be left in groups to prevent problems with wind-throw.

- Patches of mature forest should be left adjacent to ponds and wetlands as well as moose calving areas, and logging or other human disturbances should be minimized during calving season (May 15-June 15).
- Vegetation clearing (to include clearing and grubbing, and other site preparation and construction activities that would violate the MBTA) should be conducted prior to May 1 or after July 15 to avoid impacts to migratory birds.
- No logging should be done within 1/4 mile of known, occupied bear or wolf den sites 660 feet of active eagle nests, or 330 feet of inactive eagle nests.
- No logging shall be done within 100 feet of anadromous streams and lakes, and only selective logging shall be done within 100-300 feet of lakes, streams, recreation areas, or main roads in accordance with setback requirements in Section 7.6.2.
- Logging in wetlands should be minimized, and if necessary, should be done in the winter.
- Spruce trees should be harvested after 1 July and before 31 December. All spruce trees cleared outside this window will be debarked in place or chipped to minimize risk of exacerbating or spreading spruce beetle activity.
- Summer logging in upland areas should utilize whole-tree-logging methods to provide some site scarification.
- Logging in sensitive areas should be restricted to rubber-tired or low-pressured track equipment.

The DoDI 4715.03 and AFI 32-7064 requires that forest products with marketable value, such as white spruce and birch, are not given away, abandoned or destroyed. Commercial sales will likely be conducted for the purpose of land conversion. In most cases projects on base are not large enough for commercial timber sales and fall under small-lot sales which require salvageable trees greater than 4-inches DBH to be cut and hauled to established wood lots and made available for the personal-use firewood program. Designated firewood cutting areas are established in several training areas and several more have been located proximate to recent project sites to reduce hauling costs. Each project is treated on a case-by-case basis. Where the wood is ultimately located depends on available/adequate spacing, hauling routes, proximity to the site, and access for woodcutters. Where possible, sales will be timed to coincide with improved market conditions. Commercial timber sales will be restricted to the portion of JBER owned by the Air Force, with timber receipts going to the Air Force. Any new or future timber sales on BLM lands will be coordinated with the BLM and administered by Natural Resources.

Personal-Use Forest Product Sales Program

A personal-use woodcutting program began in the early 1970s. The removal of dead and downed wood from designated areas averaged less than 100 cords per year prior to 1987. In 1987, a fee schedule was initiated for the sale of personal-use forest products including a personal-use Christmas tree cutting program that sold 550 permits at $5 a tree. Since joint basing occurred, JBER did not collect fees for forest products, and thus, did not contributing to the Air Force reimbursable forestry account and currently not eligible for reimbursable funds to support the program.

In September 2018, JBER finalized an agreement with the BLM entitled “Memorandum of Understanding Between Joint Base Elmendorf-Richardson and the Bureau of Land Management concerning preparing, reviewing, and implementing the JBER Integrated Natural Resource Management Plan and Management of Vegetation on JBER withdrawn land” (BLM MOU AK-2018-013; JBER-IAA-N214-FY18). This agreement allows for JBER to execute a fee based personal use forest product program and retain those funds to be deposited into the Air Force reimbursable forestry account. Beginning 1 November, up to a full

cord of firewood may be harvested for a permit fee of $35.00. A reduced fee of $17.50 is charged for collecting up to one-half cord of firewood.

Much of the firewood sold/given away in recent years has been generated by numerous development projects that resulted in forest clearing. Projects on base that include tree removal are required to provide salvageable trees to be cut and stacked for firewood that is made available to the public. Specific areas are also opened to allow dead and downed wood to be salvaged by wood cutters. Opening specific areas for public woodcutting in these areas helps support stand management and forest health project; where limited personnel and funding has restricted forest management efforts. These areas are usually areas that have sustained damaged from high wind events or have been affected by beetle kill. Other areas where firewood collection is allowed include project areas where clearing, thinning, or other management strategies have been executed by JBER Forestry or USARAK Range Management crews.

Christmas tree harvest is offered in designated lots. In 2018, Christmas tree lots were selected based on areas where thinning of small replacement level trees were abundant in otherwise mature spruce stands. Thinning the understory will reduce crowding and improve growing conditions for maturing spruce, reducing stand vulnerability to disease and pests, such as spruce beetles. Christmas tree cutting is allowed typically between Thanksgiving weekend and the weekend after Christmas. Only one tree is allowed per authorization. Christmas tree permits remain free under the current personal use harvest program.

Table 7-9: JBER Forest Product Permit Sales

Year	Firewood	Christmas Trees
2014	609	374
2015	431	345
2016	629	206
2017	541	317
2018	586	155
2019*	420	128

Not all authorized woodcutters harvest the total amount of wood allowed to collect. An accurate harvest record is not attainable through the iSportsman system since many recreators fail to sign in, sign out, or complete the harvest record properly.

Forest Stand Management History

Prior to joint basing, a Forestry and Wildland Fire Management Plan was developed as a component of the Fort Richardson INRMP (U.S. Army Garrison, Alaska 2007a). This plan covered the management, maintenance, protection, and improvement of forest vegetation on USAG-AK-managed lands in Alaska, including Fort Richardson.

Forest management strategies are directed toward producing benefits to both the military mission and to the native ecosystems. Activities may include manipulation of forest structure, such as thinning, seedling planting, etc., for a specific mission need or to create a security buffer, visual screen, or noise buffer. Forest stand management incorporates silviculture treatments for areas on an annual basis, which include thinning, seed tree cuts, and selective cutting of live or dead or snag trees. Methods will depend on site conditions and location. The ITAM program monitors training areas for hazardous trees to identify those that present hazardous situations and must be removed so military use of training areas is not jeopardized.

JBER Natural Resource managers will work with BLM and Alaska Department of Natural Resources Division of Forestry (AKDOF) and Wildland Support Module on continued development of a forest management plan in association with the BLM MOU.

Forest Stand Management for Spruce Beetles and other Forest Pests

A major outbreak of spruce beetle began on JBER during 1991-1992 and spread to portions of Chugach State Park. Severe infestations can effectively girdle the tree, killing it. More than 80 percent of the mature white spruce on JBER were killed by 2001. Several sawmill operators requested permission to buy beetle-killed spruce and remove it. This mutually beneficial arrangement resulted in the removal of many dead trees in a contracted portion of Elmendorf, north and west of the airfield. Additionally, other stands were cleared by ITAM in the expansion and/or creation of new firing points. Other areas, particularly along Poleline Road in Training Area 411 and 412 and on Clunie Lake Road and to the north in Training Areas 402, 403, 404, and 405 were authorized for woodcutting, to encourage removal of standing dead spruce. By 2017, the majority of the beetle killed timber had been removed from the previously affected areas.

In 2016, a marked increase in the abundance of spruce beetles was observed by the AKDOF, including pockets of increased activity on JBER. By 2018, large tracts of spruce forest throughout the Matanuska-Susitna Borough, from Wasilla to Denali State Park, had been decimated. The 2017 Forest Health Conditions report (U.S. Forest Service, 2018) noted at the end of 2017 that more than 400,000 acres of spruce forest had been destroyed in Alaska since 2016, more than twice than what was destroyed between 2015 and 2016. JBER incurred a significant increase in mortality of spruce in stands near Green and Spring Lake as well as in several stands in Training Areas 401, 402, and 403. A trap tree study conducted in the Green/Spring Lake stand showed that spruce beetles, which typically have a 2-3 year life cycle, were producing callow adults within one year. This is likely due to sequential mild winters and wet summers prolonging the active development of larvae in spruce trees.

Spruce beetle activity is stimulated by vulnerable stands of spruce, including large (greater than 8-10 inches) mature trees with slow or suppressed growth which may result from overcrowding, climate conditions, or mechanical damage from storms, clearing, or other anthropogenic activities. Mechanized land clearing along utility corridors or clearing for training areas incur direct and incidental effects to spruce trees, which are then highly vulnerable and attractive to beetles. Several large stands of spruce and spruce birch forest had been cleared for flightline safety and expansion of Army training ranges. Spruce were stockpiled for firewood, but not collected and burned before emergence of the beetles occurred the following year.

Response was initiated in 2017 to minimize the further spread of spruce beetles on JBER; however, the infestation has only continued to intensify. Removal efforts of dead and infested trees has been initiated and will be continued in order to limit the proliferation of the pest and manage affected stands to minimize wildland fire risk and degradation of natural training areas and wildlife habitat. Forest areas with active infestations will not be opened for general firewood harvest or other activities unless strict best management practices are employed.

Best management practices to limit the effect and spread of spruce bark beetles and other pests include:

- Harvest of spruce should take place between 1 July and 31 December to maximize the drying/mortality of spruce outside of the beetle flight window. Trees that have been dead awhile are less attractive to beetles. Fresh and recently cut spruce, even completely downed, are attractive to beetles.
- Harvest of spruce less than 6 inches DBH should be chipped and disposed of in place.

- Harvest of large (>8" DBH) spruce using mechanized land clearing or removal by hand, in or near (within 1 mile) heavily infested areas must be delimbed and debarked in place. Spruce stockpiled for firewood harvest must be segregated from other tree species.
- Firewood harvesters should be certain to split and burn all spruce firewood by May of the following year.
- Mechanized land clearing, including for range activities, construction site preparation, utility installation/maintenance, etc., must be conducted conservatively to avoid incidental damage to trees to be left in place. Damage to trees makes them attractive to beetles and less likely to survive an attack.

Stand management to improve habitat value and decrease vulnerability to forest pests will be implemented as possible. Selective harvest, small patch thinning, and understory clearing are options to create stand diversity and promote strong and healthy growth. Placement of insect traps or falling of trap trees in actively infested areas can be effective in areas with small infestation to minimize spread. Infestations occurring in the cantonment area may be dealt with by insecticide use, discussed in Sections 7.7.7 and 7.11.

In response to the current outbreak, JBER will continue to monitor affected stands through roadside surveys and aerial surveys coordinated with AKDOF and the Alaska Army National Guard. Roadside and aerial surveys were conducted in 2017, 2018, and 2019. Additional surveys will be conducted annually in late May-early June, when newly matured beetles will be fleeing dead spruce in search of fresh, mature trees to lay the next generation in until the current spruce beetle epidemic wanes. This is the time period when spruce die very quickly, turning from green to bright yellow in a matter of weeks, and then red shortly after, just prior to all the needles falling, the final indication of mortality.

Common local, defoliating insects include the morning cloak butterfly, spear-marked black moth, large aspen tortix, and the spruce budworm. Some minor insect defoliation problems exist, especially aspen tortix on the bluff area above the Port of Alaska facility. Fungal heart rot is common in birch over 80-years old. This is not entirely negative, however, as this process creates cavities available to cavity-nesting wildlife species. With an outbreak peak in 2011, geometrid moths defoliated a large expanse of forest near Arctic Valley Road. This outbreak affected five species of trees in the area. This area will be monitored for these moths and for recovery. In the fall of 2011, Sawfly larvae were found attacking several species of spruce around JBER. General forest health observations were conducted by MWH in 2014 (MWH 2015b). These areas will continue to be monitored for management needs and recovery. A wildfire hazard assessment (see Section 7.9, Wildland Fire Management) must also be performed regularly to determine where fuel reduction is most necessary and areas that are fire prone.

Windthrow and other Disturbance Events

In September 2012, JBER experienced a 100-year wind event that significantly disturbed the forest. This wind event was coupled with severely saturated soils and multiple flood events around the same time. The combination of saturated soils and high winds prior to the freeze-up made this forest a prime candidate for severe wind-throw. This event impacted the entire base and varied in intensity affecting up to 50% of the trees in some stands. Though it was not officially recorded, micro-bursts were suspected to have occurred, based on the patterns of windthrow observed in some stands. An event of this magnitude poses significant forest health concerns as trees die and become targets for forest pests, fallen and snagged trees serve as hazards in the natural training environment, and there is an increase in vulnerability to wildfire.

Recent Development

Flightline safety projects to remove trees and water hazards near the flightline have required clearing of approximately 183 acres of spruce and mixed spruce-birch forest, particularly on the north end of the east-west runway. These projects occurred between 2016 and 2018 and are continuing into 2019.

Army clearing projects occurring between 2016 and 2017 include construction of Firing Point 6 (11.6 acres), expansion of Firing Point 10 (5.4 acres), and construction of an underground training facility and access trail near Baumeister Village (9.5 acres combined).

Utility clearing by Doyon Electric in 2017 resulted in approximately 33.59 acres of clearing of both new and pre-existing right-of-way (ROW) for installation and maintenance of overhead- and underground utility lines. In 2016, new utility line projects required approximately 14 acres of new clearing.

Other clearing projects in the main cantonment areas include for parking and new construction near the Veterans Affairs Hospital (1.1 acres).

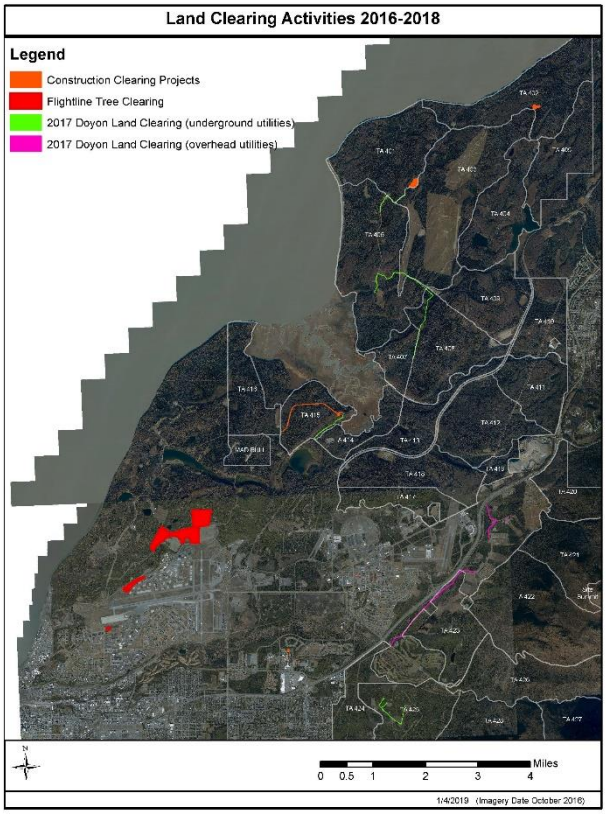


Figure 7-12: JBER Land Clearing Activities

Forest Stand Management Practices

Snagged and downed birch and standing dead spruce pose a specific hazard as ladder fuels which may facilitate escalating ground fires into the canopy. Management activities for areas abundant with these hazards were opened up for public use woodcutting with the intent to target efforts in areas where removal would improve habitat, safety, and forest health. Areas abundant with snagged hazard trees were targeted for cutting by JBER emergency services during annual training exercises as well as by forest management crews in the Natural Resources and ITAM programs. Once the snagged trees were downed, areas were opened up for firewood collection.

Christmas tree cutting areas will be prescribed in locations where thinning smaller (<20 foot tall) spruce will decrease the overall stem density and improve growing conditions for maturing spruce. This strategy may also be employed for small patch stand management, as was executed near Sixmile Lake (Talley Avenue) in 2016 and 2017.

Forest management activities continue to be prioritized where spruce beetle killed and wind thrown, standing dead, or otherwise downed trees are a hazard to training troops or areas where wildlife habitat could be improved, with reduction in ladder fuels, especially near firing ranges. In accordance with the MOA, silviculture treatments in withdrawn lands will not exceed more than 70 acres of harvesting live trees, as well as, no more than 250 acres of salvaging dead or dying trees on an annual basis. Silviculture prescriptions will be prepared for each area prior to the field season discussing the forest management

activity, such as thinning, harvesting, planting, pruning, etc. Personal-use firewood cutting and Christmas tree harvests is used to support silviculture treatments in designated areas, serving as the function of minor thinning operations.

Forest Management Planning

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

BMPs and Safety Practices

JBER incorporates forestry Best Management Practices (Alaska Statute 41.17) to minimize impacts to the environment resulting from forest management activities. The DoD, however, may be held to higher federal standards (including those within this document) standards than what is expected of private landowners. The BMPs set forth by Alaska Division of Forestry include specific guidance for timber harvests, site prep,

It must be noted that on JBER-Richardson a high percentage of the standing timber within the training lands is currently or has historically been located within a range safety firing fan for a multitude of various live fire ranges. Consequently these trees have accumulated a build-up of copper jacketed, plain lead bullets, or other unexploded ordnances through weapon ricochets and in-line firing. Public safety should be of primary concern if these areas are considered for any future harvest. This phenomenon is taken into account in the Forest Management Plan (draft). However, such areas would be targeted in the carbon sequestration research because of the land-use restrictions in place.

The Range/ITAM community often fully utilizes trees that are contaminated with munitions residue during training land and range project upgrades. These contaminated trees are mulched with a hydro axe machine and the resulting wood chips are used as a soil erosion control and stabilization measure. Identification of storm water best management practices is required within a project storm water pollution prevention plan (SWPPP) and this procedure allows for good stewardship of on-site timber resources that may be considered unsuitable to sell or give away to the public in light of safety concerns.

Regeneration

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

The two most recent commercial clear-cuts on JBER required artificial site regeneration to bring stem counts up to adequate levels. Current development/construction that results in land clearing operations requires no regeneration efforts primarily due to land-use conversion.

Artificial regeneration was also used to compensate for spruce bark beetle damage occurring between 1998 and 2003. Approximately 20,000 white spruce seedlings were planted as Boy/Girl Scout projects during that time.

Regeneration should be conducted with the following considerations:

- Any new construction should consider using already disturbed areas.

- Any disturbed areas not being utilized should be reforested, provided that it is within land use designation prescriptions.
- New disturbances should ensure adequate wildlife corridor/habitat management considerations.
- Any gravel extraction sites will include adequate funding for reclamation of those sites back to forested habitat.
- New reforestation efforts should ensure best management practices are applied to minimize invasive species and disease introductions. Local seed (certified weed free), seedlings, planting sprigs, or cutting cultivation is recommended.
- Effort should be made to use local seed sources for genetic continuity.

Reforestation plans will be developed for sites regenerated after harvest or disturbance. Plans will define site preparation, regeneration technique, seed/seedling source, planting technique, spacing, stand type, and composition to be achieved at the target year. Stand maintenance/improvement treatments will be outlined. Natural Resources personnel will periodically conduct site visits to ensure minimal regeneration standards and objectives of reforestation plans are met. Minimal regeneration standards adopted from the State of Alaska's Forest Practices Act should be followed. Land should be reforested as soon as possible, but must be reforested seven years after harvest.

JBER will develop reforestation plans that meet 3WGI 91-212 BASH standards and allows for no conflict with aircraft operations and no unnecessary wildlife attraction. Plans will emphasize replanting native trees to areas not deemed for construction, range projects, or other mission-related use, and will focus on natural regeneration or use of seedlings propagated from local seed sources where possible.

Seed Collection

In 2014, more than 1,000 seeds of mountain hemlock (*Tsuga mertensiana*) were collected near Geronimo Drop Zone and were processed at the Northern Latitude Plant Material Center in Palmer, Alaska. Seeds were greenhouse grown through spring of 2018, then delivered to JBER with plans to be planted in designated reforestation areas (to be determined).

7.9 Wildland Fire Management

This section applies to USAF installations with unimproved lands that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool. This section is applicable to JBER.

7.9.1 Policy and Background

The JBER Wildland Fire Management Plan (WFMP) is written as a supporting document for implementation of the INRMP as mandated by AFI 32-7064. It also supports a coordinated approach to wildfire response and risk mitigation that includes Fire and Emergency Services (FES), installation Natural Resources (NR) personnel and the AFCEC/CZOF. This plan addresses the specific fire-related supporting goals and objectives identified in the INRMP as well as Flight Management Instruction (FMI) 32-313 and the JBER FES Standards of Cover (SOC) for wildfire response. Implementation of this WFMP will assure achievement of fire-related resource management and mission support objectives.

The WFMP has been developed to provide guidance for the suppression and prevention of wildfires on JBER lands and to implement ecosystem management and fuels reduction goals using mechanical fuels treatments and prescribed fire in support of the INRMP. The WFMP provides guidance for the suppression

and prevention of wildfires on JBER lands and to implement ecosystem management and fuels reduction goals using mechanical fuels treatments and prescribed fire in support of the INRMP. It was most recently updated in 2019 and is awaiting signature by the installation commander. It is located in Tab 9.

The JBER FES is currently responsible for suppressing wildland fires and the FES Fire Chief (FC) is responsible for ensuring wildfire readiness and response for the installation and for ensuring that the WFMP accurately reflects FES FMIs and SOCs, roles, and responsibilities.

In 2019, AFCEC/CZOF stood up the JBER Wildland Support Module (WSM), to provide a high quality, mobile, qualified and experienced resource for installations to implement the goals and objectives of the WFMP. The WSM will maintain expertise to plan and conduct prescribed fire, accredited training delivery, and mechanical fuels reduction services. The WSM will be part of the initial attack assignment for all wildfire on JBER.

The JBER WSM provides technical expertise in the areas of long-term planning, ignitions, holding and suppression, prescribed fire preparation and implementation support, hazard fuels reduction, and fire effects monitoring, resulting in fire fulfilling its natural or historic role to meet resource and management objectives. The WSM will coordinate all activities extensively with the installation NR staff and FES to ensure all actions are aligned to a common goal.

Prescribed fire can be a cost effective tool to protect, maintain, and enhance military training environments. However, wildfires are also a concern because of their impact on human activities, structures, and military operations.

Fire may have had a more important influence on ecosystem functions in the Anchorage area during pre-settlement times. Wildfires were prevalent in the 1800s and early 1900s, as indicated by early to mid-successional forest stages that have developed since then (Jorgenson *et al.* 2002). Forty eight percent of JBER-Richardson over the past 200 years has been affected by fire (Jorgenson *et al.* 2002).

Although wildfires are a concern at JBER, they are rarely a significant problem. Numerous fires have been recorded in the Matanuska-Susitna Valley to the north, but no major fires have occurred on FRA since 1950 (Jorgenson *et al.* 2002). Severe drought conditions occur about once every 20 years (U.S. Army, Alaska 1998), and in normal years there is an average of less than five wildfires. These fires are usually mission-related, small, and easily contained. A number of firebreaks are developed on JBER- Richardson and the ITAM GIS metadatabase includes this data layer.

Functions of wildland fire management on JBER are outlined in *Wildland Fire Management Program*, Flight Management Instruction 32-313 (11 Feb 2011). This instruction discusses fundamental functions for the operation of the program, and is intended to meet all regulatory and state and federal requirements.

In 2015, the AFCEC Wildland Fire Center looked at the installation as a whole and assessed the risk of land features and land-use against the potential for wildland fire (CEMML 2016). The goal of this risk assessment was to evaluate how well protected the landscape is and provide management recommendations for the subsequent 5 years. These recommendations were incorporated into the 2019 Wildland Fire Management Plan to help target project funding to increase fire protection on the installation.

This assessment determined that the overall wildfire risk on JBER is very low due to low ignition probability, moist and calm weather, and a fire season limited to just three months in most years. The risk assessment attributes JBER's fire behaviors to fuels and their condition, rather than to wind or topography and determined that the risk of a large or intense fire is very rare and highly unlikely to escape the installation. The most likely location of a wildland fire is near the Grazelka Range, which is actively

managed for wildland fire. Grazelka Range is an example of a grass dominated system bordered by forest where ignition from tracer (flare) rounds could ignite the grass and then spread to the adjoining forest. Wildland fire management practices in such areas include prescribed burning to reduce grass fuels and thinning and clearing of ladder fuels in up to 200 feet around the edges of the ranges at their interface with the forest. A network of trails and firebreaks are also actively managed around firing ranges and around interfaces with the adjoining community to minimize risk of wildland fire escape. These management strategies are employed annually as a cooperative effort involving USARAK Range Control, Natural Resources, JBER WSM, and JBER FES.

Fire management regimes (including prescribed fire) have been established throughout JBER in all active firing ranges including throughout the Richardson Training Area Small Arms Complex, ISBC, Biathlon Range, IPBC, DMPTR, and Malemute Drop Zone.

7.9.2 Wildfire Prevention

JBER Fire Emergency Services (FES) takes weather readings once daily with the morning shift dispatcher. Fire weather stations are located at the Small Arms Complex and in JBER cantonment areas. Weather readings are reported as a fire weather index, which is available on a shared computer drive. The fire weather index is completed and emailed by 0630 daily. This index is used to calculate a fire danger rating.

The fire weather index is used to establish the daily fire danger rating. This fire danger rating is provided to Range Control, which restricts the use of munitions and pyrotechnics as fire danger increase according to their incendiary risk.

Main causes of fires are human caused. Most military activity occurring on JBER-Elmendorf in the wildland areas is non-combustible. Most wildland fires occurring on JBER-Richardson have been small and confined to areas behind the small arms complex. Ten wildland fires, all human caused, have been recorded on JBER since 1956. The largest fire occurred in 2006, the Otter Lake Fire, which burned 81 acres. A fire must reach and exceed the size of 1.0 acre to be recorded. Typically, FES reports a few to over 100 fire starts each year. This varies by weather, training activities, and other conditions.

During times of high fire danger, all fires are restricted to designated fire pits or barbecue. At other times, such as during winter, campfires are not restricted due to the low danger of wildfire. Fires caused by catalytic converters from some vehicles are occasionally a problem. Off-road restrictions reduce the potential of fires from off-road vehicles. The railroad has reduced vegetation around the tracks to reduce the rate of spread should a fire occur.

Increasing fuel loads from the spruce bark beetle that killed most of the larger white spruce on JBER is a concern and could lead to large fires, which would be difficult to control. In some areas, dead and dying timber and a build-up of understory and associated litter have increased the wildfire potential.

Additionally, the death of larger spruce trees has allowed areas to be taken over by the grass *Calamagrostis* spp., another potential fire risk. Because of the extensive mortality of white spruce on JBER-Richardson, fire prevention activities were conducted in 1999 and 2000 to reduce fuel loads adjacent to small arms ranges. In addition, firewood collection has focused efforts on reducing the dead and downed wood and standing dead spruce in some of these problem areas. Corridors were established that have allowed harvest along Arctic Valley Road to increase the fire protection provided by this hardened gravel road. Snagged trees, resulting from the wind storm in 2012, serve as dangerous ladder fuels which may increase the hazard of a more readily controlled ground fire spreading into the forest canopy.

Timber harvesting or prescribed burns can help reduce the fuel load in an effort to prevent wildfires. Planned burns are difficult to organize. The prescribed burning window (which occurs between loss of snow cover and green-up) is very narrow and, in some years, does not occur. Burns can be accomplished in fall, but the burning window is narrow due to weather and personnel constraints. Another limiting factor is that winds must be low to prevent smoke from entering urban areas. Because of proximity to Anchorage and mission requirements, fire has been prevented and largely excluded from the forest ecosystem on JBER. Unfortunately, due to narrow burning windows and stringent air quality standards, it is difficult to re-establish fire in this ecosystem. The ADEC issues burning permits for prescribed fire for agencies that have a fire management plan and have burn plans prepared that meet state and federal laws and regulations. Historically, the only burns that occur on JBER are planned and executed by AFS on behalf of RTA Range Control. Prescribed burns are subject to NEPA review and must conform to all state and local permitting requirements.

In 2015, JBER Emergency Services established a Memorandum of Agreement with the U.S. Forest Service and the Alaska Department of Natural Resources Division of Forestry (AKDOF) for the management of fuels in active firing ranges, as well as to execute training and response to wildland fire. In 2016, AKDOF completed tasks to re-establish a fuel break between the installation boundary and the Stuckagain and Muldoon residential neighborhoods.

7.9.3 Wildfire Suppression

Pre-suppression

In fire-prone areas, climate, human activity, and types of vegetation (or fuels) determine the level of wildland fire risk. Pre-suppression activities are those activities that reduce wildland fire risk. Pre-suppression actions are planning, prevention/ education, fuels management, and prescribed burning.

Pre-suppression planning stresses safety, effective fire response planning, and pre-suppression priority. Public and firefighter safety is the first and highest priority. Once personnel are committed to an incident, those resources become the highest value to be protected. Fire response planning is a continuing process.

JBER's northern portion is classified for full and critical fire management priority due to the high value of resources at risk from fire, in addition to the proximity to Anchorage and Eagle River. Most of the area is classified for critical fire management due to the many military resources in the area. Training areas along Knik Arm are classified for full fire management. Cultural resources staff identified sites in the northern JBER area, but management options related to wildland fire have not been determined. This portion of JBER is bounded by private parcels, railroad lands, and Native Corporation lands.

The southern portion of JBER is classified under full and limited fire management priority. Most of the area is under full fire management because it is mainly used for military training and small arms ranges. Alpine zones are classified for limited fire management because of their remote location. Many military resources are at risk from wildland fire in this area including a small arms complex. Additional surveys by Explosive Ordnance Disposal personnel are needed to ascertain sites where ordnance has been used and disposed. Cultural resources staff identified sites in this area, but management options related to wildland fire have not been determined. This southern portion of JBER is bounded by private parcels and state lands.

Prescribed burns have been conducted since 2015 in all active firing ranges including throughout the Ft. Richardson Small Arms Complex, ISBC, Biathlon Range, IPBC, DMPTR, and Malemute Drop Zone. Prescribed fire projects will be implemented to attain goals and objectives of the INRMP and to support AF and Army mission requirements. Implementation will follow state prescribed fire regulations and will

follow a site-specific PFP using the AF Prescribed Fire Plan Template (AF PFP Template; see Appendix 3.5 of the JBER WFMP or AFCEC/CZOF) or the PMS 484, Interagency Prescribed Fire Planning and Implementation Procedures Guide, July 2017 (PMS 484), upon which the AF PFP Template is based. The WSM will assist JBER FES with prescribed fire implementation to provide risk reduction and to aid the military mission preparedness, as well as to provide an invaluable training opportunity for mutual aid partners to work together. All prescribed fire planning will be coordinated through the WSM Lead. Prescribed fire for the purpose of fuel reduction near ranges and impact zones will be implemented as needed, based upon wildfire risk. It is expected that between 2,000 and 3,000 acres will be burned annually to meet this objective.

Planned mechanical fuels treatments will include maintenance of all firebreaks and fuelbreaks. Additional planned mechanical fuels treatments will focus on removal spruce killed by the spruce beetle and maintenance of shaded fuel breaks.

Suppression

Primary fire suppression responsibility lies with the JBER Fire Emergency Services. JBER FES provides initial response to wildland fires on JBER. However, wildland fire management in Alaska requires multi-agency cooperation. Fire management is a joint effort by JBER and the AFS, and the Alaska Division of Forestry, Mat-Su District. If the fire exceeds the capabilities of JBER FES, the fire chief or senior fire official can request assistance from these agencies. The AKDOF ultimately has wildfire suppression responsibility for all areas in the southern part of the state regardless of land ownership.

JBER FES and WSM maintain firefighting equipment, including portable pumps, hoses, shovels, chainsaws, water tanks with pumps, pulaskis, hoes, rakes, brush kits, Indian packs, and swatters. Firebreaks have not been created on JBER-Elmendorf. A fuel break/firebreak system has been established on JBER-Richardson at locations with the highest wildfire risk, particularly behind the small arms complex, to minimize the spread of fires. If a wildfire escapes the initial attack, fuel breaks and other fuel modification areas provide the most logical location for fire containment lines. Well-maintained fuel breaks and fuel modifications provide defensible space that aids in wildfire containment. The many wetland areas, roads, military facilities, and the Cook Inlet help minimize the spread of most wildfires.

7.10 Agricultural Outleasing

This section applies to USAF installations that lease eligible USAF land for agricultural purposes. This section is not applicable to JBER.

7.10.1 Program Overview/Current Management Practices

There are presently no areas on JBER used for agricultural leases. There are no plans to institute agricultural leases on JBER since they generally are not compatible with the military mission, JBER security, or ecosystem management strategies. However, if any JBER lands are evaluated in the future for this type of outlease, it will be conducted in such a manner to support mission operations, support conservation compliance, execute natural resources stewardship, maintain healthy ecosystems, and sustain biodiversity.

7.11 Integrated Pest Management Program

This section applies to USAF installations that perform pest management activities in support of natural resources management (e.g. invasive species, forest pests, etc.). This section is applicable to JBER.

7.11.1 Policy and Background

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 JBER is the responsibility of the 773 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 the JBER 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 JBER.

A JBER Integrated Pest Management Plan (IPMP) was renewed on 10 October 2018, and complies with applicable requirements, particularly those of the federal Insecticide, Fungicide, and Rodenticide Act and DoD and individual military Department policies. The Installation Pest Management Plan is reviewed annually and updated at least once every five years. The IPMP is managed by the 773d CES/CEOIE Pest Shop, who coordinate with 673d CES/CEIEC Natural Resources for plan updates and revisions.

In accordance with AFI 32-1053, Pest Management Program, the installation Integrated Pest Management Plan must address all strategies for managing pests. Native wildlife and invasive wildlife are treated differently. Native wildlife is managed in accordance with BASH (see Section 7.12, Bird/Wildlife Aircraft Strike Hazard Management) and INRMP requirements. Invasive wildlife animals are treated as such and are removed and/or killed. JBER uses the Integrated Pest Management approach, emphasizing the use of non-chemical corrective measures (e.g., surveys, education, sanitation, harborage reduction, exclusion, and mechanical means to include mowing) when possible. When necessary, chemical control is used at the lowest and most effective application level. Major pest control work for housing units is sub-contracted to a local pest control company by Aurora Housing.

7.11.2 Program Overview/Current Management Practices

Pest management requirements on JBER are:

- Disease vectors and other health related pests, such as mosquitoes;
- general household and nuisance pests, such as silverfish, fruit flies, and firebrats;
- structural pests, such as carpenter ants;
- BASH pests, such as grasshoppers;
- Noxious and invasive weeds, such as dandelions, clover, and other lawn weeds, and non-lawn invasive plants, such as bird vetch, white sweet clover, orange hawkweed, reed canarygrass, thistle, elodea, and bird cherry;
- vertebrate pests, such as mice, voles, bats, shrews, and squirrels; and
- Birds, such as Violet-green Swallows, Cliff Swallows, European Starlings, and Rock Doves.

The 2018 IPMP includes considerations for pest management operations in areas of special environmental concern, such as areas with endangered or protected species (beluga whale, Bald Eagle) and environmentally sensitive areas, such as wetlands and waterways.

Vegetation control is required on the airfield, shoulders of main roads, storage areas, and in pavement cracks. Weeds, such as dandelions, knotweed, and crabgrass, are treated under recurring work orders. Chemical control is a last resort option. Pesticide use in support of JBER natural resources management activities involves invasive plant control and forest diseases and insect control (Section 7.8 Forest Management). Any plant control activities associated with withdrawn lands consider the BLM strategic noxious weed control plan.

JBER golf courses maintain a separate pesticide and herbicide application program and are responsible for development and implementation of their own Pest Management Plan. This plan is an Appendix to the 2016 IPMP.

The Natural Resource office will coordinate with 773 CES/CEOIE Pest Management Section personnel to ensure that the IPMP and INRMP are mutually supportive and not in conflict. AFI 32-1053 requires Natural Resources to:

- *3.6.1. Provide program guidance for managing IPM programs;*
- *3.6.2. Work with [PACAF] and installation pest management personnel to develop relevant sections of the …INRMP including invasive species, animal damage control, BASH, ecosystem management, forestry, and range and grounds maintenance;*
- *3.6.3. Coordinate all required … NEPA documentation for pest management activities;*
- *3.6.4. Provide guidance for threatened and endangered species protection; and*
- *3.6.5. Coordinate the INRMP and installation pest management plan with the U.S. Fish and Wildlife Service in accordance with the Sikes Act.*

7.11.3 Invasive or Deleterious Fish and Wildlife Species

At least four species of non-native/non-local fish and wildlife have been found or reported on JBER, and actions have been taken to reduce their presence. Appendix F lists exotic and invasive wildlife species occurring on JBER.

Northern Pike

The northern pike (*Esox lucius*) are native to interior Alaska and can be a voracious feeder on salmonids, sometimes limiting population size and presence. During the latter half of the 20th century, pike were introduced from interior Alaska to a few lakes in the Susitna River drainage of Cook Inlet. Flooding during the 1980s promptly dispersed the pike population throughout the drainage, and suspected human introductions added to their distribution spread. In the 1990s, Northern pike were illegally introduced into Otter Lake on JBER. Pike have been reported in Clunie, Fish, and Green lakes, but no pike have been confirmed.

In 2004, a preliminary study was conducted to assess pike numbers, age, and size distribution in Otter, Gwen and Clunie lakes. Pike were only found in Otter Lake. Pike are extremely difficult to eradicate, short of poisoning a system, and this option does not guarantee the prevention of future illegal introductions. Netting operations were started as an alternative to test the feasibility of controlling pike numbers. In 2011, JBER staff started working with ADF&G personnel to treat Otter Lake with rotenone to remove pike. This project was completed during the fall of 2015. In spring of 2016, biologists set nets under the ice at Otter

Lake and utilized eDNA sampling to test for presence of pike. Pike were not detected during either of these surveys indicating the treatment was a success.

Invasive fisheries monitoring is discussed in Section 7.1.2, Fisheries Management.

Rock Dove

The Rock Dove, also known as the pigeon, (*Columba livia*) has long been established in the city of Anchorage. Their presence on JBER has been an issue for BASH, as well as, for building and equipment cleanliness and maintenance. Hangers with large open bay doors attract roosting and nesting pigeons. Pigeons are aggressively removed by the USDA-APHIS-WS.

European Starling

The European Starling (*Sturnus vulgaris*) was introduced to the United States in the late 1800s and quickly spread across the continent. Starlings were first observed in this region of Alaska in the 1970s in the Palmer area northeast of JBER. Starlings became established in Anchorage in the last 5-10 years and in 2005 began appearing as breeders on JBER. Starlings can become a nuisance to residents; pose a minor BASH risk, especially when flying in tight flocks, and can compete with resident, hole-nesting species. In accordance with BASH regulations, starlings will be destroyed as they enter the Bird Exclusion Zone, but efforts to stem the spread of starlings also occur outside the Bird Exclusion Zone. Rock Doves and European Starlings have not been documented on JBER training lands. Pest management personnel are responsible for their control in the cantonment areas.

House Mouse

The introduced house mouse was captured during small mammal survey in 2001. The specimen was captured on south post, many miles from any Anchorage neighborhood, which raised questions concerning their viability to live in the wild. House mice are known to occur commonly in Anchorage area resident homes, but the capture of this specimen so far from any houses suggests the potential to co-exist with native small mammal populations. Norway and black rats have not been recorded on JBER.

Feral Animals

Feral cats are effective predators, directly compete with native mammals, are considered invasive species, and periodically occur in small numbers on JBER. Stray dogs also exist and, along with feral cats, are controlled in accordance with all AFI requirements.

7.11.4 Noxious Plant/Invasive Species Management

Invasive species are defined as alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. The Committee for Noxious and Invasive Plant Management in Alaska defines an invasive species as: (1) non-native to the ecosystem under consideration, and (2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112). Title 11 Chapter 34 of the Alaska Administrative Code defines noxious plant species as *…any species of plants, whether annual, biennial, or perennial, reproduced by seed, root, underground stem, or bulblet, which when established is or may become destructive and difficult to control by ordinary means of cultivation or other farm practices.* This definition is oriented to the agriculture industry.

Invasive weeds are relatively new to Alaska. Many of the invasive species problems on JBER are relatively small and local eradication is still possible. Integrated weed management is the best method to establish

control and pesticides will be used, as needed, as part of this program. If left unchecked, the problem will increase exponentially. Regulation and control of plant pests by the Division of Agriculture is authorized under Title 3 of the Alaska Statutes. The Division of Agriculture is charged with protection of the agricultural industry and public interests through preventing the importation and spread of these pests. The Animal and Plant Health Inspection Service has authority to prohibit or restrict the importation, exportation, and interstate movement of plants through the Plant Protection Act (Comeau and Vandre 1997).

From data and rankings presented by the Alaska Division of Agriculture, Alaska Center for Conservation Science, and plant lists for JBER, priority target species were identified and management strategies developed in the Management Plan for Noxious or Invasive Plant Species (NoIPS) included in Appendix E. There are ten High Management Priority species, identified based on (1) they occur on JBER, (2) are state listed restricted and/or prohibited, and/or (3) have an invasiveness ranking of 70 or higher. These species include: reed canarygrass (*Phalaris arundinacea)*, white sweet clover (*Melilotus alba*), orange hawkweed (*Hieracium aurantiacum)*, cheatgrass (*Bromus tectorum*), Canada thistle (*Cirsium canadensis)*, Siberian peashrub (*Caragana arborescens*), European bird cherry (*Prunus padus)*, chokecherry (*Prunus virginiana*), bird vetch (*Vicia cracca)*, and (bigleaf lupine *Lupinus polyphyllus*). Canadian waterweed (*Elodea canadensis)* is also a high priority for monitoring, but has not yet been found on JBER. Any vegetative surveys performed on JBER should include documentation of the presence, abundance, distribution, and condition of these high management priority species. Occurrences are reported to the 773d CES/CEOIE Pest Shop for treatment or incorporated into cooperative agreement efforts.

In accordance with Alaska Statutes 03.05.010, 03.05.030, and 44.37.030, the Alaska Department of Natural Resources, Division of Agriculture maintains a statewide list of prohibited and restricted noxious weeds (plants.alaska.gov/invasives/pdf/noxious-weeds.pdf). JBER strives to prevent the introduction and spread of noxious and invasive species through equipment cleaning practices, especially contractor equipment originating off-JBER. Biosecurity from foreign pests and/or invasive species is an aspect of noxious and invasive species prevention that JBER must address especially with aircraft arriving from foreign countries. Airfield operations include a process for receiving support from U.S. Customs and the U.S. Department of Agriculture when aircraft are inbound from Wake Island and foreign locations.

The 773d CES/CEOIE manages the *Integrated Pest Management Plan* (Tab 6), including approaches for managing invasive weeds on JBER. Invasive species inventory efforts on JBER are included in Appendix E. A formal comprehensive inventory of invasive species on JBER-Richardson was completed in 2011 and a management plan was submitted in 2012. The RTLA program documents invasive vegetation on JBER-Richardson training lands as part of land condition surveys. RTLA will only monitor invasive plants if they directly interfere with military training needs.

Focused projects occur as time and funding are available to supplement their efforts. Action items included in the 2012 Invasive Species Management Plan included targeted management of hawkweed near Sixmile Lake and reed canary grass at Otter Lake, which have been ongoing since 2014. These projects were initiated by MWH, Inc. in 2014 and 2015 (MWH, 2015). Additional efforts to implement the monitoring plan has been taken on by the 773d CES/CEIOE Pest Shop. In 2014 and 2015, reed canary grass was documented in several locations around the outfall of Otter Lake, its eastern shore, and along the upper portions of Otter Creek. Passive treatments, including covering the patches in heavy black plastic, in 2014 were not successful. Subsequent herbicide treatments in 2015 were successful, but additional occurrences have been observed in the area since and follow-up treatments have been ongoing. Reed canarygrass and Canada thistle were also identified at Eagleglen Fitness Park in 2017 and were observed persisting in 2018. Retreatment in 2019 is recommended and will be coordinated with 773d CES/CEOIE. Additionally, yellow and orange hawkweed have been treated annually since 2014 around Sixmile Lake, Fairchild Drive, north

of Airlifter Dr., and around the water reservoir. A dramatic reduction in herbicide-treated orange hawkweed has been observed at the Sixmile grass runway. Despite this, the species persists as the seed bank remains to be exhausted. Treatments will be ongoing.

In 2016, an effort to begin treating European bird cherry along the Ship Creek Corridor was initiated and has continued through 2018 up to the old Ship Creek Hatchery. In 2016 and 2017, 639 mature trees were treated with herbicide and several hundred additional small seedlings/saplings were treated or hand pulled in the Eagleglen Fitness Park area. While 100% mortality was not achieved throughout this area, significant mortality of large trees and saplings was achieved, removing a large seed source from the area. What remain are patches of small suckers difficult to identify and treat due to the large number of them; exacerbated by the prolific seed source remaining in the area, which will require follow-up treatment in years to come. One source of escaped bird cherry occurring along the Ship Creek corridor likely includes trees planted in the JBER urban forest. Prioritized removal of these trees began in 2019, with the highest priority given to trees in the BASH zone, then trees in the WEZ zone, and finally trees within a half mile of natural areas especially near wetlands and streams. All bird cherry, chokecherry, and mountain ash in the BASH and WEZ were treated, except those occurring in lands under management by Aurora Housing.

Natural Resource project crews conducting field work report observations of invasive species to the JBER Ecologist who coordinates treatment with the Pest Shop or incorporates treatment into funded project efforts executed under contract with cooperative agencies. Between 2015 and 2017, more than 50 occurrences of invasive weeds were documented by the Aquatic Ecology Streams crew in remote, streamside environments. Left unchecked, these relatively isolated occurrences may have spread. Observations were reported and high management priority species as well as invasive mountain ash, were treated under contract, by the Palmer Soil and Water Conservation District in 2018 and 2019.

7.12 Bird/Wildlife Aircraft Strike Hazard (BASH)

This section applies to USAF installations that maintain a BASH program to prevent and reduce wildlife-related hazards to aircraft operations. This section is applicable to JBER.

7.12.1 Policy and Background

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

The BASH plan for JBER-Elmendorf is 3WGI 91-212, *Bird and Wildlife Aircraft Strike Hazard (BASH) Program* (9 May 2012). 3WGI 91-212 implements Air Force Pamphlet 91-212, *Bird Aircraft Strike Hazard (BASH) Management Techniques*, and is used in conjunction with AFPD 91-2, *Safety Programs,* AFI 91-202, *U.S. Air Force Mishap Prevention Program*, AFI 91-204, *Safety Investigations and Reports*, AFI 91-223, *Aviation Safety Investigations and Reports*, Pacific Air Command Air Force guidance, and 11th Air Force guidance. The instruction provides a program to minimize aircraft exposure to potentially hazardous bird strikes and applies to all host, associate, tenant, and temporary duty organizations on JBER. An updated BASH instruction reflecting joint-basing was completed in 2012. In addition, the Army National Guard (ARNG) unit stationed at Bryant Army Airfield (BAAF) completed a BASH plan in 2014 and hired USDA-APHIS to support their on-site BASH program

7.12.2 Program Overview/Current Management Practices

Several bird species present hazard concerns but of particular concern are Canada Geese, other waterfowl, Sandhill Cranes, gulls, raptors, ravens, and densely flocking species. Terrestrial wildlife also poses a threat to flight operations. Wildlife species of concern include moose, wolves, coyotes, foxes, bears, and small mammals. However, with diligence, wildlife can be kept from the airfield complex by maintaining fencing, habitat maintenance, and proper gate management.

The BASH program consists of 4 sub-programs: bird dispersal, habitat change, reduction of goose populations, and research related to the first three management programs. USDA-APHIS is the primary BASH detection and dispersal agency. They have been contracted (1999 - present) during the period of April 1 through October 31 to keep the airfield and the surrounding Bird Exclusion Zone and Waterfowl Exclusion Zone clear of birds (Figure 7-13). In 2008 the contract was modified to include coverage during winter daylight flight operation periods. Both non-lethal and lethal methods are used as required. Details of these procedures can be found in 3WGI 91-212, BASH Program.

EAFB also entered into agreements with USDA-APHIS-WS to provide BASH support in the bird reduction and exclusion zones (3WG-MOA-001). 673d CES Natural Resources is responsible for evaluating airfield habitat and recommending BASH risk reduction measures. This may include planting vegetation less palatable to avian species that reside or frequent bird reduction or exclusion zones. Recommendations may also include adjustments in mowing schedules, which would allow the grass to grow higher to discourage geese.

Lands within the Bird Exclusion Zones are subject to numerous special land management practices designed to reduce the possibility of bird aircraft strikes. Specific management practices include managing grass height through careful manipulation of mowing schedules, eliminating bird resting and feeding areas, reducing insects and other prey species, and planting non-palatable species of vegetation. Further details can be found in 3WGI 91-212 (BASH Program) or by contacting 3 WG Flight Safety BASH Program Manager. Research and adjustment in management techniques for BASH reduction continues, and will remain a high priority tasking for Natural Resources and the entire 673 ABW. Discussion of a BASH compatible vegetation study is included in Appendix E, Flora.

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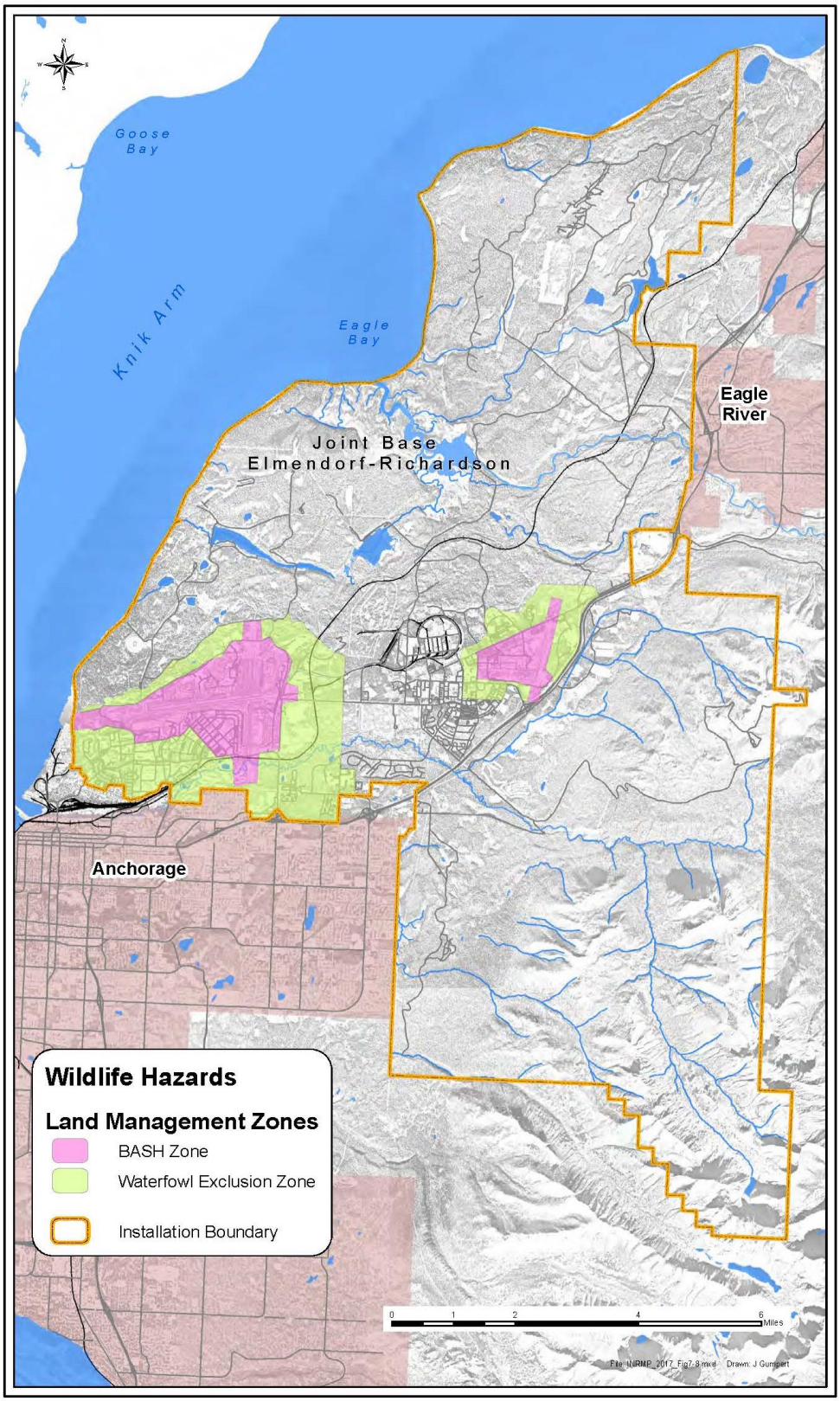
Figure 7-13: BASH and Waterfowl Exclusion Zones on JBER



7.13 Coastal Zone and Marine Resources Management

This section applies to USAF installations that are located along coasts and/or within coastal management zones. This section is applicable to JBER.

7.13.1 Policy and Background

JBER protects, preserves, and restores coastal ecosystems through the Environmental Planning section with the NEPA/EIAP program for developing projects, through the Environmental Compliance section for daily operations, and through the Environmental Restoration section for clean-up and restoration of contaminated sites. JBER has worked closely with neighboring agencies as exemplified by the recent cooperative effort with the Port of Alaska in Port Expansion projects.

7.13.2 Coastal Zone Protection Issues

JBER falls within the coastal zone boundary of the Municipality of Anchorage. Although federal lands are excluded from Alaska's coastal zone boundaries as *those lands owned, leased, held in trust or whose use is otherwise by law subject solely to the discretion of the Federal Government, its officers or agents…* (15 CFR 923.3), activities on these lands are subject to consistency provisions of Section 307 of the Coastal Zone Management Act of 1972, as amended. This has been accomplished during the NEPA/EIAP where if JBER determines that an activity, operation, project, or program may affect the coastal zone a Determination for Federal Activities questionnaire was prepared and submitted for review and the response became part of the NEPA/EIAP documentation.

7.13.3 Consistency with State Coastal Zone Management Program

The Alaska coastal management program was discontinued effective 30 June, 2011 as the Alaska House defeated a measure that would have extended the State's program.

7.14 Cultural Resources Protection

This section applies to USAF installations that have cultural resources that may be impacted by natural resource management activities. This section is applicable to JBER.

7.14.1 Policy and Background

Cultural resources management at JBER is provided in accordance with the National Historic Preservation Act (54 USC Section 300101, 54 USC 306108, 54 USC 306101, 54 USC 306102, as amended), the Archaeological Resources Protection Act (16 USC Section 470aa-47011), the American Indian Religious Freedom Act (42 USC), the Native American Graves Protection and Repatriation Act (25 USC Section 3001 et seq.), EO 11593 (*Protection and Enhancement of Cultural Environment*), and AFI 32-7065. Means to achieve compliance with these laws and policies are outlined in the *JBER Integrated Cultural Resources Management Plan, 2018-22 (updated).*

JBER cultural resources include archaeological sites, historic sites, cultural landscapes and traditional cultural properties of importance to Alaska Natives, and historic landscapes. Cultural resource management efforts at JBER have accomplished or documented the completion of archaeological surveys in areas of highest probability, including areas along the beach and bluff and areas of high relief inland. Sites identified in the surveys are cabin ruins and associated features from the homesteading era. Six sites were determined

eligible for National Register of Historic Places for their part in the history of Anchorage. Overall, known cultural resources on JBER include 94 archaeological sites, consisting of pre-contact, homesteader and military sites; 35 World War II era eligible historic properties grouped into three historic districts; 20 individually eligible Cold War-era buildings and structures; 26 historic properties in the listed Nike Site Summit Historic District; portions of the Iditarod National Historic Trail, the only congressionally designated National Historic Trail in Alaska; and the Fort Richardson National Cemetery. The Nike Site Summit Historic District and Fort Richardson National Cemetery have been listed on the National Register of Historic Places. The Fort Richardson National Cemetery is owned and operated by the Department of Veterans Affairs. Large areas of JBER remain un-surveyed. Of the 78,608 acres considered survey-able, 447,083 acres remain to be surveyed. Projects are programed in upcoming years to increase the amount of surveyed land.

The Nike Hercules Missile Battery on Site Summit is the only remaining Nike site of the eight built in Alaska that still maintains its historic character as a functional missile battery. It was the last Nike Battery in the nation to be deactivated, in 1979. JBER has continued its relationship with the Friends of Nike Site Summit and have restored 6 buildings and continuing additional restoration activities outlined in the Site Summit Retention Plan, October 2010. Trespassing at the Nike site has been an ongoing problem. JBER law enforcement personnel periodically check the site as well as other known archeological sites on the installation. Nike Site Summit is managed under a separate management plan. Projects are programed for FY17-19 to restore the weapon storage bunkers at the lower site.

Paleontological resources on JBER are covered in the Archaeological Resources Protection Act of 1979 which will be in the new JBER Integrated Cultural Resources Management Plan. The expected plan will go further into the management of these resources. JBER curates eligible items at the University of Alaska Fairbanks Museum of the North.

7.14.2 Cultural Resources Implications for Natural Resources Management

Natural resources management generally complements the preservation of archaeological sites and other cultural resources by limiting disturbance related activities. However, outdoor recreation opportunities on JBER increase the risk of vandalism to cultural resources. Activities such as tree removal, training land restoration, and development of recreation areas are potentially damaging to cultural resources.

Determination of effect and consultation guidelines provided in implementing regulations for the National Historic Preservation Act (54 USC 306108) will be followed during review of projects. Any project assessed as having a significant effect on cultural resources or historic property will be coordinated with the Alaska State Historic Preservation Officer. If the project is on military withdrawn lands, coordination will include the BLM Anchorage Field Office. Coordination with the Native Village of Eklutna and other local tribes has aided JBER-Elmendorf in working to identify sensitive cultural sites. A kiosk describing the salmon life cycle and the importance of salmon to native culture was completed in 2018.

It is important to ensure that provisions of this INRMP are consistent with the protection of cultural resources. Prior to any ground-disturbing, natural resources activity, the Cultural Resources Manager will evaluate proposed activities for compliance with all appropriate cultural resources laws and regulations. The National Historic Preservation Act requires consultation with the State Historic Preservation Officer, affected federally recognized tribes, and other interested parties regarding “undertakings” that may affect historic properties. The Cultural Resources Manager will assist with consultation and compliance, as necessary. If cultural resources may be impacted, steps must be taken to avoid or mitigate damage.

Of all practices associated with natural resources management on JBER, timber cutting, vegetation restoration, and erosion control projects have the greatest potential to disturb archeological sites. Natural resources projects that involve excavation, earth moving, and/or fill deposition can damage or bury archaeological sites.

7.15 Public Outreach

This section applies to all USAF installations that maintain an INRMP. JBER is required to implement this element.

7.15.1 Policy and Background

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

JBERs active environmental education program provides much of the positive public relations for natural resources programs. Additionally, personnel, such as the Conservation Law Enforcement Investigators, MCAs, and natural resources volunteers, through field contacts and visits, provide positive images of the natural resources program at JBER. Environmental personnel develop informational materials, conduct briefings, attend public meetings and events, and conduct surveys of public desires for natural and cultural resources management to improve public awareness about the diverse and unique natural and cultural resources found on military lands in Alaska. The SRA (Section 7.65) component of the ITAM program also provides a means to educate "other land users" on their environmental stewardship responsibilities by providing awareness materials, such as desktop calendars, pocket planners, and playing cards.

Natural Resources coordinates closely with the 673 ABW Public Affairs Office when dealing with the media or the general public. Special programs or interviews are set up through that office. In the past, this has included coverage on JBER's ongoing BASH program, Spring and Fall wildlife safety awareness, Arbor Day activities, and others.

7.15.2 Environmental Education and Interpretive Programs

The Wildlife Education Center (WEC) is currently closed as sub-standard facility conditions and damage sustained during the 2018 earthquake have precluded facility occupancy. Options to repair or relocate the WEC are being explored. The WEC has been the centerpiece of interpretative efforts for many years. Located in JBER-Elmendorf's oldest historic building, the WEC offered wildlife, cultural, and natural resources displays that include over 250 life-like mounted specimens, including all common species of birds, fish, and mammals found in Alaska. Displays of outdoor recreation opportunities, wildlife safety, and other natural and cultural resources topics were also located there. Tours were conducted by appointment, and prior to access restrictions following the 9/11 terrorists' attacks, over 20,000 people per year (1989-1997 average) participated. During the period of 2002-2016 the annual average WEC visitation dropped to less than 2,000. The WEC was a key resource not only for the JBER community, but also for Anchorage public schools, whose K-6th grade classes would take tours on a regular basis. Previously natural resource staff at the WEC were on hand to answer questions, issue natural resources permits, and provide informational literature. .

Boy Scouts of America and Girl Scouts of America both have youth troops active on JBER. The Natural Resources office has involved troops in Arbor Day events, and hosted events at the Wildlife Education Center where troops have worked on Merit badge activities guided by JBER Biologists, including the Forestry Badge and Wildlife Conservation Badge. JBER Natural Resources has provided support and projects to prospective Eagle Scouts, including trail maintenance and improvement projects and the construction of an informational kiosk at the Wildlife Education Center and bridge at the Otter Lake outlet. Other environmental education efforts include articles on natural and cultural resources topics on the JBER website, occasional interviews with local media, and special events, such as Arbor Day tree planting; and other activities. Natural Resources staff and MCAs also conduct monthly Newcomer's Briefings and wildlife safety briefings.

Kiosks and interpretive signage installed at strategic locations would also enhance outdoor experiences for watchable wildlife viewing and photographers on JBER. An upgrade to the Knik Bluff Trail to an interpretive trail and developing a watchable wildlife site at Upper Sixmile Lake would also enhance outdoor education on JBER.

Trail maintenance, including signs, bridges, brush clearing, etc., should be accomplished using reimbursable conservation funds. However, JBER does not produce or receive reimbursable funds and therefore cannot accomplish these activities without AFCEC support.

7.15.3 Public Involvement and Community Outreach Opportunities

Public involvement is a key component to JBER's commitment to community outreach. Implementation of this plan requires keeping the public informed of firewood and Christmas tree cutting areas, providing permits, and other items of interest. Arbor Day and Tree City activities are centered on the public tree planting ceremony and increasing public awareness. JBER has been certified by the National Arbor Day Foundation as a Tree City, U.S.A. since 1996. Certification requires that the community have an established Tree Board or Department; that the community has a Tree Ordinance or similar governance related to management of urban forestry in the community; that at least $2.00 per capita is spent annually on Urban Forestry, and that there is an annual Proclamation and observance of Arbor Day. Additional activities include educational presentations on Arbor Day, tree care, and forestry practices. In addition, a chainsaw instruction and safety course has been made available to the public to increase chainsaw safe use while operating on JBER.

Outdoor education and outreach opportunities to explore the vast natural areas of JBER in a safe and structured format could improve awareness and knowledge of ecosystem function and recreation on a military installation. Structured formats for scientific recreation such as National Geographic's "BioBlitz", Citizen Science lake and stream monitoring, Audubon Christmas and Summer Bird Counts, etc. could provide a unique opportunity for public outreach, and the gathering of scientific data for program use.

7.16 Climate Change Vulnerabilities

This section applies to USAF installations that have identified climate change risks, vulnerabilities, and adaptation strategies using authoritative region-specific climate science, climate projections, and existing tools. This section is applicable to JBER.

7.16.1 Program Overview/Current Management Practices

The multiparty nature of mission-based activities at JBER require a greater range of natural resources than other Air Force or Army installations. Due to the ground-based nature of Army training, habitats, and both the species and training operations that occur within them will have greater importance at JBER than at most Air Force only installations. Current and future external encroachment will have a major impact on mission operations at JBER, and the effects of climate change will likely intensify these impacts.

The potential exists for negative impacts to mission operations in relation to the Cook Inlet beluga whale (CIBW). The CIBW was found to be highly vulnerable to climate change due to primary effects such as increased water temperature, as well as secondary effects (prey availability, extreme weather, habitat loss). Current protections for the CIBW by JBER have been deemed adequate as to not place any limitations on military training. However, if CIBW population numbers decline substantially due to climate change, combined with the possible increase in future mission capacity at JBER due to additional human activity in the arctic region, the potential exists for additional training restrictions in the vicinity of Cook Inlet. This would affect flight operations that include airspace over CIBW critical habitat as well as artillery training at Eagle River Flats Impact Area. Increased water temperatures may also degrade salmon habitat.

Climate change could also expand the mission of NORAD North Slope and increase the importance of JBER to this vital command. It is anticipated that melting sea ice may result in increased shipping and resource exploration north of Alaska, which will require greater surveillance presence in the region.

Numerous buildings, roads, and other structures are anticipated to be potentially vulnerable to flooding due to increased frequency and intensity of storms. Overall, the effects of climate change on the built environment of this installation could be severe. In the Ship Creek watershed, several roads (Grady Highway, Stephenson Lane, Campos Avenue, and Sockeye Avenue) providing access to and from family housing could be inundated during large rain events. This could potentially affect the mission at JBER due to the inability of mission critical personnel to reach their duty station, as well as decrease morale.

Also, within the Ship Creek watershed, Transmitter Site Access Road, which provides access to the transmitter site between the cantonment and family housing (south of Davis Highway), could become inundated. Vandenberg Road, a major north-south road connecting several sites could be flooded during storm events in the future. Other vulnerable infrastructure that could be affected and impact the military mission at JBER include parts of Eagle Glen golf course, the water treatment building, and the Alasks Department of Fish and Game Hatchery water well.

In the Eagle Creek watershed, Route Bravo and Route Sweat could be vulnerable to flooding. Route Bravo connects several firing sites including LZ-13, LZ-15, a fixed artillery site, and a munition waste disposal site (MMRP Site 02781-166). Route Sweat connects Neibar Drop Zone and Firing Point with an open area on the right bank of the Eagle River, possibly used for riverine operations training. These two routes are vital infrastructure to the mission at JBER and even temporary closures due to flooding would negatively impact military training.

Future impacts to the mission at JBER linked to climate change could include:

- increases in temperature and wind velocity leading to unsafe environmental conditions for the launch of current and planned weapons and equipment, resulting in increased maintenance requirements, requirements for new equipment, or decreased launch capacity (DoD, 2014);

- increased dust generation effecting equipment and visibility (DoD, 2014);
- increased wind velocities damaging vital mission infrastructure (Sydeman et al., 2014);
- increased drought potential (Glick, Stein, & Edelson, 2011);
- potential loss of future training areas that may be needed in light of a changing geopolitical landscape and base realignment.

In addition to these direct effects, climate change has the potential to disrupt the acquisition and transportation of materials required for the maintenance, construction, and storage of the equipment required for these systems (DoD, 2014).

7.17 Geographic Information Systems (GIS)

This section applies to all USAF installations that maintain an INRMP, since all geospatial information must be maintained within the USAF GeoBase system. JBER is required to implement this element.

7.17.1 Program Overview/Current Management Practices

Too often, due to inefficient data storage, retrieval, and analysis systems, biological data are collected and stored without being used. A data management system is critical to ecosystem management since it relies heavily on data to make and evaluate ecosystem-based management decisions. A GIS is a vital tool for assisting land managers with decision-making and monitoring results of management and mission activities. GIS also plays a critical role in planning actions for current and future years and maps out useful information for everyday work plans.

GIS is a powerful tool to assist natural resource managers in conflict resolution and mission enhancement and sustainment. A GIS is capable of assembling, storing, manipulating, and displaying geographically referenced information, (i.e., data identified according to their locations). GIS can analyze and model (manipulate, overlay, measure, compute, and retrieve) digital spatial data and display maps and tabular resources showing results of spatial analyses. GIS technology integrates common database operations, such as query and statistical analysis, with the unique visualization and geographic analysis benefits offered by maps, which distinguishes GIS from other information management systems.

The Air Force implements GIS through the GeoBase program which specifies geo-digital collection and display protocols. The 673 CES is responsible for maintaining the JBER GeoBase system. The GeoBase system is managed by the Geo Integration office. Data gathered through inventory and monitoring at JBER are stored as digital data within a computer database and on paper as a hard copy of the digital data.

Natural Resources Spatial Database

GIS data management is critical to successful implementation of this INRMP. Spatial data for various elements of the natural resource program are used to create maps that help facilitate planning activities that have the potential to impact management programs. GIS is a powerful tool for studying natural resources and aids in location of topographic features, aerial extent of coverage of a certain resource or problem area, monitoring those resources or problems, and modeling probable scenarios, all of which assist in optimizing resource utilization.

GIS takes into consideration many of natural resources elements: land use/cover, soil, hydro-morphology, terrain slope, drainage, wildlife habitats and population parameters, etc. It combines these with human-created features (structures, recreation facilities, transportation features, etc.) and mission aspirations to

provide various choices of action plans for sustainable development or use of land and water after scientific analysis of spatial and non-spatial data.

JBER's natural resources database is stored in the JBER GeoBase enterprise geodatabase. Layers that have been developed from scientifically collected data sets include but is not limited to ecological land classifications (geomorphology, surface form class, vegetation class, disturbance class, and ecotype) (Pullman, *et al* 2003); Ship Creek flood hazards (U.S. Army Corps of Engineers 1980); and loon and raptor nesting territories (Anderson *et al* 2008). Additional INRMP-related values entered into GeoBase include recreational trails and other facilities, BASH bird exclusion zones and vegetation management, wetlands, moose hunt areas, timber harvest areas, and habitat mitigation areas.

JBER uses GeoBase data and information to support numerous mission objectives including improvement of land and resource management decisions. It incorporates field locations and data for various inventory and monitoring activities to make data more accessible to natural resource managers. GeoBase is providing and will continue to provide a variety of maps for managing and monitoring impacts of military use, recreational use planning and for natural resources projects. GeoBase will be used to produce maps that include such features as military facilities, transportation networks, drainage, cultural sites, vegetation, wetlands, elevation, soils, etc. All future JBER Environmental data layers will be developed and maintained in accordance with direction from the HQ Pacific Air Forces Directorate of Installations and Mission Support.

GeoBase supports natural resources management to evaluate development and use impacts on natural resources and to document and track resource management actions. This type of analysis will help prioritize projects for natural resources management. The maps available through the GeoBase program provide a readily available resource for field activities that provide relevant ecological, geomorphic and development details to field crews.

Remote Sensing and GIS Monitoring and Assessment Program on JBER

JBER has established long-term ecological monitoring plots to represent the entire installation. The inventory and monitoring of these small plots require a significant effort by the Natural Resources staff and are meant to monitor the health of the entire installation ecosystem. JBER plans to implement a remote sensing and GIS monitoring and assessment program to supplement ecosystem health monitoring and facilitate the management of priority species. The use of remote sensing and GIS allows a thorough assessment of vegetation health, forest productivity, wetland area and changes, and insect and fire damage on JBER and also similar areas outside JBER for comparison, if desired.

Management tools utilizing remote and GIS monitoring provide information regarding current and past ecosystem performance. Collecting systematic measurements across spatial and temporal scales allows JBER managers to compare multiple sites and provides long-term monitoring capability. This provides JBER planners with synoptic and temporal dynamics of installation ecosystems to facilitate informed management and remediation by enhancing adaptive management strategies, optimizing both JBER training requirements and ecosystem sustainability.

The long-term ecological trend monitoring project will include historical land cover change analysis, digitization of old aerial imagery and development of habitat associations to be used in managing and monitoring priority species. Successful development and implementation of such a program requires both quality digital resources as well as on the ground data collection to complete the picture, improving the integrity of the assumptions made during tabletop efforts. Forest resource and ecotype studies by APU in 2013-2015 as well as ecological monitoring conducted by HDR, APU, MWH, CSU, and JBER staff since

the 1990s provides detailed data of the ground level environment, including vegetative assemblage at all layers (canopy, shrub, herb, and ground), surface and subsurface hydrology, and soils composition. These data may be matched to aerial imagery taken around the same time to establish aerial signatures, than can be used to conduct tabletop assessments of ecotypes throughout JBER. Updates of installation digital aerial imagery and ground-truthing to monitor vegetation and land-use change are scheduled to repeat on a 3-year cycle.

GIS Maintenance and Use

673 CES Natural Resources will continue to coordinate and exchange data through the GeoBase program. New contracts that go to outside agencies or contractors include a clause that requires any spatial data developed from the study to be incorporated into a compatible GIS format, and Natural Resources will get digital (in a format compatible with current JBER GeoBase software) and hard copies of data. The potential also exists for out-sourcing or contracting for additional data layers. Partnering agencies should be solicited for additional relevant data layers of natural resources.

The GeoBase program is an Air Force program created to centralize mapping for a given installation. The GeoBase program is run by the Geo Integration office, a fused environment of enlisted personnel, civilians, and contractors working together to best meet the requirements in accordance with AFI 32-10112, Installation Geospatial Information and Services (26 Sept 2018).

The JBER Geo Integration office utilizes a diverse collection of hardware for information collection and analysis. The enterprise geodatabase is administered directly by the Geo Integration office staff with assistance from 673 CES and 673 CS system administrators. Update of software, patches, and time compliance network order directives are maintained by the GeoBase administrator. A service level agreement between the 673d Communications Squadron Network Control Center and 673 CES defines the roles each organization plays in the administration and support for the servers.

The 673 CES GeoBase program has multiple software holdings. Mapping software, raster enhancement, and remote sensing software are held and maintained by the GeoBase administrator. Environmental Systems Research Institute (ESRI) is the core software vendor used by the Geo Integration office. ESRI GIS products provide advanced spatial analysis, displays, and storage of geographically referenced information. The 611th Geo Integration office also shares a license for Earth Resources Data Analysis System imagine software package across the network for advanced raster processing.

8.0 MANAGEMENT GOALS AND OBJECTIVES

JBER 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 JBER'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, with a specific action(s) 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 conditions, mission requirements, and management issues previously identified. Below are the integrated goals for the entire natural resources program.

JBER 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 programed for funding, as applicable.

8.1 JBER Natural Resources Goals and Objectives

CEIEC Mission Statement: Support the military mission and enhance readiness by providing natural environments on JBER for training, minimizing conflicts between mission requirements and land and natural resources uses and wildlife, and serving as stewards of the land by maintaining natural landscape features and ecosystem integrity at a broad landscape scale.

Individual JBER natural resources program projects are included below the main INRMP Goal & Objective they support. Projects and tasks are also included in Section 10.0 Annual Work Plans; INRMP Implementation and Project Summary.

GOAL 1: MINIMIZE CONFLICTS BETWEEN MILITARY MISSION, WILDLIFE, NATURAL RESOURCES, AND LAND USE.

- Objective 1.1: Achieve no-net loss of military training through coordination and management of federally protected species (e.g. ESA, MMPA, BGEPA, MBTA, etc.) or their habitats and state protected species when practicable.
    - Mgt. Species, Eagles/Bird Survey
    - Mgt, Species, ERF Impact Area UAS Avian spp. Detection
    - Mgt Species, Northern Goshawk Baseline Data Collection
    - Mgt, Habitat, Climate Adaptation-Mission Vulnerability

- Objective 1.2: Advise the Bird Airstrike Strike Hazard (BASH) programs, evaluate management activities required by 3 WGI 91-212. Provide habitat or management modification recommendations annually, if needed, to both JBER airfields and appropriate drop zones.
    - Mgt, Species, Eagle, Mil Trng Effects, Behavior/Reproduction
    - Mgt, Species, Large Raptor Air Space Utilization
    - Mgt, Habitat, Urban Forest
    - Task: Update depredation permit to include base wide coverage of training areas due to recent Canada Geese observations on Malemute Drop Zone in October of 2017. A mission

was canceled due to presence of birds on Malemute Drop Zone in 2018. A coordinated BASH strategy to address the avian risk associated with this drop zone is needed.

- Objective 1.3: Identify areas at high risk of wildlife conflict based on wildlife response calls, and use this information to effectively implement monitoring and mitigation of wildlife conflict.
    - Mgt, Nuisance Wildlife
    - Task: Work with ADF&G in the development of a collaborative project on bear (black and brown) population status on JBER. This would be an emphasis on a resurvey of the 2005-2007 efforts
    - Task: Coordinate with Aurora Housing, 673 CES/CEIEC, 773d CES, FSS, and 673 CONS accomplished through meetings with all parties to monitor solid waste containers as they relate to nuisance wildlife calls.
    - Task: Create a geo-based map annually depicting all wildlife conflict responses annually
    - Task: Work with FSS to secure bear resistant food locker to minimize wildlife conflict around Otter Lake
    - Task: Identify and prioritize areas with increased and ongoing beaver conflict and reduce beaver activity in those areas through trapping support or a depredation permit.

- Objective 1.4: Utilize the principles of adaptive management; work with ITAM and Range Control to integrate land management efforts and monitor results of management and military activities. Ensure the INRMP and ITAM management plans are complementary.
    - Task: Coordinate with the Division of Forestry and UAF Coop Ext. on insect infestation monitoring on JBER. Draft and coordinate the BLM/JBER MOU required Prescription Plans. Coordinate with ITAM to develop silvicultural prescriptions for each training area based on anticipated future military needs. Perform hazard tree assessment surveys in cantonment and heavy traffic training areas, especially around firing points and landing zones.
    - Task: Coordinate with the JBER WSM to support between 2,000 and 3,000 acres that will be burned annually for the purpose of fuel reduction near ranges and impact zones, as needed, based upon wildfire risk.

- Objective 1.5: Provide environmental education and outreach. Work to establish better working relationships with neighboring communities and federally recognized tribes.
    - Task: Participate in Tree City, Arbor Day, and other urban forest initiatives (Mgt, Habitat, Urban Forest.
    - Task: Contribute to scientific knowledge by publishing results from studies, when appropriate, at scientific conferences or in peer reviewed journals.

GOAL 2: MANAGE JBER NATURAL RESOURCES UNDER THE GUIDELINES AND PRINCIPLES OF ADAPTIVE ECOSYSTEM MANAGEMENT, WHICH AIM TO MAINTAIN FUNCTIONAL ECOSYSTEMS AND NATURAL DIVERSITY INCLUDING SUSTAINABLE POPULATIONS, NATIVE SPECIES, AND ECOLOGICAL COMMUNITIES.

- Objective 2.1: Inventory and monitor JBER's natural resources, including soil, water, wetlands, flora, and fauna, to provide baseline information on ecosystem integrity and health, status of renewable resources, and status of threatened or sensitive species or communities.
    - Mgt, Habitat, Long-Term Ecological Monitoring

  - Mgt, Species, Winter Track Surveys
  - Mgt, Species, Canidae Species Surveys
  - Mgt, Species Harbor Porpoise Monitor In Knik Arm/Eagle River
  - Mgt, Wetlands / Floodplain
  - Mgt, Habitat, Urban Forest
  - Task: Conduct Spawner surveys along the other anadromous systems on JBER.
  - Task: Conduct monitoring of multi-bird species presence and abundance using volunteers
  - Task: Investigate harbor seal use of Eagle River and waters adjacent to JBER.
  - Task: Conduct pilot study: harbor seal photo-identification project in Eagle River/Bay.
  - Task: Develop/Finalize the JBER Forest Management Plan. Plan will include establishing a stand level GIS layer to facilitate forestry management, collect mapping data from ITAM, and establish baseline maps.
  - Task: Manage the aerial signature compilation for all available imagery years using historic and current vegetation monitoring data and historic aerial photographs to increase the analytical integrity of ecosystem changes over time.
  - Task: Maintain regular updates to the JBER Wetland Functional Assessment.

- Objective 2.2: Establish statistically valid monitoring programs and protocols for ecosystem integrity and function in coordination with the appropriate resource agency or agencies.
  - Mgt, Species, Statistical Oversight

- Objective 2.3: Maintain or improve native vegetation patterns, ecological successional stages, and ecosystem integrity and function.
  - Sixmile Creek Outfall Design
  - Construct Sixmile Lake Salmon Outfall
  - Mgt, Habitat, Forest Resources
  - Mgt, Species, Western Hemlock, Birch, and White Spruce
  - Mgt, Habitat, Fishery Restoration / Enhancement
  - Task: Sixmile and Otter Creeks walked and checked at least once a year to ensure large debris is not blocking the channel

- Objective 2.4: Prevent the introduction and spread of invasive species, provide for their control, validate control method effectiveness, and minimize the mission, ecological, and economic impacts.
  - Mgt, Invasive Species, Multi Plant Species
  - Task: Monitor for the presence/absence of pike in JBER lakes
  - Task: Map JBER invasive vegetation and control efforts.

- Objective 2.5: Identify and map essential/critical habitats for species at risk and species of special concern most probable to become candidate species.
  - Mgt, Species, Interagency Collaboration, SOSC Collared Pika Survey
  - Mgt, Species, Bat Survey
  - Mgt, Species, Interagency, Boreal Wetland SAR Birds-Alpine
  - Mgt, Species, Boreal Wetland Bird Genoscope/Migration
  - Rare Plant Inventory

- Objective 2.6: Identify risks to biodiversity and ecosystem health from habitat fragmentation and reduced connectivity.

  - Mgt, Habitat Alpine Training Support
- Objective 2.7: Establish/sustain functional partnerships with land management agencies, non-governmental organizations, universities and the public to fulfill JBER natural resource objectives.
  - Task: Establish and monitor wolf on JBER using camera traps in conjunction with the moose hunts.
  - Task: Reduce human-wildlife conflicts, specifically bears, through the development of a collaborative effort in conjunction with the Anchorage Bear Committee and base leadership. The program will strive to establish a uniform base policy with a focus on bear attractant minimization and reduction, public education/outreach, and enforcement.
  - Task: Work with U.S. Fish and Wildlife Service – National Wetland Inventory to provide data and support during update efforts for wetland maps in the state of Alaska.
  - Task: Complete and coordinate forest management prescription plan(s) as outlined in the forestry stewardship agreement with BLM.

GOAL 3: MANAGE HUMAN USE OF RESOURCES FOR LONG-TERM SUSTAINABILITY, BY OFFERING PRODUCTS AND SERVICES AT LEVELS COMPATIBLE WITH THE MILITARY MISSION AND ECOSYSTEM DIVERSITY, HEALTH, AND PRODUCTIVITY AND PLACING EQUAL EMPHASIS ON CONSUMPTIVE AND NON- CONSUMPTIVE USE AND CONSERVATION AND PRESERVATION OF NATURAL RESOURCES ON JBER CONSISTENT WITH SIKES ACT REQUIREMENTS.

- Objective 3.1: Evaluate JBER forest, wildlife and fisheries resources and develop recommendations for sustained yield.
  - Mgt, Species, Resident Fisheries Survey
  - Mgt. Small game/multi-species
  - Mgt, Habitat, Winter Moose Browse Utilization Inventory
  - Task: Develop a long term data set of dissolved oxygen (DO) and water temperature for JBER lakes.
  - Task: Stocked lake evaluations of over-winter growth, health, and survival of stocked fish populations.

- Objective 3.2: Support the Wildland Fire Management Plan by coordinating with other entities responsible for fire prevention and natural resource management.
  - Mgt, Species, White Spruce
  - Task: Coordinate with the JBER WSM to support planned mechanical fuels treatments, including maintenance of all firebreaks and fuelbreaks. Additional planned mechanical fuels treatments that will be shared with the JBER WSM will focus on removal spruce killed by spruce beetles.

- Objective 3.3: Monitor and evaluate outdoor recreation activities and develop recommendations for providing quality and sustainable outdoor recreation opportunities.
  - iSportsman support - provided by reimbursable Fish and Wildlife funds
  - Task: Review and comment on ADF&G annual stocking plan.
  - Task: Review iSportsman creel surveys and provide annual report of fishing efforts to ADF&G Sport Fish Division.
  - Task: Maintenance of Existing Trails and improve identified outdoor recreational opportunities.

  - Task: Coordinate with ADF&G to issue hunting permits for moose and black bear. Then conduct archery and firearms proficiency exams, provide hunter orientations, and monitor hunting activities and success.

- Objective 3.4: Provide consistent and effective enforcement of all federal, state, and local natural resource laws and regulations.
  - Task: Update or revise 673d ABWI 32-7001.
  - Task: Manage the Military Conservation Agent program to maximize assistance in enforcement of Natural and Cultural resources laws and regulations in the cantonment areas and JBER-E. Strive to provide sufficient qualified MCA's to cover 24/7 emergency, nuisance and aggressive wildlife responses. CLEO and MCA manning is problematic. Extended and more frequent deployments, TDY's and training has and will continue to cause gaps in coverage.

GOAL 4: CONTRIBUTE TO THE RECOVERY OF THE COOK INLET BELUGA WHALE.

- Objective 4.1: Study/monitor Cook Inlet beluga whales usage of waters on and adjacent to JBER.
  - Mgt, Species, Beluga Whale Prey (Marine)
  - Mgt, Species, Beluga Acoustical Monitoring
  - Mgt, Species, Cook Inlet Beluga Whale/Ice Conditions

- Objective 4.2: Monitor the quality and quantity of Cook Inlet beluga whale habitat on and adjacent to JBER, especially features included as primary constituent elements in the Cook Inlet beluga critical habitat designation.
  - Mgt, Species, Beluga Whale Prey (All waters but Sixmile)
  - Mgt, Species, Beluga Whale Prey (Salmon-Sixmile)
  - Mgt, Species, Salmon Otter Lake Drainage
  - Task: Investigate changes in Eagle River estuary bathymetry.

- Objective 4.3: Study/monitor, protect and enhance (where appropriate) prey species for Cook Inlet beluga whale.
  - Mgt, Species, Salmon Spawning Sixmile
  - Mgt, Species, Juvenile Salmon Wintering Occupancy/ Diet Requirements
  - Mgt, Species, Beluga Prey – Salmon Productivity

- Objective 4.4: Monitor in water anthropogenic noise from JBER activities and assess the potential impact on Cook Inlet beluga whales.
  - Mgt, Species, Cook Inlet Beluga Whale, Training Noise Impacts

- Objective 4.5 Assist other researchers, when practicable (e.g. NMFS, ADF&G) with Cook Inlet beluga whale studies and conservation efforts in upper Cook Inlet.
  - Task: Contribute to Knik Arm portion of photo-identification project in cooperation with NMFS.

9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.1 Natural Resources Management Staffing and Implementation

EIAP is implemented in accordance with Title 32, CFR, Part 989 (32 C.F.R. 989). The overarching purpose of EIAP is to ensure the Air Force achieves and maintains compliance with NEPA and the Council of Environmental Quality regulations for implementing the procedural provisions of NEPA. Both the project proponent and the environmental planning function have certain roles and responsibilities as part of the EIAP. The 673 CES/CEN is the designated environmental planning function for Air Force. In general, the EIAP begins at the earliest time possible, often following but not limited to, the initial review of AF Forms 332 (Base Civil Engineer Work Request) that project proponents submit to the JBER Customer Service Unit (773 CES/CEOSC). The Air Force uses AF IMT 813 (commonly referred to as AF Form 813) to document the need for further environmental analysis (e.g., environmental assessment or environmental impact statement) or for the use of certain categorical exclusions. Often a categorical exclusion will not require the generation of an AF Form 813. When an AF Form 813 is not required, the AF Form 332 may be signed by the representative of the environmental planning function (673 CES/CENPP) indicating the specific categorical exclusion that applies. The Staff Judge Advocate advises the proponent and environmental planning personnel on CATEX determinations and the legal sufficiency of environmental documents. The environmental planning function assists the proponent throughout the EIAP.

With regard to natural resources, the AF Form 813 facilitates an integrated approach to planning and decision-making by allowing environmental subject matter experts, within 673 CES/CEI, the opportunity to review a proposed action and provide comments to the environmental planning function to assist in the environmental analysis determination as to potential nature of impacts, which assists with the final determination as to whether a categorical exclusion is in fact proper, or if an environmental assessment or environmental impact statement is required. Although 32 CFR 989, Appendix B, lists the categorical exclusions that do and do not require an AF Form 813, the environmental planning function may decide to prepare an AF Form 813 to take a harder look at a proposed action to ensure that it does not present any extraordinary/unique circumstances that would make a categorical exclusion inapplicable. For example, the presence of threatened or endangered species, archeological remains, or historical sites may present such circumstance. Therefore, AF Forms 813 serves to both document the EIAP process and engage environmental subject matter experts in the review of proposed actions to ensure the proper application of categorical exclusions and to assist in the determination of further environmental analysis.

Typically, environmental assessments and environmental impact statements are prepared by consulting firms as part of the project for large projects, such as Private Sector Financed housing development, F- 22A Beddown, and the C-17 Beddown. In these cases, since the Air Force proposed the projects, the Air Force was the lead agency. Occasionally, the Air Force may function as a cooperating agency with another federal agency, such as occurred in the recent Maritime Administration environmental assessments for Port of Anchorage expansion and material extraction.

The Sikes Act Improvement Act (Sec. 2905(c) of the National Defense Authorization Act for Fiscal Year 1998) required the preparation and implementation of an INRMP on appropriate military installations by November 2001. An INRMP has been in place at EAFB since 2001 and at FRA since 1998. This plan is the third annual review of the initial JBER INRMP and will be implemented by actions to achieve goals and objectives stated in Chapter 8. Projects and Tasks focused on the accomplishment of these goals and objectives will form the foundation for funding. Each goal will be accomplished to the maximum extent possible when and if funding is available. Projects may be accomplished by in-house staff, contractors,

volunteers, or through cooperative agreements with state and federal agencies or other private organizations.

The INRMP is considered fully implemented if all high priority projects are funded and executed, there are sufficient numbers of trained natural resources personnel, and those personnel have sufficient supplies and equipment to carry out these projects. Air Force programming procedures will be followed by JBER to request funding for these projects.

9.1.1 Work Plans

Work plans and projects are integral to successful implementation of this INRMP. Annual requirements for funding through the Environmental Conservation Program have been identified through FY 2025

Work plans may change with time, as work requirements change and projects are completed, either on time, ahead of schedule, or behind schedule, or significantly change due to mission changes. All work plans and subsequent projects will revolve around best management practices to support the mission and ensure ecosystem management. Work plans will be updated annually, and reviewed and approved per AFI 32-7064.

9.1.2 Natural Resources Management Staffing

JBER personnel requirements are directly related to program and data collection maturity. The creation of JBER through joint basing as well as other requirements and issues have magnified the need for on-site subject matter experts. These requirements and issues include program incorporation, overcoming the loss of shared USARAK subject matter support, requirements for supportive data collection for resumption of year round firing into ERF impact area, endangered CIBW and salmon, a prey species considered a primary constituent element necessary for the CIBW recovery.

Personnel requirements for the JBER conservation program are delineated below in Table 9.1.

Table 9-1: Current JBER Natural Resources Management Staffing

Title	Type	Series/Grade	Status
Chief, Conservation Section	DoD Civilian	0401/GS-13	Filled
Biological Scientist (5)	DoD Civilian	0401/GS-12	Filled
Environmental Protection Specialist	DoD Civilian	0028/GS-12	Filled
Archaeologist	DoD Civilian	0193/GS-12	Filled
Conservation Enforcement Officer	DoD Civilian	1801/GS-12	Filled
Conservation Enforcement Officer	DoD Civilian	1801/GS-11	Filled
Conservation Enforcement Officer	DoD Civilian	0025/GS-7	Filled
General Biologist (2)	Cooperator		1 Filled, 1 Vacant
Seasonal Technicians	Cooperator		Funding Dependent Avg. 15 per field season

Volunteer Program

Natural Resources has an active volunteer program. Individuals and groups typically donate labor, and occasionally materials, for specific projects. Volunteers receive training, are issued equipment, and are covered for liability and workman's compensation and assist with various natural resources projects and

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

- fisheries and wildlife monitoring;
- monitoring of multi-bird species presence and abundance
- monitoring of common and Pacific loons, and red- throated and horned grebes through Alaska Loon Watch
- forest inventory;
- tree planting or cutting;
- wildlife habitat surveys and improvement projects;
- construction, upgrades, and repairs of watchable wildlife areas; and
- trail maintenance and construction.

Military Conservation Agent Program

The Military Conservation Agent volunteer program has annually provided about three man-years of volunteered time since 1995. This program greatly enhances available coverage for enforcement, patrol, public contact, and wildlife response activities. However, the program requires substantial effort to coordinate, supervise, and train Military Conservation Agents, reducing time for the full-time enforcement specialists to conduct field enforcement. Section 7.3.3, Military Conservation Agent Program further discusses this program.

Technical Support and Outside Assistance

Major projects, such as natural and cultural resources plans and inventories, are often contracted to various public and private agencies, such as the USFWS, ADF&G, Air Force Center for Environmental Excellence, and the Center for Ecological Management of Military Lands at Colorado State University. Some research has been conducted locally by graduate students, primarily from the University of Alaska. Natural Resources intends to pursue assistance with some aspects of forestry management through an agreement with the U.S. Forest Service. Technical support is sometimes available from agencies, such as the ADF&G, which has provided technical advice and training on a host of issues.

9.1.3 Implementation Funding Options

Natural resources management relies on a variety of funding mechanisms, some of which are self-generating and all of which have different application rules. AFI 32-7064 outlines funding sources, funding priorities, and level of effort for Air Force conservation programs. Funding sources include the operations and maintenance appropriation, reimbursable conservation program accounts, the DoD Legacy Resource Management Program, the Strategic Environmental Research and Development Program, and other sources, such as those that may be obtained through cooperative agreement under authority of the Sikes Act.

Funding Categories of Priority

Projects are identified, prioritized, cost-estimated and submitted through an environmental budget process to the parent command and, ultimately, Headquarters Air Force.

Funding for environmental projects are prioritized according to Air Force (AF) Common Output Levels Standards (AF COLS), which have 4 levels with Level 4 being the highest priority. They are described as follows:

AF COLS 4: (Maintain Compliance) Funds requirements that, are required by Federal, State, and local environmental laws and regulations; permit conditions; legal or regulatory mandates; Overseas Environmental Baseline Guidance Document (OEBGD); Final Governing Standards (FGS); and obligations under binding international agreements. These requirements are mandated to be completed within a particular year, and are considered critical to fund every year that they are needed. . Requirements and activities at this level include minimum amount of support necessary to sustain core operational mission capacities. Major impacts to mission are expected if funding is limited to level. Projects related to wildlife species and habitats protected by the Endangered Species Act (EAS) or Marine Mammal Protection Act (MMPA) are funded at this level.

AF COLS 3: (Sustain Compliance) Funds requirements that are required by Federal, State, and local environmental laws and regulations; permit conditions; legal or regulatory mandates; OEBGD; FGS; and obligations under binding international agreements and those requirements that comply with the most mission-critical DoD and AF guidance. These requirements are not mandated to be completed within a particular year, and are executed through risk-based prioritization. Requirements and activities at this level may be deferred where appropriate. Compliance with only the most mission-critical Executive Order/Department of Defense/Air Force guidance is maintained. Moderate impact to mission is expected if funding is limited to this level. Non-ESA/MMPA protected wildlife and habitat projects are funded at this level, though not all projects submitted are funded depending on funding availability. Almost all JBER natural resources not related to endangered species are programed and funded at this level.

AF COLS 2: (Prevents Non-Compliance) Provides funding for requirements that are described in AFCOLS 3 and 4. This funding level ensures compliance with DoD and AF requirements, though not all may be achieved due to limited funding and is executed through risk-base prioritization. Requirements at this level address best or standardized management practices that ensure long term business efficiencies, investments in pollution reduction processes, and other costs associated with managing EQ programs necessary to sustain environmental compliance which may affect military readiness. All statutory legal requirements must be met, however, not all Executive Order/Department of Defense/Air Force requirements may be met. Minor impacts to mission are expected if funding is limited to this level.

AF COLS 1: (Enhance the Environment) Provides funding for requirements that were stated in AFCOLS 2, 3 and 4 and which ensures full compliance with DoD and AF requirements that is an optimum level of service. This funding level is fully effective and provides efficient mission capability. Achieves 100% full and sustained compliance with all best management practices and responsible environmental stewardship initiatives. No impacts to mission if funding is maintained to this level.

Operations and Maintenance

Natural Resources normally has an annual operations and maintenance budget allocated through the Civil Engineering Squadron that covers day-to-day operational costs, such as employee salaries, vehicles, gas, office and field supplies, and basic operating requirements. In addition to this general funding source, funding is received for special projects, and some natural resources programs generate funds which are, by regulation, used to support programs that generated them.

Reimbursable Conservation Program Funds

Funds generated from the sale of forest products, agricultural products, grazing and cropland out-grants, and the collection of fees for hunting, fishing, trapping and other outdoor recreation activities may be reimbursed to commands and installations for support of natural resources programs under certain

conditions set forth by law. Section 7.8 Forest Management and Section 7.2, Outdoor Recreation and Public Access to Natural Resources further discuss reimbursable conservation program funds.

Forest Products and Timber Sales

Production and sale of forest products are conducted under a reimbursable forestry program. 10 USC 2665 authorizes reimbursement of costs directly related to the production of forest products with proceeds derived from the sale of the forest products. Eligible forestry program reimbursements include obligations funded that are directly related to the economic production and sale of timber, logs, pulpwood, Christmas trees, posts and poles, pine straw, stump wood, bark and other mulch, cones, seeds, firewood, and wood chips. Proceeds from the sale of forest products produced on an installation are used to reimburse forestry program operating costs. The highest priority for funds is related to the production and sale of harvest products. Other authorized expenses include forest management, forestry equipment, forest fire protection, forest access roads, reforestation, and forestry support.

Forty percent of the installation's net proceeds are then distributed as an entitlement to the state in which the military installation is located to be used for local roads and schools. Remaining net funds are transferred to a holding account known as the DoD Forestry Reserve Account. Balances in the account are made available to Military Departments for improvements of forest lands, unanticipated contingencies in the administration of forest lands, and natural resources management that implements approved plans and agreements. Timber receipts from have varied from year to year, and will be monitored and reported in future INRMP updates.

Agricultural Out-leasing

Lands used to support the military mission may also be out-leased for agricultural and grazing purposes. 10 USC 2667(d)(4) authorizes the use of proceeds from agricultural leases and sales of agricultural products to cover administrative expenses of agricultural leasing and to finance natural resources management activities that implement an approved INRMP, including improvements of lands currently or not currently leased for agricultural and grazing purposes, wildlife habitat improvement, and erosion control. These are the broadest-use funds available exclusively to natural resources managers.

Agricultural funds are treated as normal operations and maintenance funds and must be obligated in the fiscal year that they were issued. There are no agricultural leases on JBER and no plans to institute such leases in the future.

Fish and Wildlife Management Fees

The Sikes Act, 16 USC 670a(b)(3)(B), allows hunting, fishing, trapping, and other outdoor recreation fees to be reimbursed to the installation where they were generated. These fees must be used only on the installation where they were collected and used only for the protection, conservation, and management of fish and wildlife, to include habitat restoration and improvement, biologist staff and support costs, and related activities, but for no other purpose. Fish and wildlife funds are "no- year" funds (i.e., revenues generated in a particular year remain available for obligation indefinitely). AFI 32-7064 also states, "Administrative and management costs associated with hunting, fishing, trapping and the management of outdoor recreation access must be fully reimbursed by users fees." Fees offset recreation access administration and management costs as required by AFI 32-7064 and the Sikes Act. Refer to Section 7.2, Outdoor Recreation and Public Access to Natural Resources further discusses fish and wildlife fees.

Alternative Sources of Funding

Other sources of funds may be available to support implementation of INRMP actions and initiatives. Below are general descriptions alternative sources of funding available to JBER to implement this INRMP. Not all of these are used by JBER.

DoD Legacy Resources Management Program

The Legacy Resources Management Program provides funding for projects that identify means to improve natural and cultural resources management on DoD lands in general. Legacy may fund natural resource projects that may address integrated natural resource management, regional ecosystem management initiatives, invasive species control, and cooperative conservation. Projects receiving Legacy Resources Management Program funding cannot be installation specific.

In the past, some special projects have been funded through this program, the most recent being the study of rusty blackbird habitat use on JBER (Matsuoka *et al.* 2010).

BASH Funding

Since the fatal air crash in 1995, numerous projects have been funded under this program. Past and future projects to change vegetation around the flightline, as well as the cost of bird dispersal operations, are funded from this source. In many cases funds are Wing-level funds diverted from other programs.

Readiness and Environmental Protection Initiative

DoD established the Readiness and Environmental Protection Initiative to provide funding for the military to work with state and local governments, non-governmental organizations, and willing land owners to limit incompatible development and protect valuable open space and habitat around key testing and training areas. The funding leverages public/private partnerships and additional financial commitments to promote innovative land conservation solutions that meet mutual interests. Projects are selected for Readiness and Environmental Protection Initiative funding based on military needs and partnering opportunities.

Strategic Environmental Research and Development Program

The Strategic Environmental Research and Development Program is a joint DoD, Department of Energy, and U.S. Environmental Protection Agency program. The program can be used to fund conservation research on DoD installations. The program can pay for certain research and development projects that involve the development of new technologies for natural and cultural resources management.

9.2 Monitoring INRMP Implementation

Monitoring and evaluation are the heart of adaptive management and act as a check for implementation of the INRMP. Although the INRMP establishes direction for 2017-2022, it may take much longer to adequately address some goals and desired future conditions. Monitoring determines whether:

- projects are implemented in compliance with INRMP, AFI, and DoD requirements;
- standards and guidelines are followed;
- standards and guidelines are effective;
- goals and objectives are met; and
- assumptions, relationships, and decisions are valid, considering new information or changing conditions.

Implementation monitoring is pertinent to this INRMP. Implementation monitoring answers the question; "Did we do what we said we would do?" Implementation monitoring, the most basic monitoring level, determines whether or not projects and activities are designed and conducted in compliance with the INRMP and other direction. Implementation work plans and environmental assessment documents will track whether projects comply with the INRMP, have been completed, and whether the reports are completed and made publically available.

Because of the dynamic nature of natural resources and the mission, there are expected variations in needs during the course of a normal year. Some projects may be moved to a higher priority status than originally planned; some have to be dropped totally as systems change or work priorities change. The INRMP implementation and monitoring effort will include these and other changes, ensure they are reviewed and documented, and alter INRMP planning, if necessary, to fit current ecosystem and military mission needs.

During the annual review, the Natural Resources Chief, in cooperation with representatives from the USFWS, ADF&G and NMFS, will review all accomplishments outlined in the previous year's approved work plans. The Natural Resources Chief will verify results of INRMP implementation, analyze results, and prepare specific reports regarding what has and has not been accomplished. The Natural Resources Chief will then work with various program managers on upcoming annual work plan submittal to ensure all appropriate needs are addressed in that year's work plans.

9.3 Annual INRMP Review and Update Requirements

9.3.1 Implementation and Review

Implementation of this INRMP is a coordinated effort by all parties of the 673 ABW and its partners. Coordination of the separate and shared roles for implementation lies with the 673d Civil Engineer Group Commander, as delegated to 673 CES/Natural Resources. Initiating the required annual reviews and revisions is also the responsibility of 673 CES/Natural Resources. Invited annual reviewers will include:

- AFCEC Natural Resources
- Region II Sport Fishery Division, ADFG*;
- Region II Wildlife Conservation Division, ADFG*;
- Anchorage Area Field Office, Region 7, USFWS*;
- Anchorage Field Office, Bureau of Land Management (BLM);
- Anchorage Field Office of National Oceanic and Atmospheric Administration - National Marine Fisheries Service (NMFS)*;
- Federally recognized tribes with tribal interests on JBER; and
- Chugach State Park

In accordance with the Sikes Act, the cooperating agencies must review and endorse an INRMP on a regular basis, but not less often than every five years. (*) Indicates JBER INRMP signatory agency.

9.3.2 Five-Year Review and Revisions

Revisions or updates to this INRMP are required at least once every five years, or more frequently in cases of changes to the military mission, environmental compliance requirements, or other new information that significantly affects the ability of the installation to implement the INRMP.

Appendix J includes coordination/review/concurrence documents from signatory agencies. Other federal and state agencies and non-governmental organizations were afforded opportunities to review and comment

on the INRMP. Appendix J also includes comments received from these parties during the INRMP development process.

INRMP updates consist of minor edits that provide current information, or adjusts implementation timelines that would not result in changes to management goals and objectives that are substantially different than those previously agreed to by the cooperating agencies, and would not result in environmental consequences different from those in the existing INRMP.

INRMP revisions are completed if changes in the installation mission or land use that would alter the biogeophysical environment such that significant edits need to be made to ensure that the INRMP reflects the current natural resources management requirement and appropriate program goals and objectives.

The INRMP is a planning document and is not to be considered a substitute for appropriate NEPA assessment. The projects described herein are concepts offered for installation leadership consideration but no management decision will be made without full NEPA compliance.

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 Air Force 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 Air Force 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 implemented if not accomplished within a programed year due to other priorities.
- Low: Project supports a specific INRMP goal and objective, enhances conservation resources or the integrity of JBER 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.

Reports for completed projects can be obtained by contacting the INRMP editor, Natural Resources Chief, or specific resource area manager. Contact information is located below in Table 10.1: Natural Resource Manager Contact Information.

Table 10-1: Natural Resource Manager Contact Information

Resource Area	Phone	Email
Natural Resources Chief	(907) 384-6224	Vacant
INRMP Editor, Avian	(907) 384-0276	Cassandra.schoofs.1@us.af.mil
Forestry, Hunt Coord	(907) 384-3321	Raymon.hedges@us.af.mil
Wetlands/Vegetation/Ecology	(907) 384-3913	Charlene.johnson.3@us.af.mil
Fisheries/Wildlife/Ecology	(907) 384-3380	Colette.brandt@us.af.mil
Marine Mammals	(907) 384-2479	Christopher.garner.9@us.af.mil
Cultural Resources	(907) 384-3467	Margan.grover@us.af.mil

Table 10-2: FY 2016 Work Plan (with field work that occurred in 2017)

FY16 Funded Projects	Funding Source
MGT, Inventory and Monitoring Statistical Oversight.	FSXBOS614016
MGT, Habitat, Winter Moose Browse Utilization Inventory.	FXSBOS599116
MGT, Species, Eagle and Breeding Bird Surveys.	FXSBOS599016
MGT, Species, Wood Frog Baseline Survey.	FXSB61444016
MGT, Species, Beluga Prey (Salmon-Sixmile)	FXSBOS627116
MGT, Species, Beluga Whale Prey. Enumerate salmon species in Eagle River.	FXSBOS623116
Rainbow Predation Rates, Sixmile Salmon Smolt.	FXSB61640616

MGT Habitat Otter Creek/Lake, Salmon Reclamation.	FXSB61622816
JBER Stream, Lake and Habitat Survey.	FXSB6133916
Bat Survey	FXSB61701016
Mgt, Species, Beluga Acoustical Monitoring	FXSBOS453616
Eagle River Flats Bird Surveys	FXSBOS640116
Boreal Wetlands Birds at Risk--Abundance, Nesting, & Migration	FXSB460582
Monitor, Wetlands.	FXSBOS217116
MGT, Invasive Species.	FXSBOS047116
MGT, Habitat, Vegetative Plot.	FXSBOS447116
MGT Habitat, Urban Forest.	FXSBOS74116
MGT, Habitat, Silviculture.	FXSBOS14116
Forest Carbon Credit Evaluation.	FXSB61518216
MGT, Species, BASH Risk.	FXSBOS640116
Recordkeeping, Other, Recreational Access Software Maintenance.	FXSBOS87116

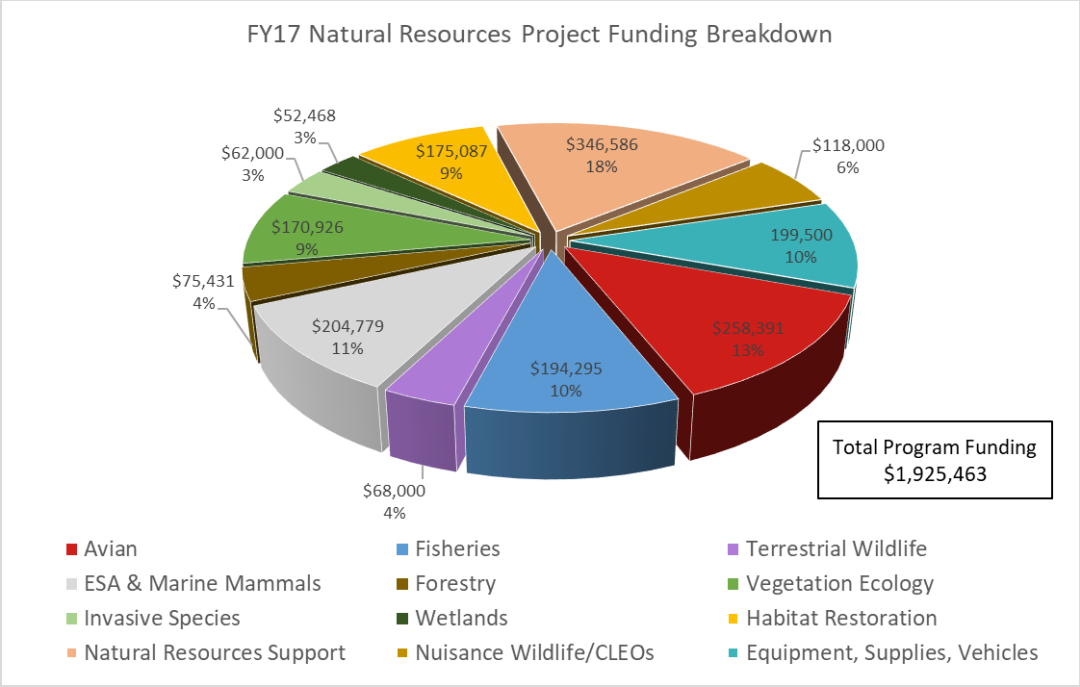


Figure 10-1: FY17 Natural Resources funded projects combined by program area

Table 10-3: FY 2017 Work Plan with most field work occurring in 2018

FY17 Funded Projects	Funding Source	Priority
Marine Mammal, PTS, TTS	Emergent Project	High
Mgt, Species, Beluga Acoustical Monitoring	FXSBOS453617	High
Mgt, Species, Eagles/Bird Survey	FXSBOS640117	High
Mgt, Habitat Fishery Restoration / Enhancement	FXSB61622917	High
Mgt, Species, Beluga Whale Prey- (All Waters But Sixmile)	FXSBOS620117	High
Mgt, Species, Beluga Whale Prey (Salmon-Sixmile)	FXSBOS621117	High
Mgt, Nuisance Wildlife	FXSB69831417	High
Boreal Wetlands Birds At Risk-Abundance/Nesting/Migration	FXSB46058117	Medium
Alpine Functional Sustainability Study	FXSB61425517	Medium

Mgt, Habitat, Vegetative Plot	FXSBOS447117	Medium
Mgt, Wetlands / Floodplain	FXSBOS217117	Medium
Mgt, Statistical Oversight	FXSBOS614117	Medium
Mgt, Invasive Species, Multi Plant Species	FXSBOS047017	Medium
Mgt, Habitat, Silviculture	FXSBOS14117	Medium
Mgt, Habitat, Winter Moose Browse Utilization Inventory	FXSBOS600117	Low
Mgt, Habitat, Gravel Pit Reclamation Plan	FXSB74494317	Low
Projects Below Funding Line	**Funding Source**	**Priority**
Mgt, Species, Western Hemlock And White Spruce	FXSB74494917	Low

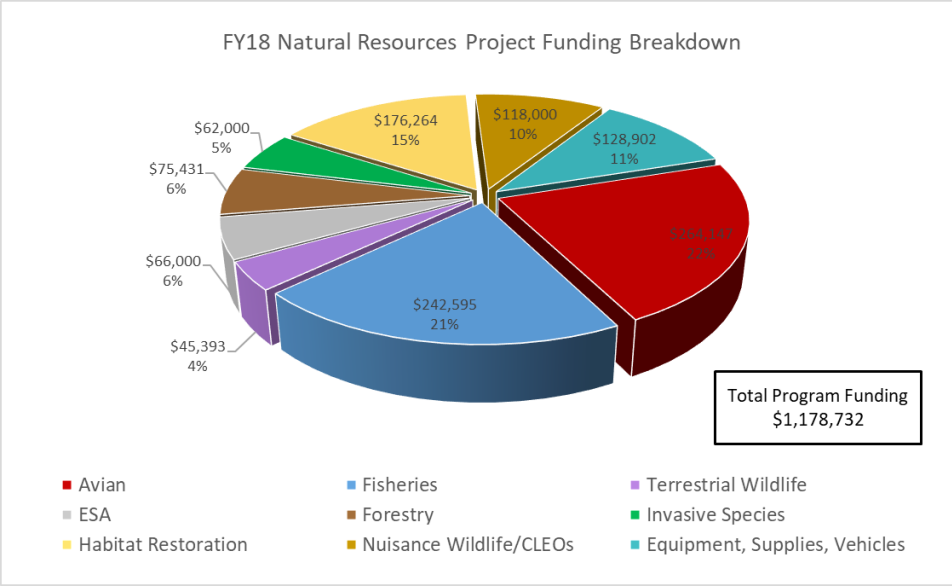


Figure 10-2: FY18 Natural Resources funded projects combined by program area

Table 10-4: FY 2018 Work Plan with field work occurring in 2018 and 2019

FY18 Funded Projects	Funding Source	Priority
Mgt, Species, Beluga Acoustical Monitoring	FXSBOS453618	High
Mgt, Species, Eagle, Mil Trng Effects, Behavior/Reproduction	FXSBOS640118	High
Mgt, Species, Beluga Whale Prey- (All Waters But Sixmile)	FXSBOS620118	High
Mgt, Species, Beluga Whale Prey (Salmon-Sixmile)	FXSBOS623118	High
Mgt, Nuisance Wildlife	FXSB69831418	High
Mgt, Habitat Fishery Restoration / Enhancement	FXSB61622918	Medium
Bat Survey	FXSB61701018	Medium
Boreal Wetlands Birds At Risk-Abundance/Nesting/Migration	FXSB46058118	Medium
Mgt, Invasive Species, Multi Plant Species	FXSBOS047018	Medium
Mgt, Habitat, Silviculture	FXSBOS14818	Medium
Mgt, Statistical Oversight	FXSBOS614118	Medium

Mgt, Habitat, Gravel Pit Reclamation Plan	FXSB74494318	Low
FY18 Programed Projects Below the Funding Line	**Funding Source**	**Priority**
Mgt, Wetlands / Floodplain	FXSBOS217818	Medium
Tanaina Lake Baseline Survey	FXSB02366818	Medium
Mgt, Habitat, Vegetative Plot	FXSBOS441118	Medium
Mgt, Habitat, Winter Moose Browse Utilization Inventory	FXSBOS600118	Low
Mgt, Species, Western Hemlock And White Spruce	FXSB74494918	Low

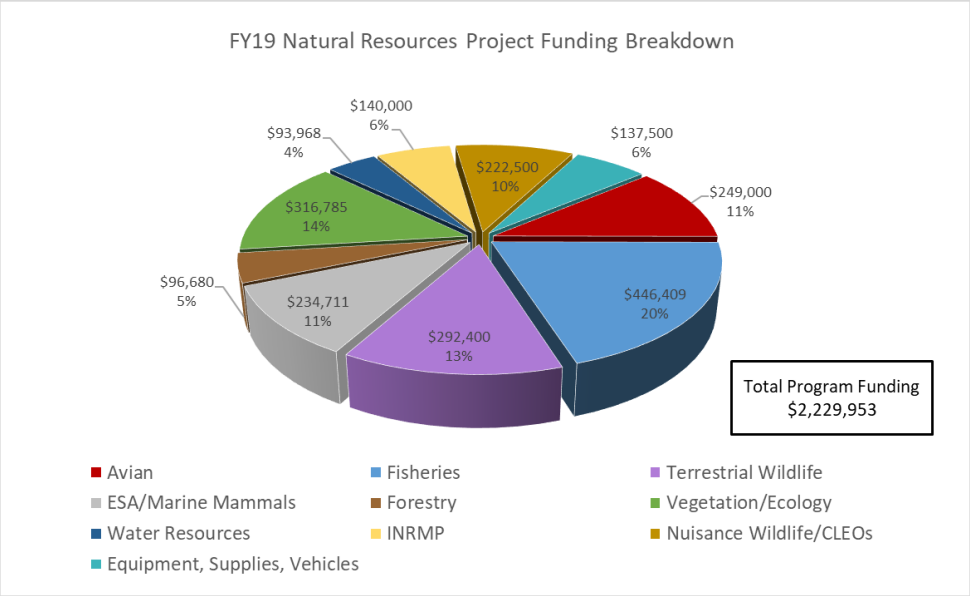


Figure 10-3: FY19 Natural Resources funded projects combined by program area

Table 10-5: FY 2019 Work Plan with field work occurring in 2019 and 2020

FY19 Funded Projects	Funding	Priority
Mgt, Species, Beluga Acoustical Monitoring	FXSBOS453619	High
Mgt, Species Harbor Porpoise Monitor In Knik Arm/Eagle River	FXSB03068119	High
Mgt, Species, Cook Inlet Beluga Whale/Ice Conditions	FXSBOS682919	High
Mgt, Species, Interagency, Boreal Wetland SAR Birds-Alpine	FXSB25756019	High
Mgt, Species, Eagle, Mil Trng Effects, Behavior/Reproduction	FXSBOS820119	High
Mgt, Nuisance Wildlife	FXSBOS691419	High
Mgt, Species, Beluga Whale Prey (Salmon-Sixmile)	FXSBOS623119	High
Mgt, Species, Beluga Whale Prey- (All Waters But Sixmile)	FXSBOS620119	High
Mgt Species, Salmon, Otter Lake Drainage	FXSBOS680319	High
Mgt, Species Salmon, Sixmile Outfall Design	FXSB02348819	High
Mgt, Species, Eagles/Bird Survey	FXSBOS640119	High
Mgt, Habitat Alpine Training Support	FXSB61425519	Medium
Plan Revision, INRMP	FXSBOS461819	Medium
Mgt, Invasive Species, Mult Plant Species	FXSBOS044119	Medium

Mgt, Habitat, Long Term Ecological Monitoring	FXSBOS441119	Medium
Mgt, Habitat Fishery Restoration / Enhancement	FXSB61622919	Medium
Mgt, Wetlands / Floodplain	FXSBOS217819	Medium
Mgt, Habitat, Forest Resources	FXSBOS14819	Medium
Mgt. Species, Bat Survey	FXSB61701019	Medium
Inv/Mapp'g Otter/Sixmile Lk. Sockeye/Coho Spawn'g Habitat	FXSB03055119	Medium
Mgt, Statistical Oversight	FXSBOS614119	Medium
Mgt Species, Winter Track Surveys	FXSBOS216819	Low
Mgt, Habitat, Winter Moose Browse Utilization Inventory	FXSBOS600119	Low
Mgt Species, Small Game / Multi-Species Surveys	FXSBOS680619	Low
Mgt, Habitat, Climate Adaptation-Mission Vulnerability	FXSBOS7419	Low
Mgt, Habitat, Alpine Lake Sampling in Active Training Area	FXSB02366819	Low
Mgt, Species, Western Hemlock And White Spruce	FXSB74494919	Low
FY19 Programed Projects Below the Funding Line	**Funding Source**	**Priority**
Outreach	FXSBOS4019	Low
Boreal Birds Conservation Concern Kiosk	FXSBOS112119	Low

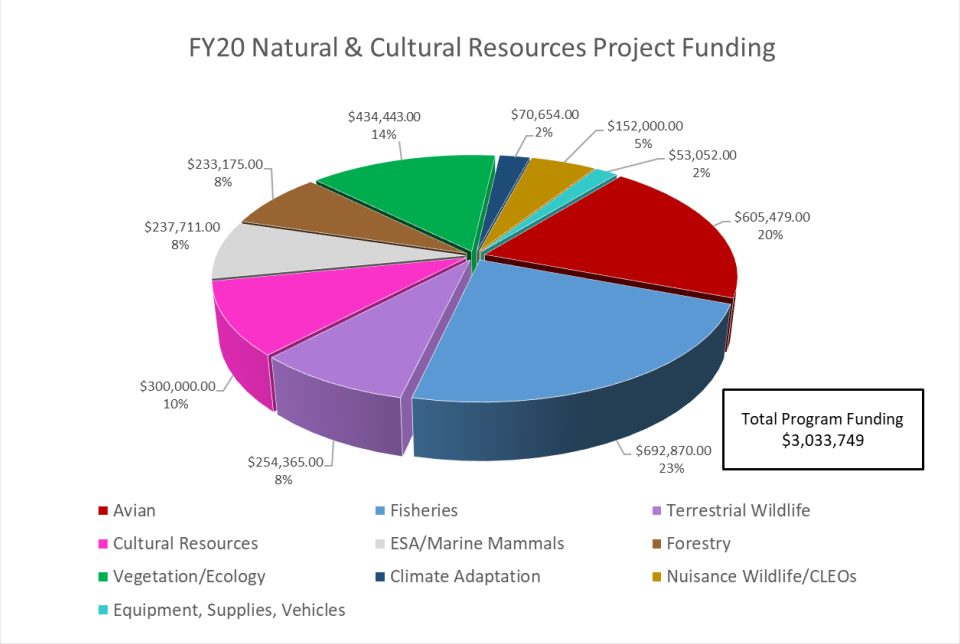


Figure 10-4: FY20 Natural Resources funded projects combined by program area

Table 10-6: FY 2020 Programed Work Plan

FY20 Funded Projects	Funding Source	Priority
Mgt, Species, Cook Inlet Beluga Whale/Ice Conditions	FXSBOS682920	High
Mgt, Species, Beluga Acoustical Monitoring	FXSBOS453620	High
Mgt, Species, Beluga Whale Prey- (All Waters But Sixmile)	FXSBOS620120	High
Mgt, Species, Beluga Whale Prey (Salmon-Sixmile)	FXSBOS623120	High
Mgt, Species Harbor Porpoise Monitor In Knik Arm/Eagle River	FXSB03068120	High

Mgt, Nuisance Wildlife	FXSBOS691420	High
Mgt, Species, Eagle, Mil Trng Effects, Behavior/Reproduction	FXSBOS820120	High
Mgt, Species, Eagles/Bird Survey	FXSBOS640120	High
Mgt, Species, Salmon Spawning Sixmile	FXSB21678120	High
Mgt, Species, Salmon Otter Lake Drainage	FXSBOS680320	High
Mgt, Species, Interagency, Boreal Wetland SAR Birds-Alpine	FXSB25756020	High
Mgt, Species, Boreal Wetland Bird Genoscope/Migration	FXSB55937720	High
Inv/Mapp'g Otter/Sixmile Lk. Sockeye/Coho Spawn'g Habitat	FXSB03055120	Medium
Mgt, Habitat, Alpine Training Support	FXSB61425620	Medium
Mgt, Habitat, Fishery Restoration / Enhancement	FXSB61632920	Medium
Mgt, Habitat, Forest Resources	FXSBOS14820	Medium
Mgt, Habitat, Long Term Ecological Monitoring	FXSBOS441020	Medium
Mgt, Wetlands / Floodplain	FXSBOS217820	Medium
Mgt, Species, Candae/Wolf Species Survey	FXSB55945120	Medium
Mgt, Species, SOSC Collared Pika Survey	FXSB559298	Medium
Mgt, Species, Large Raptor Air Space Utilization	FXSB04243620	Medium
Mgt, Invasive Species, Multi Plant Species	FXSBOS044120	Medium
Bat Survey	FXSB61701020	Medium
Mgt, Statistical Oversight	FXSBOS614120	Medium
Mgt, Habitat, Winter Moose Browse Utilization Inventory	FXSBOS600120	Low
Mgt, Habitat, Climate Adaptation-Mission Vulnerability	FXSBOS7420	Low
Mgt, Habitat, Urban Forest	FXSBOS74120	Low
Mgt, Species, Western Hemlock, Birch, and White Spruce	FXSB74494920	Low
Mgt, Species, White Spruce	FXSB5599920	Low
Rare Plant Inventory	FXSB61516620	Low
Mgt, Species, Winter Track Surveys	FXSBOS216820	Low

Table 10-7: FY 2021 Programed Work Plan

FY21 Funded Projects	Funding Source	Priority
Mgt, Species, Cook Inlet Beluga Whale/Ice Conditions	FXSBOS682921	High
Mgt, Species Harbor Porpoise Monitor In Knik Arm/Eagle River	FXSB03068121	High
Mgt, Species, Beluga Whale Prey (Marine)	FXSB732221	High
Mgt, Nuisance Wildlife	FXSBOS691421	High
Mgt, Species, Beluga Whale Prey (Salmon-Sixmile)	FXSBOS623121	High
Mgt, Species, Beluga Whale Prey (Salmon Productivity)	FXSBOS338021	High
Mgt, Species, Eagles/Bird Survey	FXSBOS640121	High
Mgt, Species, Beluga Whale Prey- (All Waters But Sixmile)	FXSBOS620121	High
Mgt Species, Salmon Otter Lake Drainage	FXSBOS680321	High
Mgt, Species, Beluga Acoustical Monitoring	FXSBOS453621	High
Mgt, Species, Interagency, Boreal Wetland SAR Birds-Alpine	FXSB25756021	High
Mgt, Species, Boreal Wetland Bird Genoscope/Migration	FXSB55937721	High
Mgt, Species, ERF Impact Area UAS Avian spp. Detection	FXSB55941221	High
Construct Sixmile Lake Salmon Outfall	FXSB03351421	Medium

Mgt, Species, Candae/Wolf Species Survey	FXSB55945121	Medium
Mgt, Species, SOSC Collared Pika Survey	FXSB55929621	Medium
Mgt, Habitat Alpine Training Support	FXSB61425621	Medium
Mgt Species, Large Raptor Air Space Utilization	FXSB04243621	Medium
Mgt, Habitat Fishery Restoration / Enhancement	FXSB61632921	Medium
Mgt, Species, Resident Fisheries Survey	FXSB55949421	Medium
Mgt, Statistical Oversight	FXSBOS614121	Medium
Mgt, Wetlands / Floodplain	FXSBOS217821	Medium
Mgt, Habitat, Forest Resources	FXSBOS14821	Medium
Mgt, Habitat, Long Term Ecological Monitoring	FXSBOS441021	Medium
Mgt, Habitat, Urban Forest	FXSBOS74121	Low
Mgt, Species, Western Hemlock, Birch, and White Spruce	FXSB74494921	Low
Mgt Species, Winter Track Surveys	FXSBOS216821	Low
Mgt, Habitat, Winter Moose Browse Utilization Inventory	FXSBOS600121	Low
Mgt Species, Small Game / Multi-Species Surveys	FXSBOS680621	Low

Table 10-8: FY 2022 Programed Work Plan

FY22 Programed Projects	Funding Source	Priority
Mgt Species, Northern Goshawk Baseline Data Collection	FXSB04255622	High
Mgt, Species, Cook Inlet Beluga Whale/Ice Conditions	FXSBOS682922	High
Mgt, Species Harbor Porpoise Monitor In Knik Arm/Eagle River	FXSB03068122	High
Mgt, Species, Cook Inlet Beluga Whale Training Noise Impacts	FXSB5593722	High
Mgt, Species, Beluga Whale Prey (Marine)	FXSB732222	High
Mgt, Nuisance Wildlife	FXSBOS691422	High
Mgt, Species, Beluga Whale Prey (Salmon-Sixmile)	FXSBOS623122	High
Mgt, Species, Beluga Whale Prey (Salmon Productivity)	FXSBOS338022	High
Mgt, Species, Eagles/Bird Survey	FXSBOS640122	High
Mgt, Species, Beluga Whale Prey- (All Waters But Sixmile)	FXSBOS620122	High
Mgt Species, Salmon Otter Lake Drainage	FXSBOS680322	High
Mgt, Species, Juvenile Salmon Winter Occupancy/Dietary Rqmt	FXSB218722	High
Mgt, Species, Beluga Acoustical Monitoring	FXSBOS453622	High
Mgt, Species, Candae/Wolf Species Survey	FXSB55945122	Medium
Mgt, Species, SOSC Collared Pika Survey	FXSB55929622	Medium
Mgt Species, Large Raptor Air Space Utilization	FXSB04243622	Medium
Mgt, Invasive Species, Mult Plant Species	FXSBOS044122	Medium
Mgt, Statistical Oversight	FXSBOS614122	Medium
Mgt, Wetlands / Floodplain	FXSBOS217822	Medium
Mgt, Habitat Fishery Restoration / Enhancement	FXSB61632922	Medium
Mgt, Species, Resident Fisheries Survey	FXSB55949422	Medium
Mgt, Habitat, Forest Resources	FXSBOS14822	Medium
Mgt, Habitat, Long Term Ecological Monitoring	FXSBOS441022	Medium
Mgt, Species, Bat Survey	FXSB61701022	Medium
Mgt, Habitat Alpine Training Support	FXSB61425622	Medium

Mgt, Habitat, Urban Forest	FXSBOS74122	Low
Mgt, Species, Western Hemlock, Birch, And White Spruce	FXSB74494922	Low
Mgt Species, Winter Track Surveys	FXSBOS216822	Low
Mgt, Habitat, Winter Moose Browse Utilization Inventory	FXSBOS600122	Low

Table 10-9: FY 2023 Programed Work Plan

FY23 Programed Projects	Funding Source	Priority
Mgt Species, Northern Goshawk Baseline Data Collection	FXSB04255623	High
Mgt, Species, Cook Inlet Beluga Whale/Ice Conditions	FXSBOS682923	High
Mgt, Species Harbor Porpoise Monitor In Knik Arm/Eagle River	FXSB03068123	High
Mgt, Nuisance Wildlife	FXSBOS691423	High
Mgt, Species, Beluga Whale Prey (Salmon-Sixmile)	FXSBOS623123	High
Mgt, Species, Beluga Whale Prey (Salmon Productivity)	FXSBOS338023	High
Mgt, Species, Eagles/Bird Survey	FXSBOS640123	High
Mgt, Species, Beluga Whale Prey- (All Waters But Sixmile)	FXSBOS620123	High
Mgt Species, Salmon Otter Lake Drainage	FXSBOS680323	High
Mgt, Species, Beluga Acoustical Monitoring	FXSBOS453623	High
Mgt, Species, Juvenile Salmon Winter Occupancy/Dietary Rqmt	FXSB218723	High
Mgt, Invasive Species, Mult Plant Species	FXSBOS044123	Medium
Mgt, Statistical Oversight	FXSBOS614123	Medium
Mgt, Wetlands / Floodplain	FXSBOS217823	Medium
Mgt, Habitat Fishery Restoration / Enhancement	FXSB61632923	Medium
Mgt, Species, Resident Fisheries Survey	FXSB55949423	Medium
Mgt, Habitat, Forest Resources	FXSBOS14823	Medium
Mgt, Habitat, Long Term Ecological Monitoring	FXSBOS441023	Medium
Mgt, Species, SOSC Collared Pika Survey	FXSB55929623	Medium
Mgt, Habitat Alpine Training Support	FXSB61425623	Medium
Mgt, Habitat, Winter Moose Browse Utilization Inventory	FXSBOS600123	Low
Mgt, Habitat, Urban Forest	FXSBOS74123	Low
Mgt, Species, Western Hemlock, Birch, And White Spruce	FXSB74494923	Low
Mgt Species, Small Game / Multi-Species Surveys	FXSBOS680623	Low

Table 10-10: FY 2024 Programed Work Plan

FY24 Programed Projects	Funding Source	Priority
Mgt Species, Northern Goshawk Baseline Data Collection	FXSB04255624	High
Mgt, Species, Cook Inlet Beluga Whale/Ice Conditions	FXSBOS682924	High
Mgt, Species Harbor Porpoise Monitor In Knik Arm/Eagle River	FXSB03068124	High
Mgt, Nuisance Wildlife	FXSBOS691424	High
Mgt, Species, Beluga Whale Prey (Salmon-Sixmile)	FXSBOS623124	High
Mgt, Species, Beluga Whale Prey- (All Waters But Sixmile)	FXSBOS620124	High
Mgt, Species, Eagles/Bird Survey	FXSBOS640124	High
Mgt Species, Salmon Otter Lake Drainage	FXSBOS680324	High

Mgt, Species, Beluga Acoustical Monitoring	FXSBOS453624	High
Mgt, Species, Juvenile Salmon Winter Occupancy/Dietary Rqmt	FXSB218724	High
Mgt, Species, SOSC Collared Pika Survey	FXSB55929624	Medium
Mgt, Invasive Species, Mult Plant Species	FXSBOS044124	Medium
Mgt, Statistical Oversight	FXSBOS614124	Medium
Mgt, Wetlands / Floodplain	FXSBOS217824	Medium
Mgt, Habitat Fishery Restoration / Enhancement	FXSB61632924	Medium
Mgt, Habitat, Forest Resources	FXSBOS14824	Medium
Mgt, Habitat, Long Term Ecological Monitoring	FXSBOS441024	Medium
Mgt, Habitat Alpine Training Support	FXSB61425624	Medium
Mgt, Habitat, Urban Forest	FXSBOS74124	Low
Mgt, Species, Western Hemlock, Birch, And White Spruce	FXSB74494924	Low
Mgt, Habitat, Winter Moose Browse Utilization Inventory	FXSBOS600124	Low

Table 10-11: FY 2025 Programed Work Plan

FY25 Programed Projects	Funding Source	Priority
Mgt, Species Harbor Porpoise Monitor In Knik Arm/Eagle River	FXSB03068125	High
Mgt, Species, Cook Inlet Beluga Whale/Ice Conditions	FXSBOS682925	High
Mgt, Nuisance Wildlife	FXSBOS691425	High
Mgt, Species, Beluga Whale Prey (Salmon-Sixmile)	FXSBOS623125	High
Mgt, Species, Beluga Whale Prey- (All Waters But Sixmile)	FXSBOS620125	High
Mgt Species, Salmon Otter Lake Drainage	FXSBOS680325	High
Mgt, Species, Eagles/Bird Survey	FXSBOS640125	High
Mgt, Invasive Species, Multi Plant Species	FXSBOS044125	Medium
Mgt, Wetlands / Floodplain	FXSBOS217825	Medium
Mgt, Habitat Alpine Training Support	FXSB61425625	Medium
Mgt, Habitat Fishery Restoration / Enhancement	FXSB61632925	Medium
Mgt, Habitat, Long Term Ecological Monitoring	FXSBOS441025	Medium
Mgt, Habitat, Forest Resources	FXSBOS14825	Medium
Mgt, Wetlands / Floodplain	FXSBOS217825	Medium
Mgt, Statistical Oversight	FXSBOS614125	Medium
Mgt, Habitat, Urban Forest	FXSBOS74125	Low
Mgt, Species, Western Hemlock, Birch, And White Spruce	FXSB74494925	Low

Table 10-12: Reoccurring Budget Items

Reoccurring Budget Items	
Equipment Purchase / Maintain, CN	FXSBOS5809XX
Vehicle Fuel & Maintenance, CN	FXSB848335XX
Supplies, CN, CLEO	FXSB69510XX
Supplies, CN	FXSBOS5306XX
Vehicle Leasing, CN	FXSBOS5969XX