# UNITED STATES AIR FORCE
# JOINT BASE ELMENDORF-RICHARDSON
# ALASKA

*ENVIRONMENTAL CONSERVATION PROGRAM*

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

## FINAL

## 1 June 2016

**Compliance Date 20 August 2015**

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# 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.

BRIAN R. BRUCKBAUER
Colonel, USAF
Commander

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## 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

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# 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

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Commissioner
Alaska Department of Fish and Game

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# 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

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# Acronyms

| | |
|---|---|
| AAFES | Army and Air Force Exchange Service |
| ABW | Air Base Wing |
| ABWI | Air Base Wing Instruction |
| ACES | Automated Civil Engineering System |
| ACMI | Air Combat Maneuver Instrument |
| ADEC | Alaska Department of Environmental Conservation |
| ADF&G | Alaska Department of Fish and Game |
| AFI | Air Force Instruction |
| AFPD | Air Force Policy Directive |
| AFWA | International Association of Fish and Wildlife Agencies |
| APU | Alaska Pacific University |
| ARNG | Army National Guard |
| ASOP | Airborne Standard Operating Procedures |
| BAAF | Bryant Army Airfield |
| BASH | Bird Aircraft Strike Hazard |
| BCT | Brigade Combat Team |
| BLM | Bureau of Land Management |
| CEG | Civil Engineer Group |
| CEMML | Center for Environmental Management of Military Lands |
| CEIEC | Natural Resources Element, Conservation and Compliance |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| CES | Civil Engineer Squadron |
| CIBW | Cook Inlet Beluga Whale |
| CFR | Code of Federal Regulations |
| CLEO | Conservation Law Enforcement Officer |
| DoD | Department of Defense |
| DoDI | Department of Defense Instruction |
| DoDM | Department of Defense Manual |
| DOF | Alaska Division of Forestry |
| DZ | Drop Zone |
| EA | Environmental Assessment |
| EAB | Echelon Above Brigade |
| EAFB | Elmendorf Air Force Base |
| EIAP | Environmental Impact Analysis Process |
| EO | Executive Order |
| EOD | Explosive Ordnance Disposal |
| EPA | Environmental Protection Agency |
| ERF | Eagle River Flats |
| ESA | Endangered Species Act |
| ESRI | Environmental Systems Research Institute |
| F | Fahrenheit |
| FONSI | Finding of No Significant Impact |
| FRA | Fort Richardson, Alaska |
| FY | Fiscal Year |
| GIS | Geographic Information System |
| HAARP | High Frequency Active Auroral Research Program |

| | |
|---|---|
| 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 |
| JBER | Joint Base Elmendorf-Richardson |
| JBER-E | Joint Base Elmendorf-Richardson - Elmendorf |
| JBER-R | Joint Base Elmendorf-Richardson - Richardson |
| LMU | Land Management Unit |
| LRAM | Land Rehabilitation and Maintenance |
| LTVM | Long-Term Vegetation Monitoring |
| LZ | Landing Zone |
| MBTA | Migratory Bird Treaty Act |
| MCA | Military Conservation Agent |
| METL | Mission Essential Task List |
| MMPA | Marine Mammal Protection Act |
| MOU | Memorandum of Understanding |
| MWH | MWH Global |
| NEPA | National Environmental Policy Act |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| OES | Outside Expert Support |
| PDZ | Potential Development Zones |
| PEA | Programmatic Environmental Assessment |
| PSWCD | Palmer Soil and Water Conservation District |
| REV | Relative Ecological Value |
| RTLA | Range and Training Land Assessment |
| SRA | Sustainable Range Awareness |
| SRP | Sustainable Range Program |
| SWPPP | Storm Water Pollution Prevention Plan |
| TRI | Training Requirements Integration |
| U.S. | United States |
| USAF | United States Air Force |
| USAG-AK | United State Army Garrison, Alaska |
| USARAK | United States Army, Alaska |
| USC | United States Code |
| USDA-APHIS-WS | United States Department of Agriculture Animal Plant Health Inspection Service and Wildlife Services |
| USFWS | United States Fish and Wildlife Service |
| WEC | Wildlife Education Center |
| WFMP | Wildland Fire Management Plan |

# 1.0 Executive Summary

## 1.1 Purpose of the Integrated Natural Resources Management Plan (INRMP)

### 1.1.1 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 September 2012 *Joint Base Elmendorf-Richardson Integrated Natural Resources Management Plan (2012)*. 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 General Plan (in preparation) 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 (*Delphinaterus leucus*) as required under Sec 4 (b)(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.

### 1.1.2 INRMP Support of the Air Force Mission

Preparation and implementation of this INRMP is required by the Sikes Act (16 USC 670 *et seq*.) and Air Force Instruction (AFI) 32-7064, *Integrated Natural Resource Management* (November 18, 2014). Additional INRMP guidance is provided by the Department of Defense Manual (DoDM), 4715.03 *INRMP Implementation Manual*, (Nov 25, 2013); and DoD Instruction (DoDI) 4715.03, *Natural Resources Conservation Program* (February 14, 2011).

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 2.2, *Authority*. This plan describes how the 673 ABW will implement provisions of AFI 32-7064, *Integrated Natural Resource Management* (November 18, 2014) on JBER.

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 General Plan (in preparation). 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 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 will result in degrading natural habitats and could result in violations of federal environmental protection laws.

Implementation of the INRMP directly supports the military mission in numerous ways. Natural resources projects contribute to airfield management. Controlling birds near runways and hazing large animals are prime examples. Catastrophic loss of personnel and aircraft is more likely without such bird control. Likewise, without hazing of bears occurring at JBER, a mauling of personnel is more likely to occur on the installation.

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

## 1.2 Summary of the Benefits of INRMP Implementation

INRMP implementation provides for the management of natural resources, including fish, wildlife, and plants, and provides the landscape necessary for sustainment of military uses. The INRMP ensures that plans to provide for the conservation and rehabilitation of natural resources on JBER are consistent with the use of JBER lands to ensure the readiness of the Armed Forces. The INRMP assists 673 ABW in complying with federal and state laws. INRMP implementation will help sustain the military mission by supporting appropriate ecosystem management.

## 1.3 Implementation of the INRMP

This INRMP is a living document and utilizes an adaptive management approach to sustain natural resources at JBER. This INRMP is flexible and capable of adapting new methods and processes as needed over time. In implementing projects to achieve goals and objectives in the plan, assumptions leading to management decisions are based on the latest scientific research, past experience, and input from stakeholders. As projects are implemented under this plan, results will be monitored and compared with initial assumptions. If some assumptions are shown to be invalid, adaptations will be made. This adaptive approach allows resource managers to continue toward the future vision, making slight corrections in a timely fashion to preserve resources and ensure mission flexibility.

### 1.3.1 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 are diverse, productive, and economically sustainable. Below are JBER major goals identified for this plan. Projects and tasks to achieve these goals and objectives are identified in Chapter 7, *Natural Resources Program Management* and included in Chapter 8, *Management Goals, Objectives, and Projects*.

**Natural Resources 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.*

**Goal 1:** Manage JBER natural resources under the guidelines and principles of adaptive ecosystem management, which aim to maintain functional ecosystems and natural diversity, including viable populations, native species, and ecological communities**.**

**Goal 2:** Minimize conflicts between military mission, wildlife, natural resources, and land use**.**

**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**.**

Objectives for these goals can be found in 2.4.3, *JBER Natural Resources Mission, Goals and Objectives*.

### 1.3.2 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).

### 1.3.3 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.

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# 2.0 General Information

## 2.1 Purpose

The overall purpose of this Integrated Natural Resources Management Plan (INRMP) is to manage installation lands, waters, air space, and natural resources to support the 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, 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 "JBER-Richardson" and "Fort Richardson Alaska (FRA)" represent the same land mass as does "JBER-Elmendorf" and "Elmendorf Air Force Base (EAFB)." FRA and EAFB usage will generally reflect actions conducted prior to joint basing, whereas JBER, JBER-Richardson, and JBER-Elmendorf usage represent current and future actions.

This INRMP is a routine update of the September 2012 *Joint Base Elmendorf-Richardson Integrated Natural Resources Management Plan* (2012). 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.

### 2.1.1 Scope

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 General Plan (in preparation) and is itself supplemented by annual, agency-coordinated updates and other related JBER plans (*e.g.*, 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, and the U.S. Army Alaska Integrated Training Area Management Plan). This INRMP was prepared with cognition of these plans and coordination with appropriate JBER offices is imperative to the success of this INRMP.

The physical scope of the plan is generally JBER lands. However, the following remote training and support sites will be managed under the same strategies outlined in this INRMP; Eklutna Mountain Training Site, Gulkana Army Training Site, HAARP Research Station, Kenai Airport Annex, and ACMI sites 1 - 8. The Seward Recreation Camp is anticipated to be transferred and therefore will not be discussed in this INRMP. Figure 2.1.1 shows the location of these sites.

### 2.1.2 Function

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.

## 2.2 Authority

### 2.2.1 Sikes Act

The Sikes Act is the cornerstone legislative mandate that provides for natural resources management on Department of Defense (DoD) lands. The Sikes Act (16 USC 670 *et seq*.) 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, both on and off DoD installations.

The Sikes Act (16 U.S.C. 670(a)(d)(2)) also encourages the Secretary of Defense, to the greatest extent practicable, to enter into agreements to use services personnel, equipment and facilities, with or without reimbursement, of the Secretary of the Interior or states in carrying out the provisions of this section.

The Sikes Act requires that, consistent with the use of military installations to ensure the preparedness of the Armed Forces, each INRMP shall, where appropriate and applicable, provide for:

- fish and wildlife management, land management, forest management, and fish and wildlife-oriented recreation;
- fish and wildlife habitat enhancement or modifications;
- wetland protection, enhancement, and restoration where necessary for support of fish or wildlife;
- integration of, and consistency among, the various activities conducted under the INRMP;
- establishment of specific natural resources management objectives and time frames for proposed action;
- sustained use by the public of natural resources to the extent such use is not inconsistent with the needs of fish and wildlife resources management;
- public access to the military installation that is necessary or appropriate for sustained use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources, subject to requirements necessary to ensure safety and military security;
- enforcement of all federal natural resource laws and regulations, when violations occur on the installation;
- no net loss in the capability of military installation lands to support the military mission of the installation; and
- such other activities as the Secretary of the military department considers appropriate.

The Sikes Act also requires or provides for:

- regular review of this INRMP and its effects, not less often than every five years;
- provisions for spending hunting and fishing permit fees exclusively for the protection, conservation, and management of fish and wildlife, including habitat improvement and related activities in accordance with the INRMP;
- exemption from procurement of services under Office of Management and Budget Circular A-76 and any of its successor circulars; and
- priority for contracts involving implementation of this INRMP to state and federal agencies having responsibility for conservation of fish or wildlife.

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

- required annual review of program effectiveness;
- migratory bird management to include opportunities for collecting hunting fees;
- public access for outdoor recreation on military installations to include opportunities for disabled veterans, dependents, and others;
- enforcement of federal laws for violations occurring on DoD lands;
- requirement for sufficient numbers of professionally trained civilian resource managers and enforcement personnel who are inherently governmental; and
- authority to enter into multi-year cooperative agreements with nonfederal agencies, organizations, or individuals for the purpose of management of natural resources.

### 2.2.2 Department of Defense

**Department of Defense Instruction (DoDI) 4715.03**, *Natural Resources Conservation Program (February 14, 2011) 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 *Natural Resources Conservation Program (February 14, 2011)* 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 as necessary, based on results of these reviews.

In 2013, the DoD, USFWS, and the International Association of Fish and Wildlife Agencies (AFWA) signed a Memorandum of Understanding (MOU) for a Cooperative Integrated Natural Resource Management Program on Military Installations. The DoD, among other items, agreed to:

- Communicate the establishment of this MOU to all DoD Components.
- Take the lead in developing policies and guidance related to INRMP development. Ensure the involvement of USFWS and state fish and wildlife agencies, as appropriate, in updates, revisions and implementation of the INRMP.
- Ensure distribution of the DoD and USFWS Sikes Act Guidance to all appropriate DoD Components.
- Encourage DoD Components to invite appropriate USFWS and state fish and wildlife agency offices to participate in annual INRMP reviews. All such invitations should be extended at least 15 business days in advance of the scheduled review to facilitate meaningful participation by all three Parties. Meeting may be in person or by other mutually agreed means.

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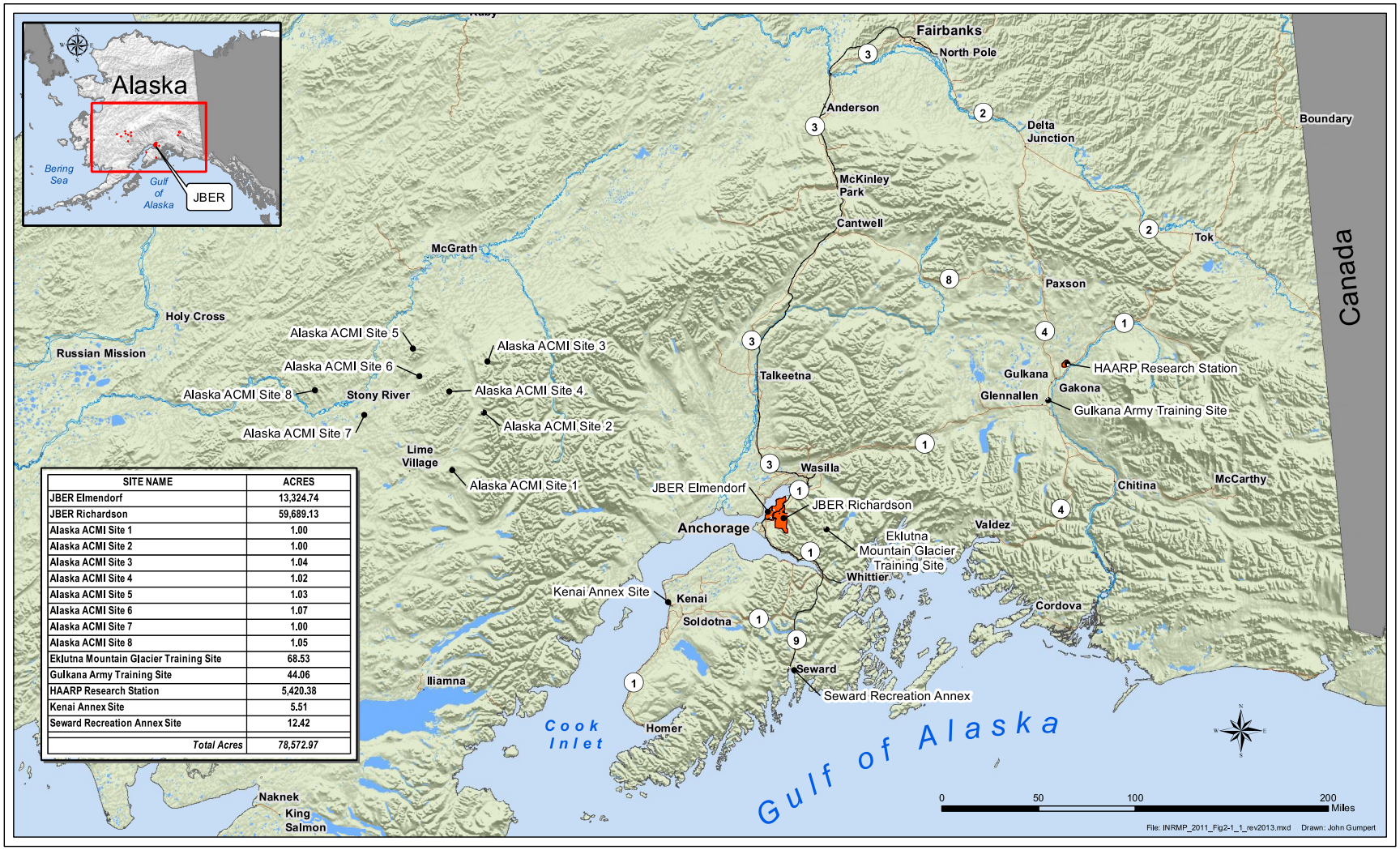
**Figure 2.1.1 Joint Base Elmendorf-Richardson Sites** **1:3,000,000**




| SITE NAME | ACRES |
|---|---|
| JBER Elmendorf | 13,324.74 |
| JBER Richardson | 59,689.13 |
| Alaska ACMI Site 1 | 1.00 |
| Alaska ACMI Site 2 | 1.00 |
| Alaska ACMI Site 3 | 1.04 |
| Alaska ACMI Site 4 | 1.02 |
| Alaska ACMI Site 5 | 1.03 |
| Alaska ACMI Site 6 | 1.07 |
| Alaska ACMI Site 7 | 1.00 |
| Alaska ACMI Site 8 | 1.05 |
| Eklutna Mountain Glacier Training Site | 68.53 |
| Gulkana Army Training Site | 44.06 |
| HAARP Research Station | 5,420.38 |
| Kenai Annex Site | 5.51 |
| Seward Recreation Annex Site | 12.42 |
| *Total Acres* | *78,572.97* |

**Figure 2.1.1 JBER Sites**

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- Encourage DoD Components to take full advantage of USFWS and state fish and wildlife agency natural resources expertise through the use of Economy Act transfers and cooperative agreements. Encourage DoD Components and USFWS to explore the use of the Fish and Wildlife Coordination Act for technical assistance, fish stocking, and other conservation projects. Priority should be given to projects that:
    i. Sustain the military mission.
    ii. Effectively apply ecosystem management principles.
    iii. Consider the strategic planning priorities of the USFWS and state fish and wildlife agencies.
    *iv.* Encourage DoD Components to give priority to INRMP requirements that:
        *i.* Sustain military mission activities while ensuring conservation of natural resources.
        *ii.* Provide adequate staffing with the appropriate expertise for updating, revising, and implementing each INRMP within the scope of DoD Component responsibilities, mission, and funding constraints.
- Encourage DoD Components to discuss with the USFWS and state fish and wildlife agencies all issues of mutual interest related to the protection, conservation, and management of fish and wildlife resources on DoD installations.
- Subject to mission, safety, security, and ecosystem requirements, provide public access to military installations to facilitate the sustainable multipurpose use of its natural resources.
- Identify natural resource research needs, and develop research proposals with input from Parties.
- Identify opportunities to work with the DoD Components to facilitate:
    *i.* Cooperative regional and local natural resource conservation partnerships and initiatives with USFWS and state fish and wildlife agency offices.
    *ii.* Natural resources conservation technology transfer and training initiatives between the DoD Components, federal land management agencies, and state and wildlife agencies.

The JBER INRMP was developed, and will be implemented, in a manner consistent with this Memorandum of Understanding.

### 2.2.3 Air Force

**Air Force Instruction (AFI) 32-7064**, *Integrated Natural Resources Management* (November 18, 2014) 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 Natural Resources* (February 15, 2013). 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 resources, as well as 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 B, *Laws and Regulatory Instruments that May Affect JBER Natural Resources Management* lists other laws and regulatory instruments that may have bearing on natural resources management on JBER. Policies are also discussed in appropriate sections of Chapter 7.

### 2.2.4 Other Related Authorities

Appendix B 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.

## 2.3 Responsibilities

This INRMP has been developed by the Natural Resource personnel, in coordination with USFWS and the Alaska Department of Fish and Game (ADFG). The INRMP has been reviewed by Pacific Air Force Command, which is also responsible for its implementation. This INRMP is approved and signed by the Commander, 673 ABW. Natural Resources personnel recommend the delegation of approval for future annual updates to the INRMP and workplans to the 673d Civil Engineer Group Commander.

The 673 Civil Engineering Squadron Natural Resources office has primary responsibility for implementation and is also responsible for ensuring all elements of the Squadron comply with the INRMP. It is the responsibility of all Wing elements, and military users, to coordinate their proposed activities with this INRMP to ensure they comply with it.

## 2.4 Management Philosophy

### 2.4.1 Department of Defense Policy

*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 to sustain the long-term ecological integrity of the resources base 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 (March 18, 2011)* identifies DoD policy to include, *DoD shall follow an ecosystem-based management approach to natural resources-related practices and decisions, using scientifically sound conservation procedures, techniques, and data.*

#### 2.4.1.1 Ecosystem Management

Ecosystem management is complex, with all of the variability and uncertainty found in ecosystems themselves. 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 (March 18, 2011)* 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.
- Evaluate and engage in the information 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.

#### 2.4.1.2 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. DoDI 4715.03 includes biodiversity directives to be followed whenever practicable.

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.

**Biodiversity Management Strategy at Joint Base Elmendorf-Richardson**
Important biodiversity issues at JBER include identification and protection of critical habitat, travel corridors and linkages, minimizing fragmentation, and ensuring viable populations of native species and communities, and illustrating these important ecological features on a GeoBase layer as a planning tool.

It is difficult to quantify the status of biodiversity on JBER, but it is believed that JBER has a reasonable level of biodiversity. Habitat type, distribution, abundance, and species richness are examples of parameters that could be utilized to determine biodiversity. In terms of aquatic systems, the combination of non-self-sustaining fish populations in kettle lakes and the exclusion of salmon from upper Ship Creek could represent a decrease in aquatic biodiversity. In terrestrial systems, the high percentage of old growth forest and declining stands is one possible indicator of declining biodiversity. Other possible indicators of declining biodiversity are the increasing development and resulting loss or degradation of habitat caused by fragmentation. Further study should be conducted in these areas.

With the present trend of collecting and storing data and utilizing the tools to analyze that data, including a geographic information system (GIS), a better understanding of biodiversity can be attained in the future.

#### 2.4.1.3 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.

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

### 2.4.2 Air Force Policy

AFI 32-7064 *Integrated Natural Resource Management* (November 18, 2014) states that when preparing or revising an INRMP, ecosystem management principles and guidelines of DoDI 4715.03, *Natural Resources Conservation Program* (March 18, 2011) 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 Natural Resources* (February 15, 2013) 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 further states that lands and natural resources will be managed with the following priorities in mind:

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

### 2.4.3 JBER Natural Resources Mission, Goals, and Objectives

**Natural Resources 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.*

**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 listed species or their habitats and state listed protected species when practicable.

Objective 1.2: Advise the Bird Airstrike Strike Hazard (BASH) program executed by 3WG and evaluate management activities required by 3 WGI 91-212 and make recommendations for modifications annually to both JBER airfields. At that time which Bryant AAF has its own BASH program in accordance with 3WG Safety-MOU-001 also advise the airfield management at that location.

Objective 1.3: Provide environmental education and outreach to minimize dangerous conflict with wildlife and conduct an evaluation of program effectiveness.

Objective 1.4: Utilizing the principles of adaptive management, work with Integrated Training Area Management (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 complimentary by 2014.

**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 viable populations, native species, and ecological communities.**

Objective 2.1: Inventory JBER's natural resources, including soils, 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.

Objective 2.2: Establish statistically valid monitoring programs and protocols for ecosystem integrity and function by 2016.

Objective 2.3: Maintain or improve native vegetation patterns, successional stages, and biodiversity for ecosystem integrity and function.

Objective 2.4: Prevent the introduction and spread of invasive species, provide for their control, and minimize the mission, ecological, and economic impacts.

Objective 2.5: Contribute to the health, quantity and quality of the primary constituent elements for Cook Inlet beluga whale by increasing the JBER salmon smolt production by 2016.

Objective 2.6: Identify and map essential/critical habitats of species at risk and species of special concern most probable to become candidate species.

Objective 2.7: Identify risks to biodiversity and ecosystem health from habitat fragmentation and reduced connectivity by 2016.

Objective 2.8: Contribute to scientific knowledge by publishing results from studies, when appropriate, at scientific conferences or in peer reviewed journals.

Objective 2.9: Seek and establish functional partnerships with land management agencies, non-governmental organizations or universities to fulfill JBER natural resource objectives.

**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.**

Objective 3.1: Evaluate JBER forest, wildlife and fisheries resources and develop recommendations for sustained yield by 2015. Specifically, JBER will evaluate the feasibility and impact of initiating a black bear hunt on JBER-Richardson lands in conjunction with ADFG.

Objective 3.2: Develop and implement a Wildland Fire Management Plan, coordinate with other entities responsible for fire prevention and natural resource management, and identify the appropriate sources of funding for wildland fire activities.

Objective 3.3: Monitor and evaluate outdoor recreation activities and develop recommendations for providing quality outdoor recreation opportunities.

Objective 3.4: Provide effective enforcement of all federal, state, and local natural resource laws and regulations.

This INRMP outlines many of the values that have been expressed by the Air Force, 673 ABW, reviewing agencies and the public concerning natural resources management at JBER. Specific goal- and objective-related tasks/projects identified in Chapter 7 and summarized in Chapter 8 of this INRMP reflect the values that have been chosen at this time as highest priorities. These values may change over time, in which case, this plan will also change to represent the new values.

### 2.4.4 Social and Cultural Values

The values of those using and managing JBER cannot be ignored. Human values are an integral part of ecosystem management. These values will establish priorities and activities that occur on JBER. Because of the variety of human values, ecosystem managers will be required to make difficult choices. According to the *Natural Resources Handbook for Managing Military Lands* (Leslie *et al*. 1996):

> *"In an ideal world, managers would be able to conserve all populations and species, protect or restore all habitats, re-connect all landscapes, and still serve all human needs and desires. Choices have to be made as to the most effective and efficient use of limited resources, including staff time, funding, and available expertise. Because of these limitations, not every probl em can be addressed immediately and thoroughly; some are elevated to immediate concern while others must be relegated to lower status. How these choices are made is critical to the futures of species, biological communities, and ecosystems, as well as to the condition of military lands and the sustainability of training and operations. Fortunately, there are principles, guidelines, and precedents that help us make intelligent and thoughtful choices."*

Quality of life of DoD personnel is an important component of DoD's national defense mission. DoD Services implement a variety of land management practices on their installations that support military readiness and quality of life programs. For DoD, multiple-use is *an approach to land management* rather than an element of its mission. A variety of land management tools, such as hunting, fishing, nature trail maintenance, watchable wildlife programs, and the maintenance of groomed open spaces, may be within the INRMP in support of both quality of life programs and military training and testing requirements. By using a mix of these land management tools, DoD undertakes a multiple-use approach to land management while still meeting the single mission use of the land (military readiness for national defense).

An important aspect of this type of multiple-use approach to land management, however, is that it is employed only to the extent that it does not conflict with military training and testing components of the overall national defense/readiness mission. For instance, JBER manages lands with many of the same

protections as Wilderness land or Wild and Scenic Rivers. However, Wilderness designation or Wild and Scenic Rivers designation would be incompatible with the intent of the military land withdrawals and the military training mission.

### 2.4.5 Support of Installation Goals

**673d Air Base Wing**

**Vision:** *Arctic Tough, Family Strong!*

**Motto:** *Cavete Ursum Arcticum -- Beware the Arctic Bear!*

**Mission:** *Provide and Support Mission-Ready Arctic Warriors; Enable Our JBER Mission Partners; and, Serve Our Families and Joint Base Community.*

**Priorities:**

- Enable Mission Partners
- Sustain America's Arctic Power Projection Platform
- Provide Mission Ready Warriors
- Serve Our Families and Joint Base Community

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.

## 2.5 Conditions for Implementation and Revision

### 2.5.1 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, as a minimum:

- 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);
- Native Village of Eklutna; and,
- Chugach State Park

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.

### 2.5.2 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 C 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 C also includes comments received from these parties during the INRMP development process.

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# 3.0 Installation Overview

## 3.1 Location, Acreage, and Population

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 south-central Alaska (latitude/longitude: 61 degrees 15 minutes N/149 degrees 42 minutes W). The 73,013-acre (GeoBase 2013) 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 3.1). 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.

JBER has 11,000 active duty military personnel. This includes 5,600 Air Force, 5,500 Army, 8 Marine Corps, and 10 Navy. JBER also has 1,480 Army National Guard, 1,400 Air National Guard, 400 Air Reserve, and 100 Coast Guard. In addition, JBER has 3,600 civilian personnel and is home to an estimated 17,000 military dependents (JBER Economic Impact Analysis FY 14; Public Affairs Handout 2015).

## 3.2 Installation History

The area that is now JBER was inhabited by the Dena'ina group of Athabaskans at the time of Caucasian contact. Dena'ina tribes of Knik, Eklutna, and 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.

In 1939, an Executive Order (EO) was issued that withdrew 36,570 acres of land in south-central Alaska from the public domain placing it under War Department jurisdiction for the creation of Fort Richardson and Elmendorf Field. Several 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.

FRA'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, FRA was charged with defending Alaska from invasion and coordinating the Alaskan war effort. As the war progressed, FRA'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 many 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. EAFB was established and during the 1950s was 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 became a historical site listed on the National Register of Historic Places in 1996.

In 1974 U.S. Army Alaska was inactivated, and FRA 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. The 6th Infantry Division (Light) was inactivated July 1994, 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 23$^{rd}$ Air Base Group arrived shortly after to provide base support. The 11$^{th}$ Air Force was formed at Elmendorf in 1942. The 11$^{th}$ was redesignated 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 43$^{rd}$ Tactical Fighter Squadron arrived in 1970, providing a new flexible role for Elmendorf based units as the Vietnam War was winding down. The 18$^{th}$ 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, FRA boundaries remained fairly stable. Leases from BLM expanded the boundary to the east and in the south. Between 1980 and 2010, FRA acreage was re-allocated to the Municipality of Anchorage for a municipal landfill and to EAFB for privatized housing.

Figure 3.1 Location of Joint Base Elmendorf-Richardson, Alaska 1:120,000

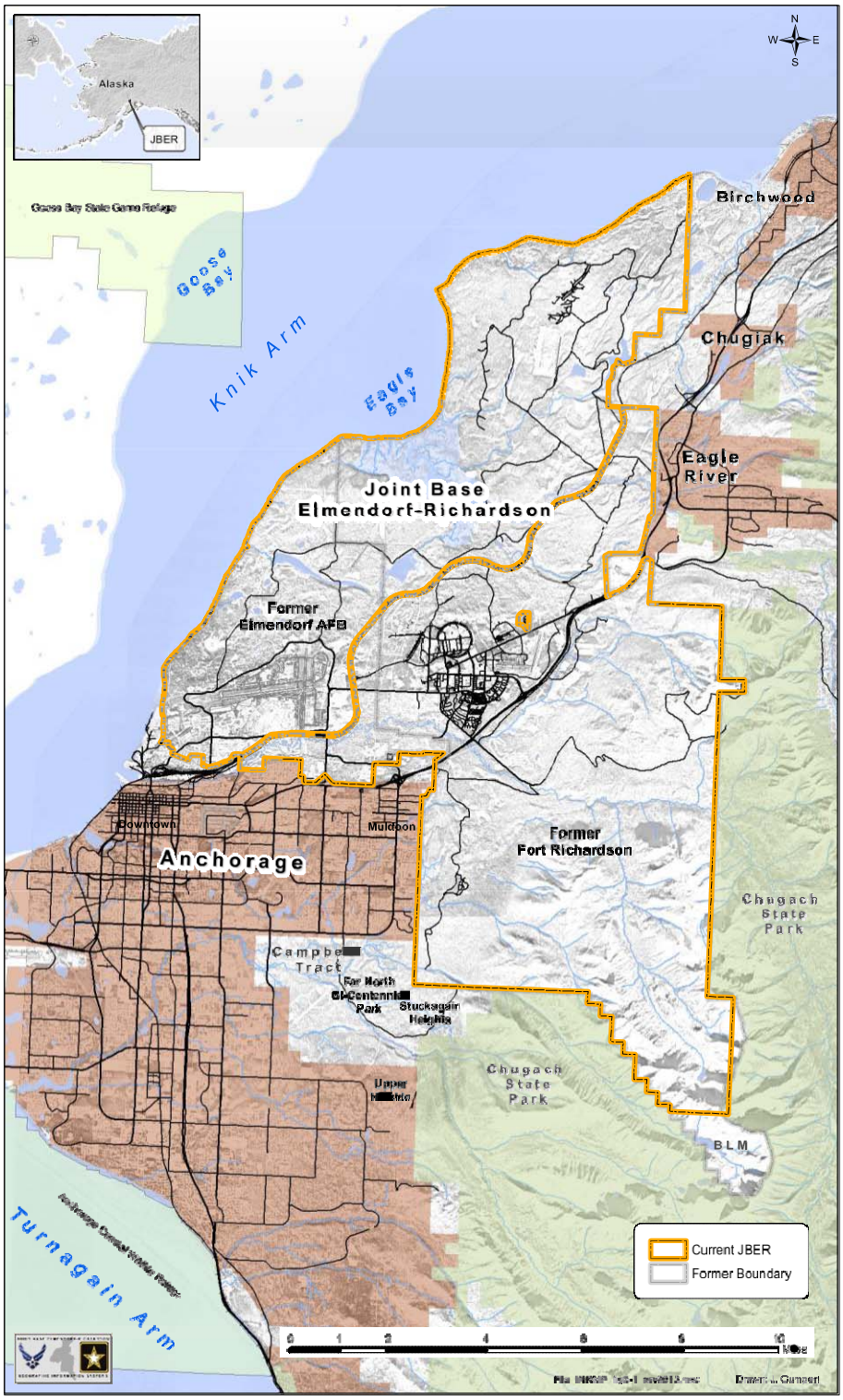


Figure 3.1 Location of Joint Base Elmendorf-Richardson, Alaska 1:120,000

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In 2005, the Base Realignment and Closure Commission called for the realignment of EAFB and FRA 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 HQ 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 3.2a shows the jurisdictional history of current JBER land, and Figure 3.2b shows the ownership status of JBER land, which is important from a natural resources management viewpoint.

The United States holds fee simple title to all federally owned lands. Figures 3.2a and 3.2b 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 3.2a and 3.2b are government owned property; PDOM, PLO, and EO labeled lands are within the public domain and have withdrawal restrictions associated with their use.

## 3.3 Military Mission

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.

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 9,000 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 and Public Affairs.

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… *strategically deploy, conduct forcible entry parachute assault and secure key objectives for follow-on military operations in support of U.S. national interests*.

## 3.4 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, 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, and Birchwood are to the northeast. Further north, Palmer and Wasilla, the primary communities of the Matanuska-Susitna Borough, serve as "bedroom communities" for many workers of Anchorage businesses and agencies. The 2010 estimated population of the Matanuska-Susitna Borough was 88,995. Figure 3.1 shows JBER surrounding communities.

## 3.5 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 Anchorage recently expanded, which 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 6.3.2, *Non-Military-Related* has more detail on this significant issue.

## 3.6 Local and Regional Natural Areas

Within a five-mile radius of JBER are five significant natural areas managed by state and municipal offices. The largest and most significant natural area is Chugach State Park, JBER's largest neighbor (Figure 3.1). 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, depending on species, also visit JBER.

The state game refuges of Anchorage Coastal, Susitna Flats, Goose Bay (Figure 3.1), 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, serve a significant source of BASH risks to JBER aircraft.

Bicentennial Park (Figure 3.1) 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.

Figure 3.2a Jurisdictional History of Joint Base Elmendorf-Richardson Land 1:100,000

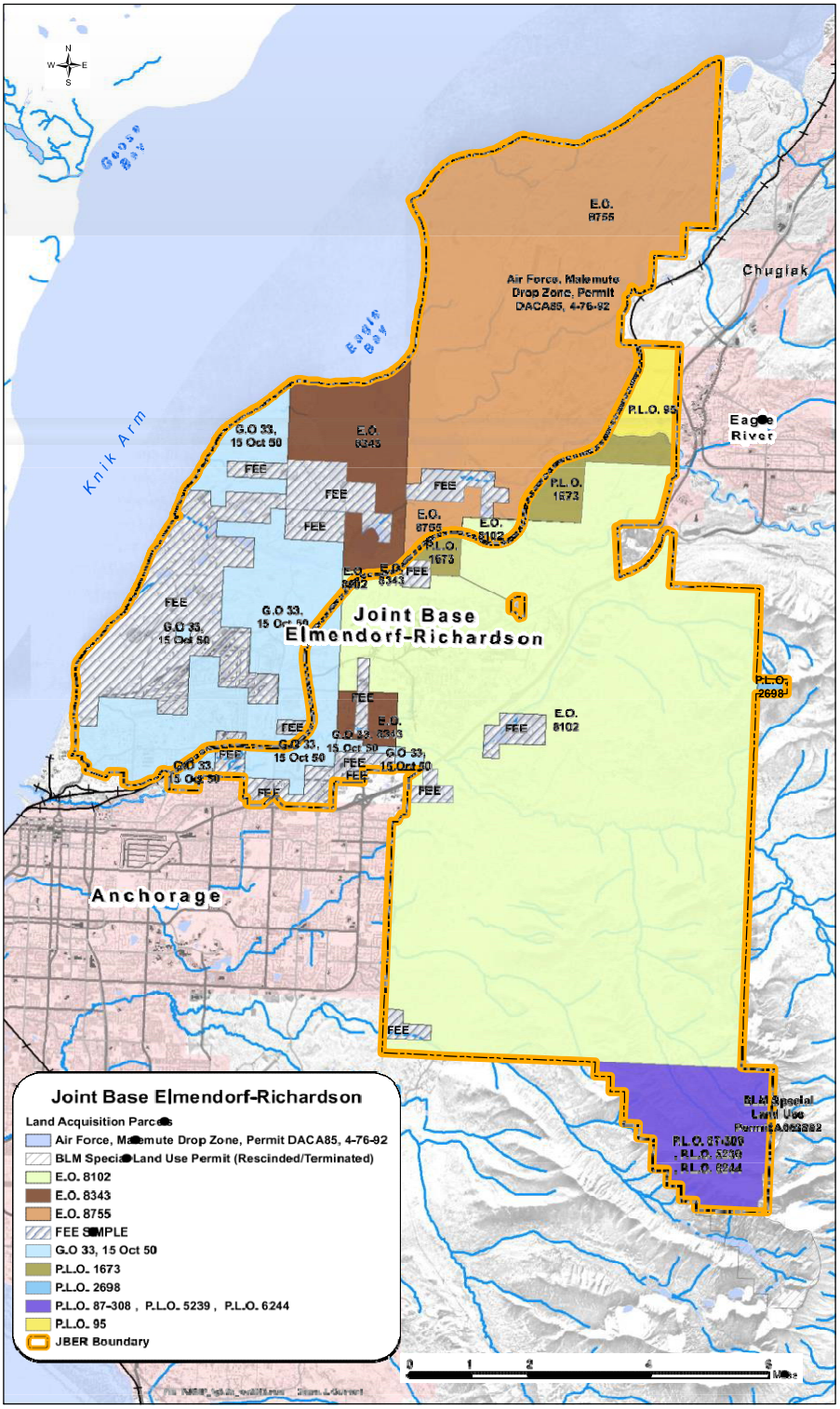


Figure 3.2a Jurisdictional History of Joint Base Elmendorf-Richardson Land 1:100,000

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Figure 3.2b Ownership (Land Acquisition by Type) on Joint Base Elmendorf-Richardson 1:95,000

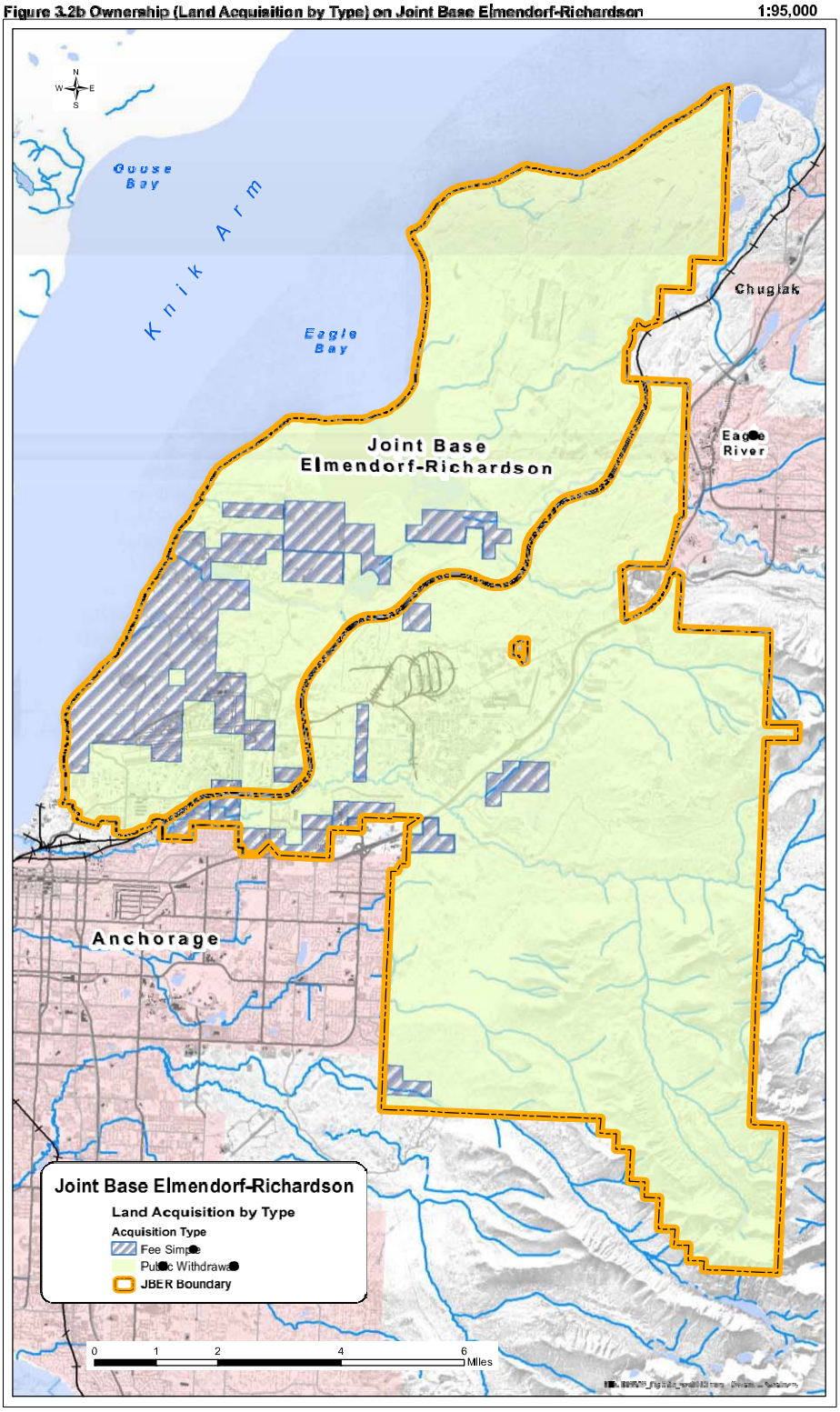


Figure 3.2b Ownership (Land Acquisition by Type) on Joint Base Elmendorf-Richardson 1:95,000

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## 3.7 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 south-central Alaska to the Alaska interior and Canada. JBER is accessed from the Glenn Highway using Richardson Drive, Muldoon Road, and Boniface Parkway highway exits. Richardson Drive passes through the heart of 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. 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 Anchorage.

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, located 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 located on the airdrome. MWR maintains a recreational aircraft gravel airstrip on the southern shore of Sixmile Lake and a winter ski strip and summer floatplane strip on the lake.

Ted Stevens Anchorage International Airport, 10 miles southwest of JBER, is the nearest commercial airport. It is the largest airport in Alaska for both passenger and air cargo operations. More than 30 carriers provide passenger service in the recently renovated airport. It is the largest air cargo handler and transfer site in the United States.

## 3.8 Domestic Water Source

JBER's water is supplied primarily by Ship Creek, which traverses JBER from east to west. 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. A water treatment plant is located near the dam and is used for 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 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).

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# 4.0 Physical Environment

## 4.1 Climate

### 4.1.1 General

JBER is located within the Cook Inlet-Susitna Lowlands, a physiographic province within the Pacific Mountain System. Elevations range from sea level to over 5,000 feet. 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 oceans. 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. A summary of monthly temperature and precipitation averages from the installation cantonment are presented in Table 4.1.1.

**Table 4.1.1. Summary of Joint Base Elmendorf-Richardson Climate Data**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Avg. High** | 22°F | 26°F | 34°F | 44°F | 56°F | 63°F | 65°F | 64°F | 55°F | 40°F | 27°F | 24°F |
| **Avg. Low** | 8°F | 11°F | 17°F | 29°F | 39°F | 48°F | 53°F | 50°F | 42°F | 28°F | 15°F | 12°F |
| **Mean** | 15°F | 19°F | 26°F | 37°F | 48°F | 56°F | 59°F | 57°F | 49°F | 34°F | 21°F | 18°F |
| **Avg. Precip.** | 0.70 in | 0.68 in | 0.62 in | 0.41 in | 0.71 in | 1.04 in | 1.90 in | 2.89 in | 2.56 in | 1.98 in | 1.03 in | 1.23 in |

Source: www.weather.com for Elmendorf AFB

### 4.1.2 Temperature

Seasonal variations in temperature at JBER are a function of latitude, geomorphology, and oceanic influences. JBER has subfreezing temperatures that usually last from mid-October to mid-April. Spring is marked by the 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. Autumn on JBER is brief, lasting from about mid-September to late-October. Autumn ends with the first persistent snowfall.

Average monthly high temperatures range from 22 to 65 degrees Fahrenheit (° F), with the highest monthly average occurring in July. The highest temperature recorded was 86° F in 1993. JBER low average monthly temperatures range from 8 to 53° F, with the lowest monthly average occurring in January. The lowest temperature recorded was -39° F in 1975. High-pressure weather systems during winter may lead to successive days with temperatures below -35° F. When 28° F is used to define a “killing frost,” the average last occurrence is 2 May and the average first occurrence is 30 September, providing a growing season of 124 days. Remarkably, not a single day in 2014 dipped into negative Fahrenheit temperatures, though meteorologists did record a reading of zero degrees, the year’s lowest on February 11, according to National Weather Service meteorologist Mike Ottenweller. This makes 2014 the first calendar year, since the National Weather Service stated keeping data on the subject in 1952, that did not include a single day with a recorded low temperature below zero in Anchorage.

### 4.1.3 Precipitation Patterns

Average annual precipitation for the JBER area is 15.29 inches. Most of this precipitation (10.1 inches or 66% of the annual total) falls from June through October as rain. Snow with minor amounts of rain is prevalent from October through April. Average snowfall is 72 inches or 6.0 inches of water, and accounts for 31% of total precipitation. Rainfall during the winter averages 0.4 inches or 3% of the total.

### 4.1.4 Wind

High altitude airflow in the JBER area is generally toward the northeast and northwest. Surface flow is more variable. During summer, surface winds blow from the west onto the installation from Cook Inlet. In winter these winds are more likely to blow south along Knik Arm. Surface wind velocities average about four knots, although wind velocities of 70 knots have been recorded in the Anchorage area. Channeling of the winds near Ship Creek is common with gusts reaching 53 knots. Prevailing winds come from the west in summer and from the north and northeast in winter. Average wind velocity is six miles per hour. 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).

## 4.2 Landforms and Topography

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 (CH2M Hill 1994). JBER topography is illustrated in Figure 4.5.1.

### 4.2.1 Cook Inlet-Susitna Lowlands

JBER includes lowlands that are part of the Cook Inlet-Susitna Lowlands, a physiographic province within the Pacific Mountain System. The Pacific Mountain System runs in an arc from southeastern to south-central Alaska and includes the Alaska Peninsula and Aleutian Islands to the west. 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.

Regional landforms in the Cook Inlet-Susitna Lowlands 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.

#### 4.2.1.1 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. 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.

#### 4.2.1.2 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. 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 are typically interconnected to waters via groundwater or other physical, biological, or chemical connections.

#### 4.2.1.3 Outwash Plain

This landform, found south of the Elmendorf Moraine, is a broad, gently sloping surface composed of sand and gravel. It covers approximately the southern third of 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-E cantonment area and flight line were built almost entirely on the outwash plain. The high quality sand and gravel soils also promote high quality, productive moose browse plant species.

### 4.2.2 Chugach Mountains

The western face of the Chugach Mountains is the visibly dominant geological feature of JBER, rising from the Anchorage Plain to 5,200 feet. On JBER the Chugach Mountains are composed of both metamorphic and sedimentary rock formations, more prevalent along the Border Range Fault.

## 4.3 Geology

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-R 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).

### 4.3.1 Regional Tectonics

The Anchorage area is also bordered by two fault systems: the Bruin Bay-Castle Mountain fault system to the west and the Border Ranges fault system running parallel to the base of the Chugach Mountains. Another fault, located in the Chugach Mountains, skirts the Arctic Valley ski area. JBER is in a tectonically active region that has experienced numerous earthquakes. The Alaska Earthquake Information Center locates and reports about 22,000 earthquakes annually in Alaska. Alaska has had 10 of 15 of the largest earthquakes recorded in the United States. The largest earthquake recorded in Alaska was a magnitude 9.2 that occurred in 1964 in Prince William Sound (Alaska Earthquake Information Center website 2011).

### 4.3.2 Mineral Resources

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.

## 4.4 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 2001 (Natural Resources Conservation Service 2001). Although soil surveys have been performed for JBER lands, inconsistencies exist between soils delineated on JBER-E and JBER-R, and no unified, series-level, installation-wide soil survey exists for JBER.

In general, soils of 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 inter-bedded 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 inter-beds 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 4.4 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 and therefore accompanies all Alaskan suborder names. 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 dominantly 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 4.4 Soils on Joint Base Elmendorf-Richardson 1:95,000

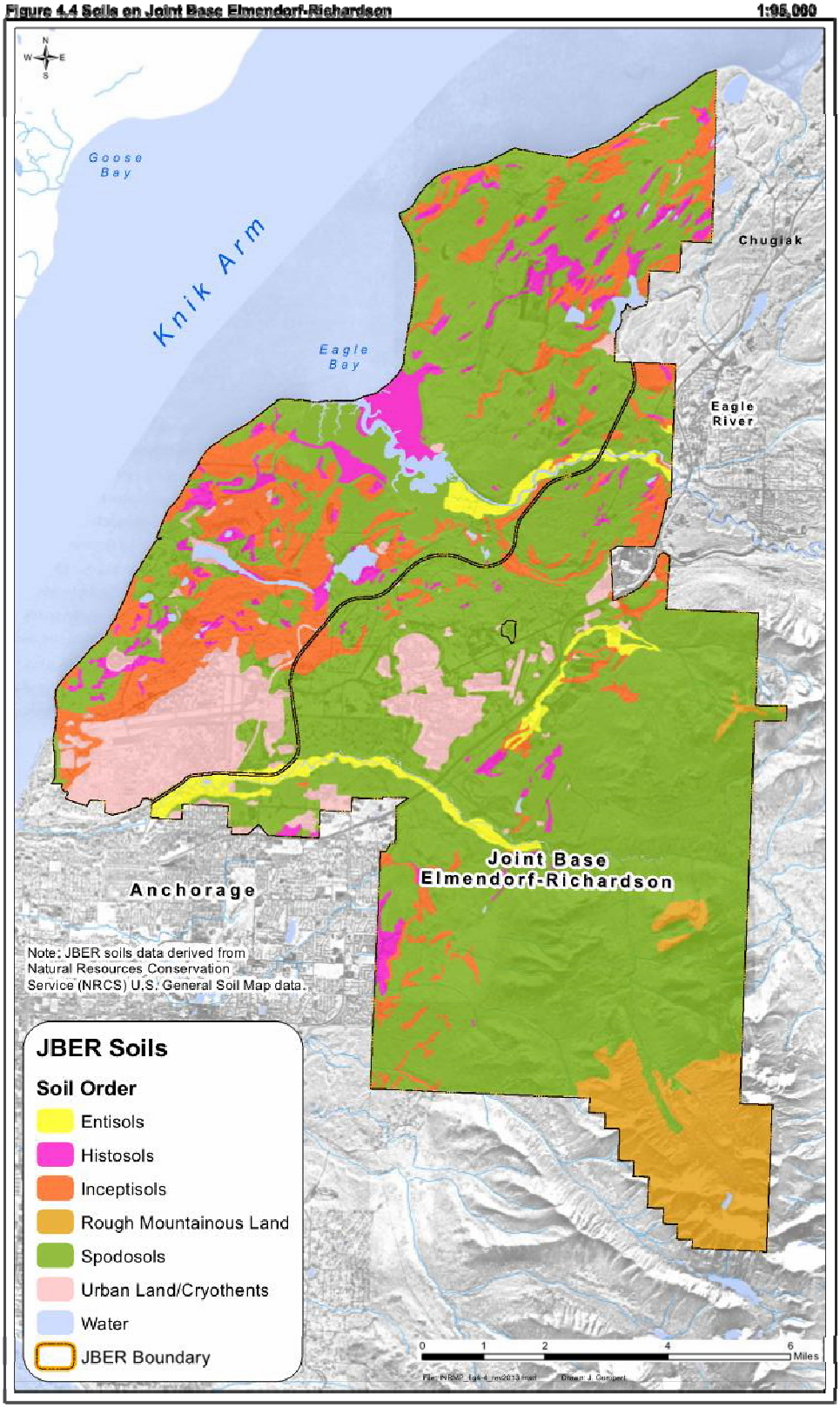


Figure 4.4 Soils on Joint Base Elmendorf-Richardson 1:95,000

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## 4.5 Hydrology

### 4.5.1 Watersheds and Surface Waters

Major watersheds or drainage systems on JBER are Ship Creek, Eagle River, Chester Creek, Fire Creek, Cherry Hill Ditch, Kettle Lakes, Campbell Creek, Sixmile Creek, EOD Creek, and Moonshine Creek (Figure 4.5.1). Within the Ship Creek Watershed the important secondary watersheds include McVeigh (Gunnery) Creek and Snowhawk Creek. Clunie Creek and Otter Creek are important secondary watersheds within the Eagle River Watershed.

Most JBER streams flow from headwaters in the Chugach Mountains to Cook Inlet (saltwater) and traverse the post in a westerly direction. Eagle River is fed by a glacier. Flow volume of streams fluctuates dramatically from season to season. During the long period of freeze, usually from October to April, flow is limited to ground water seepage from aquifers into streams. Snowmelt typically begins in April and reaches its peak in June; stream flow from snowmelt is greatest during the months of June and July. After July, most of the snow has melted, but the stream flow during the months of August and September remains steady because it is augmented by rainfall (Gossweiler 1984).

Major rainfall flood events in Upper Cook Inlet have caused flooding of Ship Creek and Eagle River, occur during August-October rainy periods (Papineau and Holloway 2011).

#### 4.5.1.1 Ship Creek Watershed

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 31,215 acres, the largest watershed on JBER. As Ship Creek enters JBER, it initially flows through a three-mile canyon of white water beginning at an elevation of 1,100 feet above sea level. Emerging from the canyon at an elevation of approximately 500 feet, it continues across the forested coastal plain to the western boundary of JBER at 50 feet elevation. As it exits JBER, the channel is approximately 20 feet wide, 2 feet deep, with an average 3 percent fall over a rocky/gravelly bottom.

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 Eagleglen 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 during September rains, while another major flooding event in September 2012 was reportedly a 500-year flood event. This flood caused extreme erosion to occur along Ship Creek, particularly near bridge abutments. The abutment for Moose Run Golf Course washed away, resulting in the bridge collapsing into the river.

The upper dam on Ship Creek forms a 2.8 acre reservoir, which provides all 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 high dam, constructed in 1952, continues to severely affect the creek's hydrology and stream dynamics.

The portion of Ship Creek on JBER that is 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. Near the power plant is a low dam and intake pond that supplied water for power plant operation. The JBER-R hatchery has several water wells that were drilled in the shallow aquifer near Ship Creek. The wells are used to supply fresh water for the raceways. There is a bridge carrying a steam line crosses Ship Creek about a half mile downstream from the JBER-R hatchery. The portion of Ship Creek between the JBER-R hatchery to the Eagleglen Golf Course is, for the most part, in a natural condition and has not been disturbed. Through this golf course, 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).

Within the Ship Creek Watershed are the McVeigh (Gunnery) Creek secondary watershed (6,545 acres with a 7.5-mile stream length) and Snowhawk Creek secondary watershed (6,700 acres with a 7.0-mile length). McVeigh Creek supports the small arms range complex while Snowhawk Creek supports high elevation troop maneuvers.

Figure 4.5.1 Watersheds, Surface Waters, and Topography on Joint Base Elmendorf-Richardson 1:95,000

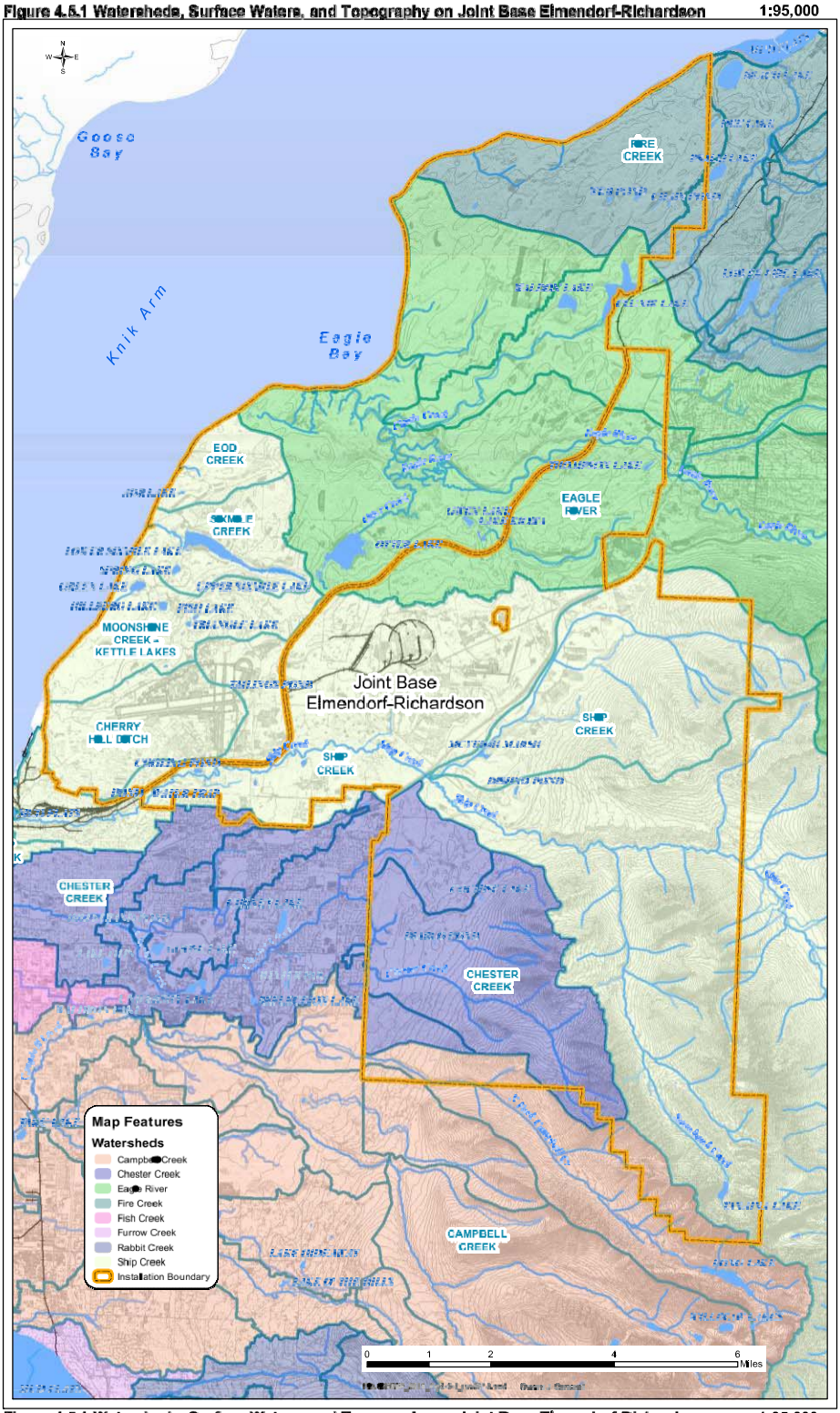


Figure 4.5.1 Watersheds, Surface Waters, and Topography on Joint Base Elmendorf-Richardson 1:95,000

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#### 4.5.1.2 Eagle River Watershed

Eagle River is a fifth-order stream that flows northwest 8.2 miles through JBER. The overall watershed of Eagle River within JBER is 18,869 acres. Eagle Glacier comprises 13 percent of the watershed, and snow and ice melting from the glacier is a major source of flow during the summer months (Gossweiler 1984). 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 (CH2M Hill 1994). 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 (Gossweiler 1984). 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. The Clunie Creek secondary watershed (5,509 total acres, 3,440 of which are within JBER) and Otter Creek secondary watershed (approximately 1,400 acres) are within the Eagle River watershed. Clunie Creek is an intermittent stream that drains Clunie Lake and other small ponds among the moraines northeast of Eagle River Flats.

Otter Lake, an important recreational lake south of Eagle River Impact Area, is a tributary drainage of Eagle River. Otter Lake (Figure 4.5.1) is primarily fed by springs from the same aquifer as Upper Sixmile Lake. The spring-fed stream feeding Otter Lake enters the historic channel of Eagle River and flows north into the lake. It is a natural lake that was historically enhanced to increase its size. The creek departs the lake through a water level control structure and continues to the north and drops into the Eagle River Flats connecting with Eagle River. This lower portion of Otter Creek has been dammed by beaver (*Castor canadensis*) for several decades, inhibiting anadromous fish from entering the lake.

#### 4.5.1.3 Chester Creek Watershed

Chester Creek, a third-order stream, south of the Glenn Highway on JBER, is JBER's third largest watershed (19,414 total acres, 8,421 acres of which are within JBER) and fourth longest with almost 7.0 miles of stream. Chester Creek originates on the western face of the Chugach Mountains, flows west, and leaves JBER entering the Muldoon neighborhood. The Davis Range and most of Bulldog Trail are within the Chester Creek watershed. Although it is a shallow creek, it usually has a constant flow of water (Gossweiler 1984).

#### 4.5.1.4 Fire Creek Watershed

Fire Creek, a third-order stream, is the fourth largest watershed on the installation (17,398 total acres, of which 5,060 acres are within JBER) on the extreme northern end of JBER. While none of Fire Creek streambed is within the JBER boundary, this watershed covers important training areas. The Fire Creek watershed includes minor drainages that flow directly off the bluff into Knik Arm between Fire Creek and Eagle River.

#### 4.5.1.5 Cherry Hill Ditch Watershed

Cherry Hill Ditch 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.

#### 4.5.1.6 North Fork Campbell Creek Watershed

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. Upper reaches of the drainage, including Long Lake, create a total watershed of 9,971 acres, of which 1,564 acres are within JBER. Campbell Creek is an important anadromous stream for the Anchorage Bowl.

#### 4.5.1.7 Sixmile Creek Watershed

Sixmile Creek, a first-order stream, located in western JBER, flows into Knik Arm and has a watershed encompassing 2,326 acres. It lies within a historic channel of Eagle River 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 is five feet wide and 10 inches deep, with an average three percent fall over a rocky/gravelly bottom. A portion of the stream channel flows through a bog and has a substrate of peat and silt in this area. This system is the primary focus for wetland mitigation through fisheries enhancement projects.

#### 4.5.1.8 EOD Creek Watershed

EOD Creek, a first-order stream, has a small watershed draining approximately 1,500 acres. It consists of one mile of stream channel, originating from seeps in a bog wetland area. The summer flow rate has been estimated at approximately 0.75 cubic feet per second. The stream substrate alternates between silt, gravel, and organic peat deposits.

#### 4.5.1.9 Kettle Lakes Watershed

The Kettle Lakes watershed (998 acres) sits in the Elmendorf moraine and has no organized stream but rather has sheet flow into Knik Arm during snowmelt and heavy rains.

#### 4.5.1.10 Moonshine Creek/Green Lake Watershed

Green Lake and its outflow, Moonshine Creek, drain into Knik Arm south of the Sixmile Creek drainage. Moonshine drains approximately 696 acres.

### 4.5.2 Wetlands and Riparian Areas

#### 4.5.2.1 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 150 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 4.5.2.1 lists larger lakes and ponds (named lakes and ponds of 3 acres or more) occurring on JBER and Figure 4.5.1 shows lakes and ponds occurring on JBER.

**Table 4.5.2.1 Larger Lakes and Ponds on Joint Base Elmendorf-Richardson**

| Lake/Pond | Acres* | Lake/Pond | Acres* |
|---|---|---|---|
| ADR (EOD) Pond | 3.0 | Otter Lake | 150 |
| Chain Pond | 5.5 | Oval (Beebe) Lake | 7.8 |
| Clunie Lake | 112.0 | Spring Lake | 11.3 |
| Dishno Pond | 4.2 | Tanaina (Snowhawk) Lake | 19.4 |
| Former Cooling Pond | 6.6 | Thompson Lake | 6.7 |
| Green Lake | 16.6 | Triangle Lake | 3.5 |
| Gwen Lake | 9.7 | Upper Sixmile Lake | 27.8 |
| Hillberg (Tuomi)Lake | 11.9 | Waldon Lake | 39.6 |
| Lower Sixmile Lake | 122.2 | Web Pond | 5.0 |
| McVeigh Marsh | 9.5 | | |

* GeoBase GIS 2011

### 4.5.2.2 Wetlands

JBER's wetlands are diverse and widespread throughout the slopes, depressions, flats, 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. These wetlands are further classified by their dominant vegetation including aquatic, emergent, shrub-carr, and forested wetlands. Additionally, wetlands may be described by their functions and values, including wetlands that serve as plant and wildlife habitat; buffers and storage basins to prevent flooding; sources of scenic beauty, educational opportunities, or that have cultural or historic significance; provide hunting, trapping, and gathering opportunities; provide protection for streams and lakes; and that serve to recharge and purify groundwater.

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. Jurisdictional wetlands are regulated by the Corps. 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 exhaustive wetland inventory in 2012, including field reconnaissance to many wetland areas where projects are anticipated in the next few years. 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 should be updated in the appropriate GIS layer.

JBER has a total of 7,474.72 acres of wetlands, which accounts for 10.24% of JBER's land base. Table 4.5.2.2.1 lists the hydrogeomorphic (HGM) classes of wetlands inventoried on JBER. Figure 4.5.2.2 shows wetlands on JBER. Additional studies to assess the functional values of wetlands are planned for 2015-2016.

**Table 4.5.2.2.1 Wetland Hydrogeomorphic (HGM) Classes on JBER**

| HGM Wetland Type | Total Acres |
|---|---|
| Depressional | 4799.84 |
| Estuarine | 93.85 |
| Flat | 1015.39 |
| Lacustrine | 497.51 |
| Open Water | 506.66 |
| Riverine | 222.30 |
| Slope | 339.16 |
| Total Wetlands on JBER | 7474.72 |

* Adapted from MWH 2012

**Table 4.5.2.2.2 Wetland Descriptions by Vegetation and Hydrology**

| Wetland Description | Total Acres | Percent of total Wetland Area |
|---|---|---|
| Estuarine Emergent Wetland | 2088.83 | 27.9% |
| Estuarine Forested Wetland | 12.74 | 0.2% |
| Estuarine Shrub Wetland | 77.73 | 1.0% |
| Freshwater Emergent Wetland | 260.83 | 3.5% |
| Freshwater Forested Wetland | 1914.47 | 25.6% |
| Freshwater Forested/Shrub Wetland | 22.12 | 0.3% |
| Freshwater Pond | 182.81 | 2.4% |
| Freshwater Shrub Wetland | 2636.16 | 35.3% |
| Riverine Emergent | 2.48 | 0.0% |
| Riverine Forested Wetland | 131.23 | 1.8% |
| Riverine Forested/Shrub Wetland | 107.00 | 1.4% |
| Riverine Shrub Wetland | 38.32 | 0.5% |

* Adapted from MWH 2012

### 4.5.2.3 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, creating a tidal zone with minimal vegetation, with exception of the Eagle River Flats (ERF).

Eagle Bay is located where Knik Arm merges with the Eagle River. 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 requirements to remove white phosphorous.

#### 4.5.2.4 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.

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 100-200-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.

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Figure 4.5.2.2 Wetlands on Joint Base Elmendorf-Richardson 1:95,000

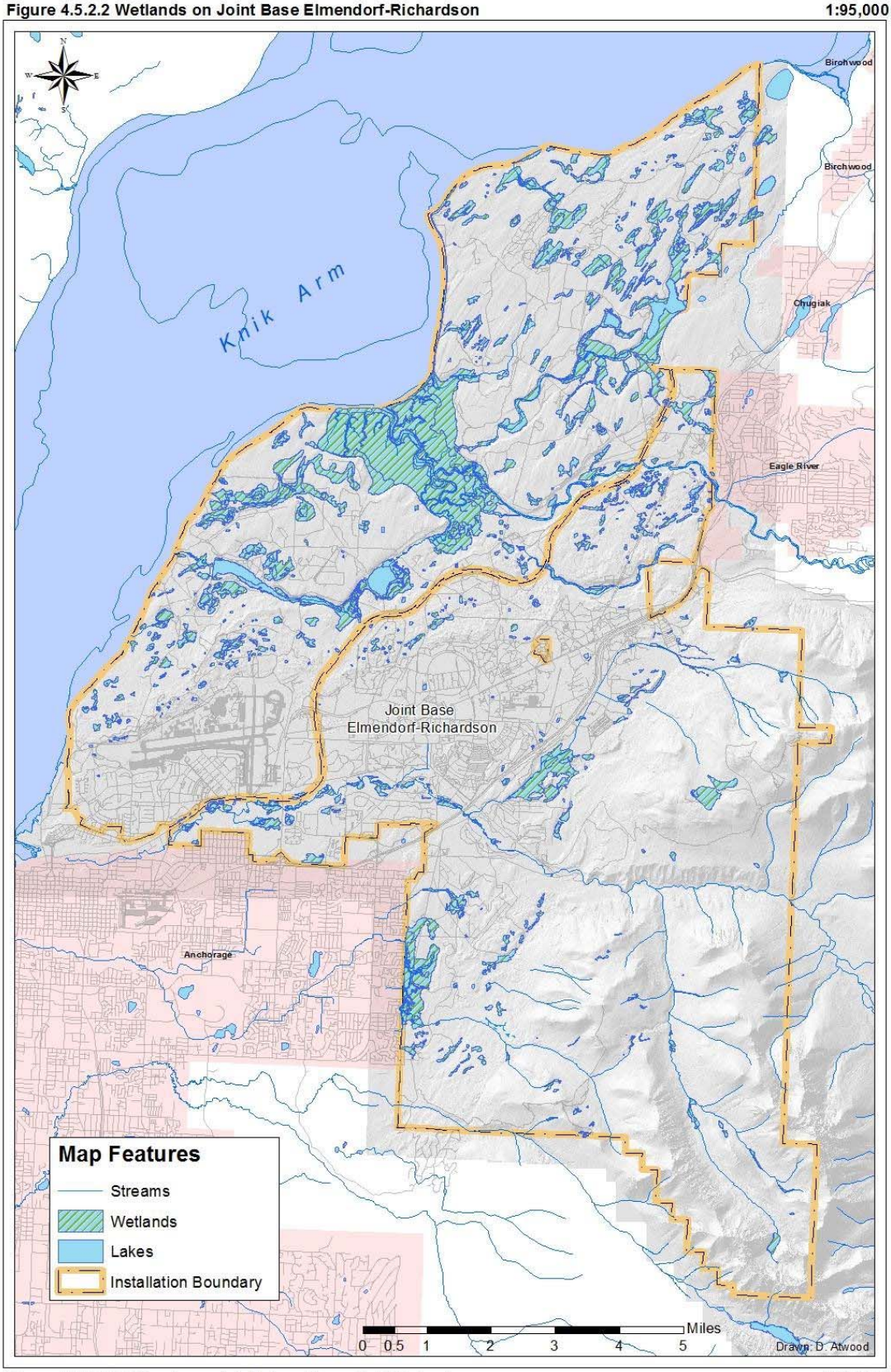


Figure 4.5.2.2 Wetlands on Joint Base Elmendorf-Richardson 1:95,000

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# 5.0 Ecosystems and the Biotic Environment

## 5.1 Ecosystem Classification

JBER lies within the Cook Inlet Lowlands section of the Coastal Trough Humid Tayga Province of Bailey's Eco-regions of the United States (McNab and Avers 1994). JBER also lies within the Anchorage Lowland, an informal subdivision of the Cook Inlet-Susitna Lowland physiographic region (Wahrhaftig 1965). Furthermore, JBER lies within the Northwestern Interior Forest bird conservation region (BCR 4) (http://www.nabci-us.org/map.html). Flora in this region closely resembles that of the boreal forest of interior Alaska, with some species that are typical to the coastal spruce-hemlock forest. 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 (Populus balsamifera), 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 (Alces alces) mitigation areas, small arms ranges, firing points, landing zones, and other human-modified areas.

## 5.2 Vegetation

### 5.2.1 Historic

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).

### 5.2.2 Current

Natural vegetation in the region is a transition between the Pacific Coast, western hemlock (*Tsuga heterophylla)* -Sitka spruce *(Picea sitchensis*) forest and interior boreal forests of white spruce, paper birch, and aspen. 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 the wetter maritime climate of the area. Rothe *et al* (1983) reported 229 plant species on EAFB. Lipkin and Tande (2001) reported an

additional 98 species, bringing the total to 327 plant species documented on JBER-Elmendorf. EAFB surveys identified only 15 major lichens and mosses to genus and/or species.

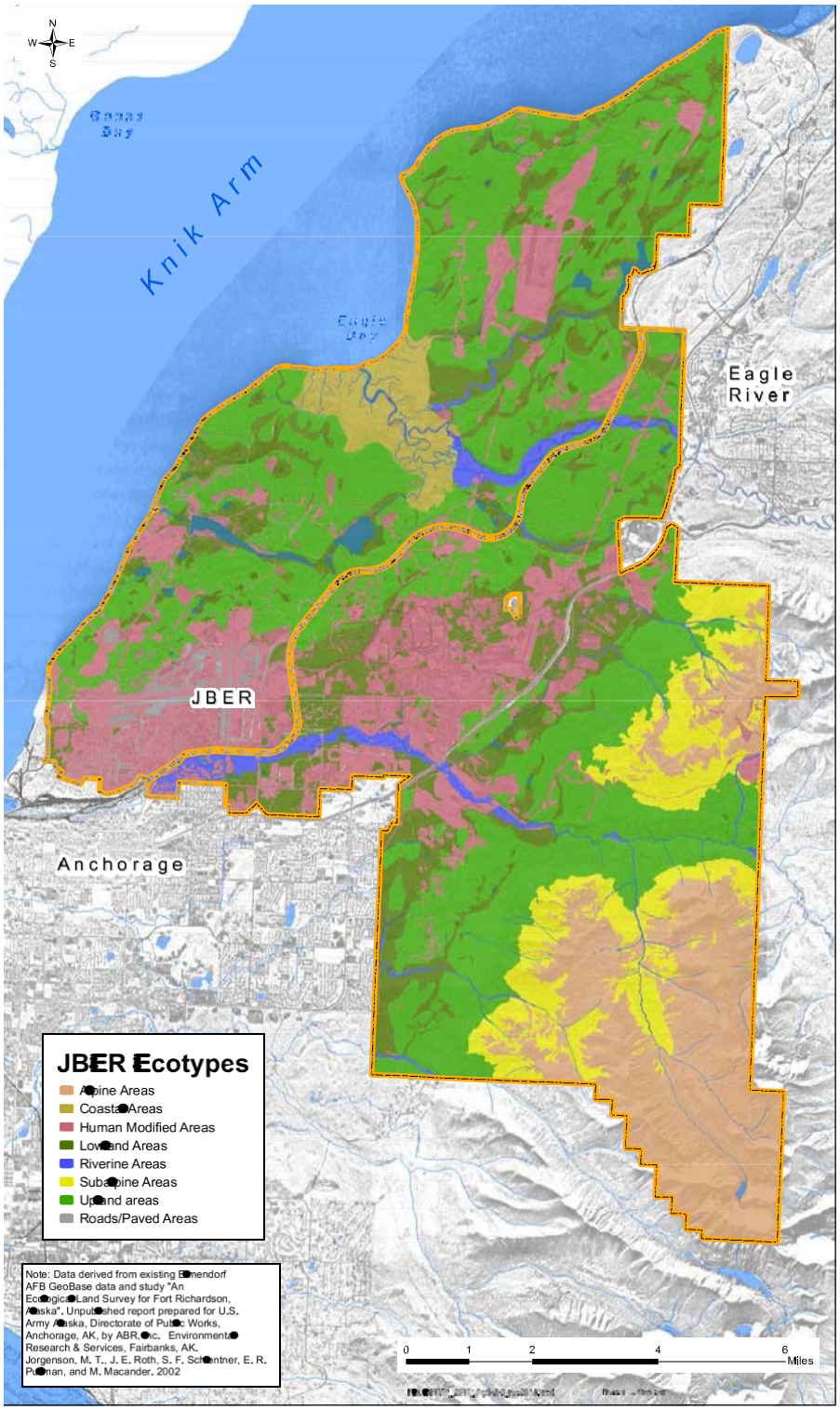
A floristic inventory of FRA (Lichvar *et al*. 1997), sampling from six areas at 98 collection sites, found 561 vascular plant species. The inventory also found 19 hepatics, 112 lichens, and 108 mosses. The ITAM Range and Training Land Assessment program has identified 681 species on JBER-R (May 2011 Plant List). Floristic inventories on JBER have identified no threatened or endangered species or species that have been proposed as candidates for listing.

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 5.2.2. 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. Forestry harvesting procedures are described in Section 7.11.4.

### 5.2.3 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 7.10, *Land Management*, includes discussion of turf and urban forest management.


N
W
E
S
Knik Arm
Eagle River
JBER
Anchorage
JBER Ecotypes
Alpine Areas
Coastal Areas
Human Modified Areas
Lowland Areas
Riverine Areas
Subalpine Areas
Upland areas
Roads/Paved Areas
Note: Data derived from existing Elmendorf AFB GeoBase data and study "An Ecological Land Survey for Fort Richardson, Alaska". Unpublished report prepared for U.S. Army Alaska, Directorate of Public Works, Anchorage, AK, by ABR, Inc. Environmental Research & Services, Fairbanks, AK. Jorgenson, M. T., J. E. Roth, S. F. Schlentner, E. R. Pullman, and M. Macander. 2002
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## 5.3 Fish and Wildlife

Most species indigenous to south-central Alaska can be found on JBER. Appendix F includes a list of vertebrate species for JBER.

### 5.3.1 Insects (Macroinvertebrates)

A 2000 survey of Ship Creek as part of a Ship Creek Restoration Strategy Plan provided a summary of benthic macroinvertebrates collected and identified to genus, if possible. Ten samples at three locations produced a minimum of 20 different taxa (Montgomery Watson 2001). Appendix F includes a list of macroinvertebrates from the MWH Ship Creek Study. A study of benthic macroinvertebrates in select JBER streams is planned for 2014.

Butterflies were collected and identified on FRA during summers of 2002 and 2003 and compared to species collected in Chugach State Park (Besh and Peirce 2004). While some of the collection took place in alpine habitats on FRA, there is probability that many species are shared with JBER-E.

### 5.3.2 Fish

#### 5.3.2.1 Pacific Salmon

All five Pacific salmon (*Oncorhynchus spp.*) species found in North America return to JBER streams to spawn. Ship Creek has enhanced runs of Chinook (*Oncorhynchus tshawytscha*) and coho (*Oncorhynchus kisutch*) salmon, with natural returns of chum (*Oncorhynchus keta*) and pink salmon (*Oncorhynchus gorbuscha*). Sockeye (*Oncorhynchus nerka*) salmon return in small numbers to Ship Creek each year, beginning in early June, with different species present through the end of September. Sixmile Creek has natural runs of four salmon species, with sockeye and pinks comprising the bulk of returning fish, followed by coho and infrequent chums. Although Chinook have been reported, the viability of the run is suspect since they have been rarely detected in recent years. This may mean the species are present only as pioneers. The run of coho 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. The historic range of recorded sockeye escapement, from when weir operation began in 1988 to present, has been 317 - 4,282. The average sockeye escapement during 1998 - 2013 was 1761. EOD Creek has some coho salmon, but the extent and viability of the run is unknown.

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 timing of the beginning of their run is 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 and the end of their run is unknown. JBER staff has sampled Otter Creek, a tributary of Eagle River, and found juvenile coho salmon presumed rearing in the creek.

According to the ADF&G anadromous waters catalog, the North Fork of Campbell Creek has spawning and rearing Chinook, spawning sockeye, and the presence of coho and pink salmon. JBER has not conducted any surveys to verify this. Also the ADF&G anadromous waters catalog notes that there are rearing coho on the South Fork of Chester Creek. In 2014, JBER had a contractor monitor the smolt out-migration on the South Fork of Chester Creek.

#### 5.3.2.2 Rainbow Trout

Rainbow trout are found in 12 JBER lakes, either as naturally occurring populations or as the result of stocking programs. Most stocked fish are 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 native trout fishery; however, non-fertile triploid rainbows were stocked in Upper Sixmile Lake through 2006. A small population of rainbow and Arctic char (*Salvelinus alpinus*) are present in Ship Creek. Native trout and char are also found in Eagle River and its tributaries and in Campbell and Chester creeks.

#### 5.3.2.3 Landlocked Salmon

Landlocked Chinook salmon are stocked in Clunie, Green and Hillberg lakes. Ice fishermen take most stocked fish. Some survival may occur beyond the first winter, but survival levels are not well documented.

#### 5.3.2.4 Other Fish

The three-spine stickleback (*Gasterosteus aculeatus*) is common in most JBER lakes and is a major source of food for rainbow trout as well as grebes, loons, and other fish-eating birds. The slimy sculpin (*Cottus cognatus*) also occurs in JBER lakes. In addition, the nine-spine stickleback (*Pungitius pungitius*) occurs in JBER-E lakes. 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. Historically, Arctic grayling (Thymallus arcticus) fry were stocked in Sixmile Lake; however, survival of the species was apparently unsuccessful. Other fish captured in the tidally influenced portion of Eagle River include: Pacific staghorn sculpin (Leptocottus armatus), starry flounder (Platichthys stellatus), saffron cod (Eleginus gracilis), eulachon (Thaleichthys pacificus), snailfish (Careproctus spp.), Dolly Varden, slimy sculpin, three and nine-spine stickleback, and rainbow smelt (Osmerus mordax)

### 5.3.3 Reptiles and Amphibians

One species of amphibian, the wood frog (*Rana sylvatica*), is common in bogs, wetlands, and fresh and saltwater marshes.

### 5.3.4 Birds

#### 5.3.4.1 Loons and Grebes

Red-necked Grebes (*Podiceps grisegena*) are the most common type of waterbird on JBER lakes. Horned Grebes (*Podiceps auritus*) are a species of special concern that breed on JBER. 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 on JBER.

#### 5.3.4.2 Ducks

Mallard (*Anas platyrhynchos*) and Ring-necked (*Aythya collaris*) Ducks are the most 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. American Wigeon (*Anas americana*), Pintail (*Anas acuta*), Barrow's Goldeneye (*Bucephala islandica*), and Green-winged Teal (*Anas crecca*) are less common but present.

#### 5.3.4.3 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.

#### 5.3.4.4 Shorebirds

Shorebirds are most abundant near Lower and Upper Sixmile lakes. The most abundant species include Greater Yellowlegs (*Tringa melanoleuca*), Lesser Yellowlegs (Tr*inga flavipes*) and Wilson's Snipe (*Gallinago delicata*). The Lesser Yellowlegs and Solitary Sandpipers (*Tringa solitaria*) are birds of conservation 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.

#### 5.3.4.5 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. Herring Gulls select roofs in industrial areas to nest. 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 7.15, *Bird/Wildlife Aircraft Strike Hazard Management* for more information on the BASH Program.

#### 5.3.4.6 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. Fifteen pairs nested on JBER in 2014. Figure 7.5.3 shows known Bald Eagle nest locations on JBER. Golden Eagles (*Aguila chrysaetos*) are sighted in the alpine and subalpine zones of JBER, but none are currently known to nest on JBER. Ospreys (*Pandion haliaetus*), a species of special concern, are uncommon, but a pair has nested on JBER communication towers in recent years including 2014. Osprey populations in Upper Cook Inlet have increased over the past 20 years.

#### 5.3.4.7 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*). At least three goshawk nesting territories have been found on JBER. Rough-legged Hawks (*Buteo lagopus*) are seen commonly in migration. Peregrine Falcons (*Falco peregrinus*) and Gyrfalcons (*Falco rusticolus*) are infrequent migrants on JBER.

#### 5.3.4.8 Owls

The Great Horned Owl (*Bubo virginianus*) is common on JBER. 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, but this species is uncommon. Short-eared Owls (*Asio flammeus*) are frequently observed during migration periods, especially near airfields and drop zones.

#### 5.3.4.9 Grouse

Spruce Grouse (*Canachites canadensis*) are common nesters and remain in good numbers despite heavy mortality of mature spruce trees, important winter food sources. Ruffed Grouse (*Bonasa umbellus*) have been documented JBER-R but not in substantial numbers, and two were collected on EAFB during spring 2006. 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 winter visitors to lowland shrub habitat.

#### 5.3.4.10 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, White-crowned Sparrows (*Zonotichia leucophrys*), and Common Redpolls (*Carduelis flammea*) are the most common nesters. Townsend's Warblers (*Dendroica townsendi*) have been heard only once in four years of Ship Creek riparian forest surveys but are more common on JBER-Richardson on 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. A bird checklist survey on FRA between 1994 and 1999 documented 122 species during the breeding season (Andres 2005).

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

### 5.3.5 Mammals

#### 5.3.5.1 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-Richardson species. A long term monitoring protocol for small mammals was implemented beginning in 2014. See Appendix H for more information.

Small mammals found on JBER includes the snowshoe hare (*Lepus americanus*), porcupine (*Erethizon dorsatum*), arctic ground squirrel (*Spermophilus parryi*), hoary marmot (*Marmota caligata*), red squirrel (*Tamiasciurus hudsonicus*), northern redback vole (*Clethrionomys 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*).

#### 5.3.5.2 Furbearers

Furbearers found on JBER include the beaver, river otter (*Lutra 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. Coyotes exist primarily near housing areas and the airfield, probably due to wolf predation. Beavers are found in most water bodies on the installation. Muskrats and river otter are uncommon but are occasionally sighted in the Sixmile Lake system, Green Lake, and Ship Creek ponds. Marten are uncommon on JBER but are more common near the Chugach Mountains. Wolverines are also found more frequently near the mountains on JBER.

#### 5.3.5.3 Wolves

A wolf study conducted on EAFB and FRA during 1998-1999, although incomplete, indicated the installations were home to two distinct wolf packs. The Ship Creek pack occupied the southern portion of JBER, and was occasionally reported 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. Wolves are known to have denned and raised pups near ERF. Aggressive behavior by wolves prompted ADF&G to conduct a removal program which was initiated in 2010 and removed ten wolves, leaving a minimum of four wolves in the Ship Creek pack.

#### 5.3.5.4 Bears

JBER was estimated to be home to 35-40 black bears, not including cubs of the year (Bostick 1997, Kleckner 2001) and a 2007 minimum of 18 brown bears (*Ursus arctos*) (Farley *et al*. 2008). Black bears, generally having smaller home ranges, have low fluctuations in numbers through the year. 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 was recorded denning within 1.0 kilometer of the JBER-Elmendorf airfield, where she birthed two cubs.

#### 5.3.5.5 Marine Mammals

Cook Inlet beluga whales (CIBW) are seasonally present in Cook Inlet adjacent to JBER and are frequently seen in summer at the mouths of Sixmile Creek and Eagle River and in Eagle Bay, especially during salmon abundance. Cook Inlet beluga whales have been sighted within ERF as far as 2.9 river miles up Eagle River. They have been observed chasing salmon up drainages along the river bank and are occasional visitors during May-July and frequent during August-November to both the river and Eagle Bay (Quirk 1994). Harbor seals (*Phoca vitulina*) are also commonly seen in Eagle Bay during the summer and fall salmon runs. Harbor porpoises (*Phocoena phocena*), Stellar sea lions (*Eumetopias jubatus*), 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). The Cook Inlet population of beluga whale was listed as endangered in 2008 and critical habitat for the distinct population segment took effect in 2011.

#### 5.3.5.6 Moose

As the largest member of the deer family, moose are the most visible wildlife species on JBER. Because of their size and the frequency with which they wander through housing areas, moose are the first major wildlife species newly-arrived personnel are likely to see. JBER shares the North Anchorage Moose Herd with portions of Chugach State Park. Of 500-600 animals, estimated 30-120 animals are found on JBER-

Elmendorf, depending on the time of year, with highs occurring in the late spring calving season and early summer.

Annual aerial surveys of JBER and the Ship Creek moose population by ADF&G have generated population estimates since 1993 (Appendix H). Funding for surveys of this moose subpopulation was primarily provided by USARAK. During the period of 1993-2011, the mean for 13 population estimates was 478.6 moose. The highest population estimate, 629 moose, came in 2003 and the lowest estimate, 335, was generated during the winter 2010-2011 survey. The decline in recent years was influenced by moose hunting and has been intentional to reduce the population size to reduce stress on winter moose habitat, thus keeping more moose on the installation and out of the adjacent communities. However, calf to cow ratios has dropped substantially in the last 3 decades presumably from increasing predator pressure from bears and wolves. During the 1980's calf to cow ratios averaged 47:100; in the 1990s it was 32:100; and since 2000 the average has been 27:100, with 2011 being 14:100, the lowest on record for this population. Moose may typically calve in just about any non-developed area of JBER but sometimes very close to facilities, presumably seeking relief from predators. Some members of this herd are migratory and spend only part of the year on JBER. The onset of subfreezing temperatures once motivated them to move toward subalpine post-rut feeding areas and warmer temperatures. Fencing along the Glenn Highway now funnels them easterly through JBER before finding passage to the Chugach Mountains.

#### 5.3.5.7 Dall Sheep

Dall sheep *(Ovis dalli*) are known to occur in alpine and mountainous terrain on JBER. Wilson (1999) studied population trends and abundance in the Chugach Mountains including those on FRA.

### 5.3.6 Invasive or Deleterious Fish and Wildlife Species

At least five 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.

#### 5.3.6.1 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 and Gwen lakes on FRA. Pike have also been reported in Fish and Green lakes, but no pike have been confirmed. A pike was also reported off JBER in Ship Creek near its mouth.

In 2004, FRA began a preliminary study 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. JBER staff worked with ADF&G personnel to treat Otter Lake with rotenone during the fall of 2015 to remove pike.

#### 5.3.6.2 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 and building and equipment maintenance and cleanliness. Hangers with large open bay doors attract roosting and nesting pigeons.

Pigeons are aggressively removed by the United States Department of Agriculture Animal Plant Health Inspection Service and Wildlife Services (USDA-APHIS-WS).

#### 5.3.6.3 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-R training lands. Pest management personnel are responsible for their control in the cantonment areas.

#### 5.3.6.4 House Mouse

The introduced house mouse was captured during FRA's 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.

#### 5.3.6.5 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.

## 5.4 Threatened, Endangered, and Protected Species

### 5.4.1 Rare, Threatened, and Endangered Flora

No threatened and endangered plant species are known to occur on JBER. Five vascular plants that are considered rare in Alaska were found during a floristic survey (Lipkin and Tande 2001). Though rare in Alaska, Lipkin noted that these five species are more common globally, and they are not recognized by ADF&G as species of special concern. Those species are: 1) Northern bugle weed (*Lycopus unifloris*), found on wet shores surrounding Hillberg and Sixmile lakes; 2) bog adder's-mouth (*Malaxis paludosa*), found in Triangle Lake fen; 3) sea saltwort (*Salicornia maritime*), was found in the small salt marsh recently filled by the Port of Anchorage; 4) pod grass (*Scheuchzeria palustris*), found in several JBER-E bogs and fens; and 5) saltmarsh bulrush (*Scirpus maritimus*), found in the small salt marsh recently filled by the Port of Anchorage.

Threatened and endangered species surveys on JBER-R have been conducted in conjunction with other surveys since 1995. No threatened or endangered species were located in the 1995 floristic inventory (Tande *et al*. 1995; Lichvar *et al*. 1997), the 1997 wetlands inventory, the 1998 vegetation mapping project, the 2000 ecological land survey (Jorgenson *et al*. 2003), annual Alaska Range and Training Land Assessment Monitoring (Peirce 2005), small mammal inventories (Cook 1995; Peirce 2003), or avian monitoring efforts (Cotter and Andres 2000; Andres *et al*. 2001).

There are 20 vascular plant species-of-concern known to occur on JBER-R, as documented by Lichvar *et al*. (1997) (U.S. Army Garrison Alaska 2007a). These plants are being tracked by the Alaska Natural

Heritage Program because they are thought to be uncommon or rare in Alaska and/or uncommon or rare globally (Alaska Natural Heritage Program 2006). Many of these plants are alpine natives, and this ecosystem is also the most vulnerable to effects of military training. There are no legal ramifications from these listings; rather, they are generated by the Heritage Program to help track the occurrence of these taxa across the state as more botanical work is conducted. Two species, occurring in alpine areas of the Chugach Mountains, are notable; the pink fleshy dandelion (*Taraxacum carneocoloratum*) was a former category 2 candidate species, and the luminous moss (*Schistostega pennata*), a rare Alaskan species, is found well outside of its range in southeast Alaska (U.S. Army Alaska 1998).

### 5.4.2 Rare, Threatened, and Endangered Fauna

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 5.4.2. Guidelines for management of these species are in Section 7.5, *Management of Threatened and Endangered Species and Habitats*. A brief discussion of other threatened and endangered species of Cook Inlet is in Appendix H.

**Table 5.4.2 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<br>(Cook Inlet Distinct Population Segment) | *Delphinapterus leucas* | Endangered | Occupies Cook Inlet waters and waters of North Gulf of Alaska (NMFS 2008a). |
| Steller Sea Lion*<br>(Western Alaska Distinct Population Segment) | *Eumetopias jubatus* | Endangered | Includes sea lions born on rookeries from Prince William Sound westward (NMFS 2008b). |
| Steller's Eider* | *Polysticta stelleri* | Threatened | Occurs in northern and western Alaska (U.S. Department of Interior 2007). |
| Yellow-billed Loon* | *Gavia adamsii* | Candidate | Nest near freshwater lakes in the arctic tundra and winter along the Alaskan coast to the Puget Sound (U.S. Department of Interior 2009a). |
| Kittlitz's Murrelet* | *Brachyramphus brevirostris* | Candidate | Nest near glaciers in rocky slopes near Gulf of Alaska waters, winters off shore in Gulf of Alaska (U.S. Department of Interior 2010b). |
| Chinook Salmon*:<br>Lower Columbia River<br>Puget Sound<br>Snake River (spring/summer)<br>Snake River (fall)<br>Upper Columbia River (spring)<br>Upper Willamette River | *Onchorhynchus tshawytsha* | <br>Threatened<br>Threatened<br>Threatened<br>Threatened<br>Endangered<br>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). |
| Steelhead*:<br><br>Lower Columbia River<br>Middle Columbia River<br>Snake River Basin<br>Upper Columbia River<br>Upper Willamette River | *Onchorhynchus mykiss* | <br><br>Threatened<br>Threatened<br>Threatened<br>Endangered<br>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).

### 5.4.2.1 Cook Inlet Beluga Whale

The beluga whale is a small, 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 Conservation Plan (NMFS 2008a) and the Proposed Rule (72 FR 19854; April 20, 2007).

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 of these and is the only one of the five Alaskan stocks occurring south of the Alaska Peninsula in waters of the Gulf of Alaska. 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. This decline was mostly attributed to subsistence harvest (through 1998); however, even with restrictions on harvest, the population has continued to decline by 1.45 percent per year from 1999 to 2008. Annual surveys have continued since 1994 and indicate this population is not recovering.

After receiving several petitions to list the Cook Inlet population of beluga whales 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. In a proposed rule dated 20 April 2007, NMFS officially proposed listing the CIBW as endangered under the ESA. The rule designating the CIBW as endangered was finalized and took effect on 22 December 2008. On December 2, 2009, NMFS proposed critical habitat (74 FR 63080) for the CIBW distinct population segment. The final rule (76 FR 20180) to designate critical habitat for the CIBW distinct population segment under the ESA took effect on 11 May 2011. Two areas are designated, comprising 3,013 square miles of marine habitat. Figure 5.4.2 shows the CIBW critical habitat area in the vicinity of JBER.

### 5.4.3 Species Protected by Marine Mammal Protection Act

All marine mammals are protected under the MMPA. Species identified by NMFS that are occasionally documented near JBER are the killer whale (*Orcinus orca*), harbor porpoise (*Phocoena phocoena*), and harbor seal (*Phoca vitulina*) (Table 5.4.3). Primary local stressors for these species are considered to be the same as for the CIBW. Management goals and conservation measures for the CIBW are expected to be adequate protection of these species as well.

**Table 5.4.3 Upper Cook Inlet Species Protected by the Marine Mammal Protection Act**

| Common Name | Scientific Name | Location Description |
|---|---|---|
| Killer Whale | *Orcinus orca* | Observations by NMFS from 1975 to 2002 indicate only occasions that killer whales were in Knik Arm; however, they are often observed a few times a year in the rest of Cook Inlet (Shelden *et al*. 2003). An acoustic mooring deployed by JBER, NMFS and ADF&G recorded a killer whale off of Point Mackenzie in 2012. |
| Harbor Porpoise | *Phocoena phocoena* | Considered infrequent occurrence in Knik Arm. Multiple harbor porpoise detections (visual or acoustic) per year have occurred in Knik Arm since 2012. |
| Harbor Seal | *Phoca vitulina* | Frequent occurrence in Knik Arm. |
| Stellar Sea Lion | *Eumetopias jubatus* | Includes sea lions born on rookeries from Prince William Sound westward (NMFS 2008b). During the fall of 2009, a lone Steller sea lion was observed in transit in Eagle Bay and in the spring of 2011, another lone Steller sea lion was observed just north of the Port of Anchorage. |

### 5.4.4 Species of Special Concern

A former federally listed threatened species, the Bald Eagle, is common locally and Golden Eagles are sighted periodically in alpine and subalpine zones of JBER. Section 5.3.4, *Birds* discusses these species in more detail. Eagles 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 (*Falco peregrinus tundrius*) (1994), may pass through the JBER area during migrations. JBER operations and activities are not expected to impact the Peregrine Falcon to any considerable degree.

ADF&G compiled a list of species that are of special concern to state and federal agencies in addition to those on United States and Alaska threatened and endangered species lists (ADF&G 2006). Birds of Conservation Concern (USFWS 2008) identified four species that were not compiled on this list that were also added. Table 5.4.4 presents a summary of species from that list considered local breeders on JBER or within the Upper Cook inlet eco-region. All avian species on the list are also protected under the Migratory Bird Treaty Act (MBTA).

**Table 5.4.4 Species of Special Concern Recognized for Joint Base Elmendorf-Richardson**

| Common name | Scientific name | JBER Status | Designating Agencies |
|---|---|---|---|
| American Golden Plover | *Pluvialis dominica* | Migrant | USFWS |
| American Peregrine Falcon | *Falco peregrinus anatum* | Migrant | ADF&G, USFWS |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | Migrant | ADF&G, USFWS |
| Arctic Tern | *Sterna paradiaea* | Breeding | USFWS |
| Blackpoll Warbler | *Dendroica striata* | Breeding | ADF&G, BLM |
| Gray-cheeked Thrush | *Catharus minimus* | Migrant | ADF&G, BLM |
| Horned Grebe | *Podiceps auritus* | Breeding | USFWS |
| Hudsonian Godwit | *Limosa haemastica* | Migrant | USFWS |
| Lesser Yellowlegs | *Tringa flavipes* | Breeding | USFWS |
| Northern Goshawk | *Accipiter gentilis* | Breeding | USFS |
| Olive-sided Flycatcher | *Contopus cooperi* | Breeding | ADF&G, BLM |
| Osprey | *Pandion haliaetus* | Breeding | USFS |
| Pacific Golden Plover | *Pluvialis fulva* | Migrant | USFWS |
| Red-throated Loon | *Gavia stellata* | Migrant | USFWS, BLM |
| Rusty Blackbird | *Euphagus carolinus* | Breeding | USFWS, BLM |
| Short-billed Dowitcher | *Limnodromus griseus* | Breeding | USFWS |
| Solitary Sandpiper | *Tringa solitaria* | Breeding | USFWS |
| Trumpeter Swan | *Cygnus buccinator* | Breeding | BLM |
| Golden Eagle | *Aguila chrysaetos* | Migrant | BLM |

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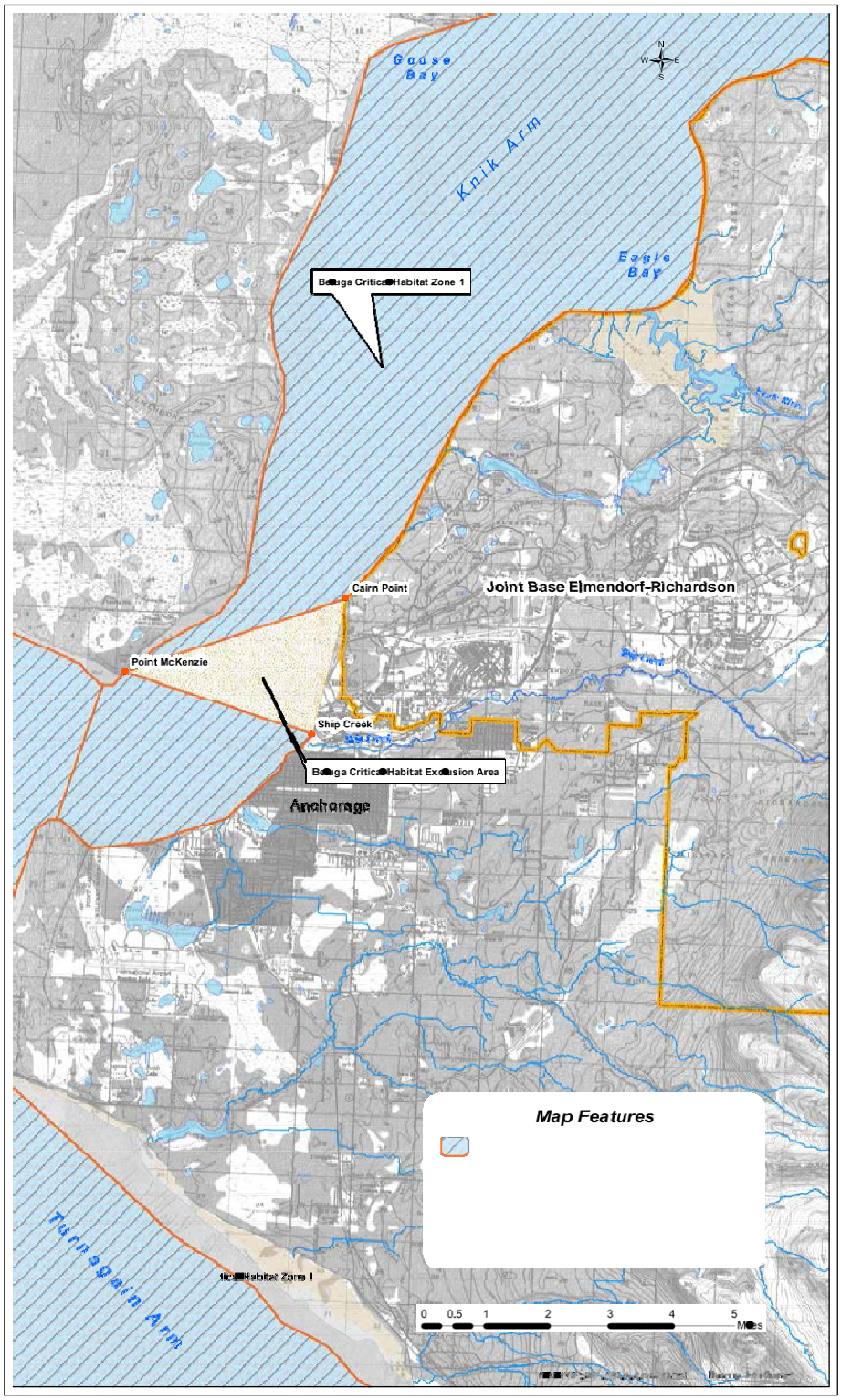


Figure 5.4.2 Beluga Whale Critical Habitat Area in Vicinity of JBER 1:95,000

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## 5.5 Other Natural Resource Information

### 5.5.1 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. Old growth forests are addressed in Section 7.11, *Forest Management*; however, due to joint basing and lack of current data, old growth forests on JBER should be reassessed in order to provide appropriate management.

### 5.5.2 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. Most acreage is under the jurisdiction of BLM. 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. It is critical wildlife habitat. 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-Richardson. Black and brown bears and bald eagles heavily use its anadromous stream and saltwater shoreline. It is a population center for Spruce Grouse.

The area is probably too far north of traditional moose winter ranges on JBER-Elmendorf to make moose habitat improvement effective, and there are enough other areas in need of silvicultural work that it should not be necessary here. Due to the anadromous stream buffer areas and extensive wetlands, logging operations are limited in this area. Motorized access should be restricted to work vehicles only, with the possible exception of fall moose hunters, whose time frames and numbers are limited enough to cause little impact.

This area will have limited access and could be designated as a Research Natural Resource Area (a state and federal land management agencies program). It is adjacent to a similarly protected area, ERF on JBER-Richardson. Together, they would effectively double the size of the protected area and protect important travel corridors, wildlife habitat, and a unique vegetation type.

### 5.5.3 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 and the Eagleglen and Moose Run golf courses. Current management concerns include water quality, soil and bank erosion in the golf course area, and protection of wildlife habitat areas.

### 5.5.4 Sixmile Lake System

The Sixmile Lake system is a critical biological and recreational resource on JBER. It is an anadromous system with large numbers of sockeye migrating to Upper Sixmile Lake each year to spawn. 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 trophy trout fishery, with rainbow trout to 27 inches. It is also home to beaver, loons, grebes, and numerous other types of 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 snowmobiling on the ice are popular in winter.

Current management concerns include fuel leakage and spills from floatplanes, impacts on nesting waterbirds by boaters (specifically those testing large outboards, which is allowed with a special use permit), 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.

### 5.5.5 Alpine Areas

Alpine areas are important components to the overall ecology of Alaska. Alpine ecosystems are very sensitive to disturbance and susceptible to damage. The alpine tundra consists of short 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 FRA 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.

### 5.5.6 Eagle River Flats

ERF and its associated tidal wetlands are important for both natural resources conservation and for military training. 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. Live-fire activities may not target wildlife, including CIBW, when they are present in the Eagle River.

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 an important 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 force[1] 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).

[1] Eagle River Flats task force included representatives from the U.S. Army, U.S. Environmental Protection Agency, USFWS, Alaska Department of Fish and Game and Alaska Department of Environmental Conservation.

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# 6.0 Military Mission and External Impacts on Natural Resources

This section describes mission impacts on natural resources and related issues and concerns relevant to the protection and management of natural resources on JBER. Identification of natural resource concerns, including those generated from the USFWS, ADFG, and the Air Force, is essential for evaluating alternatives when planning future development. Emphasis is placed on identifying those natural resource protection concerns that have the potential to pose a constraint to future development and mission expansion.

## 6.1 Land Use

Of the 73,013 acres that comprise JBER, about 5,040 acres are classified as improved grounds, 10,039 acres as semi-improved grounds, and 57,934 acres as unimproved grounds (673 CES GeoBase 2013) [1]. Figure 6.1 shows land use categories on JBER.

### 6.1.1 Improved Grounds

Improved grounds include lands occupied by buildings and other permanent structures as well as lawns and landscape plantings on which intensive maintenance activities are annually planned and performed. Improved grounds include the cantonment areas, parade grounds, drill fields, athletic areas, golf courses (excluding roughs), cemeteries, and housing areas.

The amount of improved grounds on JBER was calculated using GeoBase vegetation/improvement type data, which indicates about 5,040 acres in this category. The main facility on JBER is the airfield, which is 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, post exchange, and commissary. The joint military mall, installation hospital, Veterans Administration hospital, and privatized family housing units expanded into previously forested ecosystems in the south cantonment area. Improved grounds are shown on Figure 6.1.0.

### 6.1.2 Semi-Improved Grounds

Semi-improved grounds are lands where periodic maintenance is performed primarily for operational reasons. These areas require maintenance less often than the maintained turf grass on improved grounds. About 10,039 acres are semi-improved on JBER.

JBER semi-improved areas 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;

[1] As JBER-Elmendorf and JBER-Richardson are functionally combined, an ongoing process, land use classification acreages will likely change to some degree.

- 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; and
- 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 include:

- Eagle River Flats Impact Area for mortar and artillery firing from approximately 30 firing points;
- 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.

Figure 6.1.0 Land Use on Joint Base Elmendorf-Richardson 1:95,000

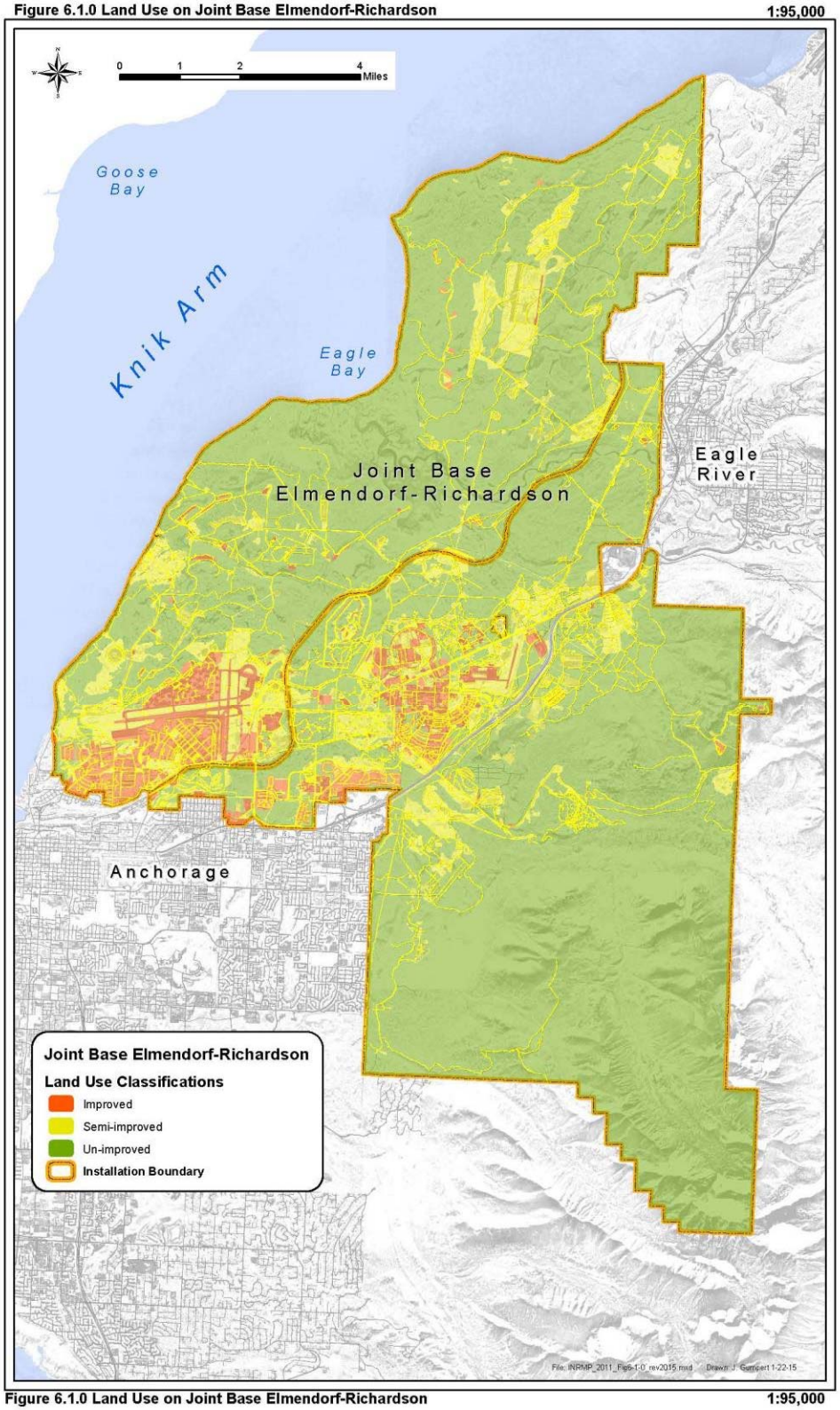


Figure 6.1.0 Land Use on Joint Base Elmendorf-Richardson 1:95,000

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### 6.1.3 Unimproved Grounds

Unimproved grounds are areas not classified as improved or semi-improved. These areas represent the forest, shrub, and wetland areas and any other areas where natural vegetation is allowed to grow unimpeded by maintenance activities. JBER has 57,934 acres of unimproved grounds.

JBER's unimproved grounds are comprised of maneuver area and impact areas. Training areas are numbered 401-431, giving JBER-Richardson a total of 30 training areas (Figure 6.1.3).

### 6.1.4 Military Land Uses

Military land use follows the categories discussed above. Improved grounds are the cantonment or developed area on JBER. Training areas however, 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. 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, semi-improved grounds. Munitions from firing ranges land in surface danger zones or impact areas, unimproved grounds. Descriptions for military land use on JBER are in Table 6.1.4.

**Table 6.1.4 JBER Military Land Use Descriptions**

| General Land Use Category | Primary Military Land Use Category | Secondary Military Land Use Category | Description |
|---|---|---|---|
| Improved Grounds | Cantonment Area | | The area where most buildings are located, including those for office use, indoor training, and housing. |
| Semi-improved Grounds | 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- |

| General Land Use Category | Primary Military Land Use Category | Secondary Military Land Use Category | Description |
|---|---|---|---|
| | | | 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, however, this would be considered unimproved grounds. |
| | | 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 probably highly disturbed. Military activities include airborne assault, air assault in support of combined arms, aeromedical evacuation, and landing zones for rotary wing aircraft. |
| Unimproved Grounds | 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. |
| | | 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 |

| General Land Use Category | Primary Military Land Use Category | Secondary Military Land Use Category | Description |
|---|---|---|---|
| | | | 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), which are improved, semi-improved, or receive some type of maintenance. |
| | | Rights-of-Way | Rights-of-way are any areas used for utility or pipelines (electric, gas, or communication). Areas bordering either side of improved 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. |

### 6.1.5 JBER Land Management Units

Land management units (LMU) on JBER are based loosely on watersheds with consideration to topography, land use patterns, ownership, roads, and physical features. In some cases, compromises and minor adjustments were made to produce a boundary that could be physically found on the ground to make operations and enforcement easier. LMUs may have areas within them that will require special considerations or unique management activities. Thirteen LMUs are recognized on JBER (Figure 6.1.5). JBER LMUs and their main uses and environmental issues are described in Table 6.1.5.

#### 6.1.5.1 LMU 1 or Coastal Mudflats

LMU 1, or the Coastal Mudflats LMU, is a long narrow area that follows the coast. Beach area below mean tide is state land, which leaves approximately 1,938 acres of shoreline that is managed by JBER. This LMU was created because management in this area is different from other areas and is under specific regulations, including the ESA, (PL 95-632, 16USC 1531 et seq.); Marine Protection, Research and Sanctuaries Act, as amended, (933 USC 1401 et seq. and 16 USC 1431 et seq.); Coastal Zone Management Act; (16 USC 145 et seq.); MMPA of 1972; as amended (16 USC 1361 *et seq.)* and the Rivers and Harbors Act of 1899, (33 USC 401 *et seq*.). Additionally, Air Force Instruction 32-7064 directs installations with coastal or marine properties to enter into an agreement with the Coastal America National Regional Implementation Team to coordinate and cooperate in the restoration and protection of coastal areas.

Vegetation is limited with the ground being heavily graveled in some areas and extremely muddy in others. LMU 1 is a critical travel corridor for many wildlife species, especially bears and wolves. Bears often come down to feed during salmon runs at the mouth of Sixmile Creek. Cook Inlet beluga whales are often sighted off shore, especially during salmon runs. Killer whales have been reported infrequently in Upper Cook Inlet and likely reach waters adjacent to this LMU on rare occasions. A variety of birds use the shore for feeding. Access can be gained through the EOD Creek, Sixmile Creek, and at Cherry Hill

ditch. Recreational use is discouraged because of treacherous mudflats and strong, fast moving tides, except that fishing at the mouth of Sixmile Creek occurs during salmon season. Recreational boat launching is not allowed.

#### 6.1.5.2 LMU 2 or Eagle River Flats

LMU 2, or the Eagle River Flats LMU, is a 2,477-acre area comprised primarily of an estuarine salt marsh. Anthropogenic influences on the LMU include military training, both historic (Army artillery impact area since 1949) and current (winter firing of artillery), as well as activities associated with remediation of white phosphorus residues. Vegetation of the LMU is complex. The overall environment is complex and dynamic to organisms living within and around ERF. Section 5.5.6, *Eagle River Flats* includes a more detailed description of ERF.

#### 6.1.5.3 LMU 3 or Eagle River and North Ranges

LMU 3, or the Eagle River and North Ranges LMU, is a 19,040-acre area in the northern portion of JBER that is heavily used 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. The LMU is generally rolling and slightly hilly. The western portion of LMU 3 is mostly wooded with mature tree stands. The eastern portion is typically wetter and contains bogs, ponds, and wetlands; vegetation is mostly mature forest, grassy bogs, and open peat wetlands. LMU 3 provides a vast amount of wildlife habitat and is used extensively for recreation.

#### 6.1.5.4 LMU 4 or EOD Creek and Training Areas

LMU 4, or the EOD and Training Areas LMU, is a 3,497-acre area found in the west-central part of JBER. It is composed of old growth forest with trees reaching 225 years of age, wetlands, and some shrub areas. LMU 4 is the least disturbed old-growth forest in the Anchorage Bowl, having received little human alterations. Much of the area surrounding this LMU was extensively burned when the railroad was constructed. LMU 4 is an essential travel corridor for wildlife species, most notably, bear and wolf. It is adjacent to ERF. Access to this area is difficult in that military off-limit areas, such as the EOD range and the munitions storage area are between the populated area of JBER and LMU 4, and topography restricts movement into the area from the east. ERF Impact Area is off-limits, and portions of LMU 4 were within the range safety fan for ERF and may still harbor unexploded ordnance. Because of limited access, recreational use also is limited. Main recreational use is moose hunting in the fall. LMU 4 acts as a buffer to protect sensitive activities and facilities, such as the munitions storage area and EOD range.

#### 6.1.5.5 LMU 5 or Sixmile-Otter Lakes

LMU 5, or the Sixmile-Otter Lakes LMU, is a 2,593-acre area surrounding Sixmile and Otter lakes and includes upper drainages of Otter Creek. Vegetation consists of closed young birch and alder stands with a mixture of old growth, shrub lands, and black spruce-dominated wetlands. LMU 5 is a travel corridor for moose, bear (brown and black), and wolf. The area is important for moose calving. Sixmile Creek supports salmon runs through June and July, and Upper Sixmile Lake shorelines provide spawning habitat in August through September during which it is often used by bears. Loons nest in both Upper and Lower Sixmile lakes and Oval Lake. Trumpeter swans nest and use the upper Otter Creek system. Access to the LMU is easy, with numerous maintained roads, hiking trails, cross-country ski trails, all-terrain vehicle 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.

673d Force Support Squadron, Community Services Flight, 373d Intelligence, Surveillance, and Reconnaissance Group, and 611th Air Support Group maintain rental lodges along Lower Sixmile Lake. JBER maintains a munitions storage area, EOD range, a small arms range, various communication

facilities, and the Mad Bull combat engineer training facility located north of Upper Sixmile Lake within LMU 5.

#### 6.1.5.6 LMU 6 or Kettle Lakes

LMU 6, or the Kettle Lakes LMU, is a 2,493-acre area containing Spring, Green, Hillberg, Triangle, and Fish lakes. Dominant vegetation types in LMU 6 include alder, birch with areas of old growth birch, and wetlands. LMU 6 is a travel corridor for bear, moose, and wolves. Moose calving occurs in this area, and the eastern portion is highly used by moose for browse. The area has easy access with several maintained graveled roads and some trails. LMU 6 is used extensively for recreation, such as snowmobiling and other all-terrain vehicle activities with fishing being the predominant activity. Moose hunting is allowed in this area. The Community Services Flight maintains several chalets in this area as well as a ski area. The Knik Bluff Trail is a developed hiking trail that offers scenic views of Cook Inlet and the opportunity to view wildlife and cultural resources. JBER maintains a large communication center in this area.

#### 6.1.5.7 LMU 7 or Main Cantonment

LMU 7, or the main cantonment area, comprised of 11,021 acres, which is mostly developed, having little wildland remaining. Pockets of remaining wildland are important in reducing human/animal conflicts by giving wildlife a safe place to retreat. The loss of these pockets, as well as extending clear zones, has the potential for increasing conflicts. The airfield, supporting buildings, housing, and recreation areas, dominate the LMU. It is not uncommon for wildlife to be seen in this area. Conflicts with wildlife are common, and policies have been created to reduce conflicts and set precedents for handling conflicts when they occur.

The LMU is on the glacial and riparian outwash from Eagle River glacier. Resulting soils and gravel base create conflicting roles for this area. It has less than a three-degree slope, making it attractive for development; the airfield was constructed on the western extent of this landform.

Soils and drainage characteristics are ideal for aspen, willow, and birch, when the spruce component is removed. This characteristic has prompted several mitigation activities to enhance wildlife habitat, specifically for moose and hare. However, beneath the surface soil is an extensive gravel resource that is desirable for construction and road repair. As a result, gravel extraction operations, especially in the last five years, have expanded rapidly. A past gravel extraction site became a landfill in the south-central portion of this unit but has since been closed and the site reclaimed. The landfill cover is a prescribed woody plant ecosystem with a prevalent cottonwood/poplar component to serve as an evapotranspiration cover. The landfill cover will also serve as mitigation for habitat lost in the development of private sector financed family housing in LMU 8.

Tree and brush clearing is occurring in the central portion of this LMU due to safety considerations for the flight line. The Alaska Railroad and the Davis Highway pass through this unit. LMU 7 also serves as an important corridor for wildlife between the Ship Creek corridor and the northern part of JBER. An ongoing brown bear study has strongly highlighted the importance of the central portion of this LMU for brown bear movement. Heavy moose traffic is also obvious. Recreational activities are limited by the munitions storage units located in this LMU. Moose hunting, a travel corridor for snow machines, and a remote-control aircraft strip are located in this LMU. Most military activities consist of supporting facilities, such as administrative buildings, family housing, and other support buildings and facilities. Primary activities for this area are vehicle transportation, munitions storage, habitat mitigation, gravel extraction, firefighting training facility, and wildlife movement. This area may also serve to meet future expansion of the airfield runway.

#### 6.1.5.8 LMU 8 or South Cantonment

LMU 8, or South Cantonment LMU, is a 1,117-acre area, which is mostly developed with pockets of wildland remaining. However, it is not uncommon for wildlife to be seen in this area. Most military activities consist of supporting facilities, such as the hospital complex, joint military mall, extensive private sector-financed family housing, and other support buildings and facilities.

#### 6.1.5.9 LMU 9 or Lower Ship Creek

LMU 9, or the Lower Ship Creek LMU, is 1,969 acres, which has recently experienced extensive development. Birch and alder, with some cottonwood/poplar and white spruce, dominate undeveloped areas. Access to this area is easy with several paved and unpaved roads. The fish hatchery, located near Ship Creek and run by ADFG, provides fish to stock many JBER lakes.

Moose and bear are often seen in this management unit, along with beaver and fox. Moose use this area heavily in the winter. Although this area has portions developed or cleared of natural vegetation, it remains a heavily used movement corridor for wildlife. Wildlife is often seen along the golf course and the bluff area, which is fully developed and has extensive human activity. The high density of people and wildlife often leads to a high number of wildlife conflicts in this LMU. Conflicts include moose or bear confrontation with humans, beaver and fox interfering with facilities, moose killed by vehicle collisions (car, trains, etc.), and other similar conflicts. Recreational activities included in this LMU are golf, camping (recreational vehicle), moose hunting (restricted areas), and fishing.

#### 6.1.5.10 LMU 10 or Chester Creek Lowland Training Areas

LMU 10, or the Chester Creek Lowland Training Areas LMU, is a 6,287-acre area in the southern portion of JBER used primarily for military training, wildlife habitat, and recreation. 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. Vegetation ranges from wet tundra to mainly wooded forest with varying aged stands.

#### 6.1.5.11 LMU 11 or Alpine Training Areas

LMU 11, or the Alpine Training Areas LMU, is a 12,326-acre area in the southeastern portion of JBER used primarily for military training, wildlife habitat, and recreation. The LMU is characterized by the Chugach Mountains to the east. Vegetation ranges from wetlands in lower reaches to alpine tundra in upper reaches. Topography ranges from flat areas at lower elevations to steep slopes with mountainous terrain.

#### 6.1.5.12 LMU 12 or Upper Ship Creek Training Areas

LMU 12, or the Upper Ship Creek Training Areas LMU, is 3,299 acres, which is very similar to LMU 11 with respect to vegetation and terrain. However, a main use of the LMU includes designation as a domestic watershed in addition to providing military training, wildlife habitat, and recreation.

#### 6.1.5.13 LMU 13 or Small Arms and South Ranges

LMU 13, or the Small Arms and South Ranges LMU, includes 6,985 acres east of the Glenn Highway that is used extensively for military training and safety fan. The Small Arms Complex and live fire ranges are in this area. Areas of vegetation are cleared within live fire ranges, but heavily forested areas exist between those ranges and extend into the Chugach Mountains to the east. Vegetation ranges from heavily forested areas and wetlands in lower elevation areas to wet and alpine tundra at higher elevations.

**Figure 6.1.3 Military Training Areas on Joint Base Elmendorf-Richardson** **1:95,000**

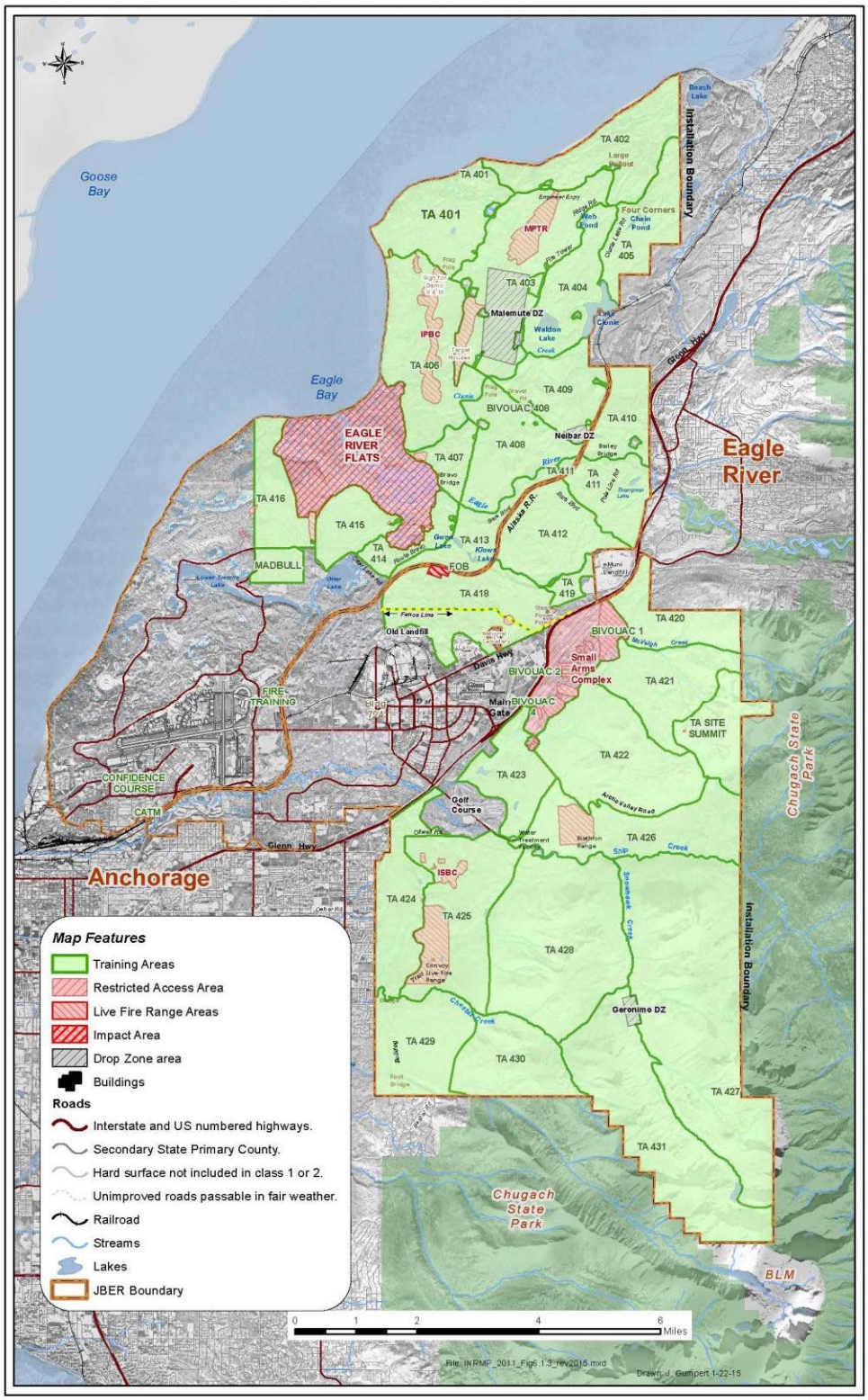


**Figure 6.1.3 Military Training Areas on Joint Base Elmendorf-Richardson** **1:95,000**

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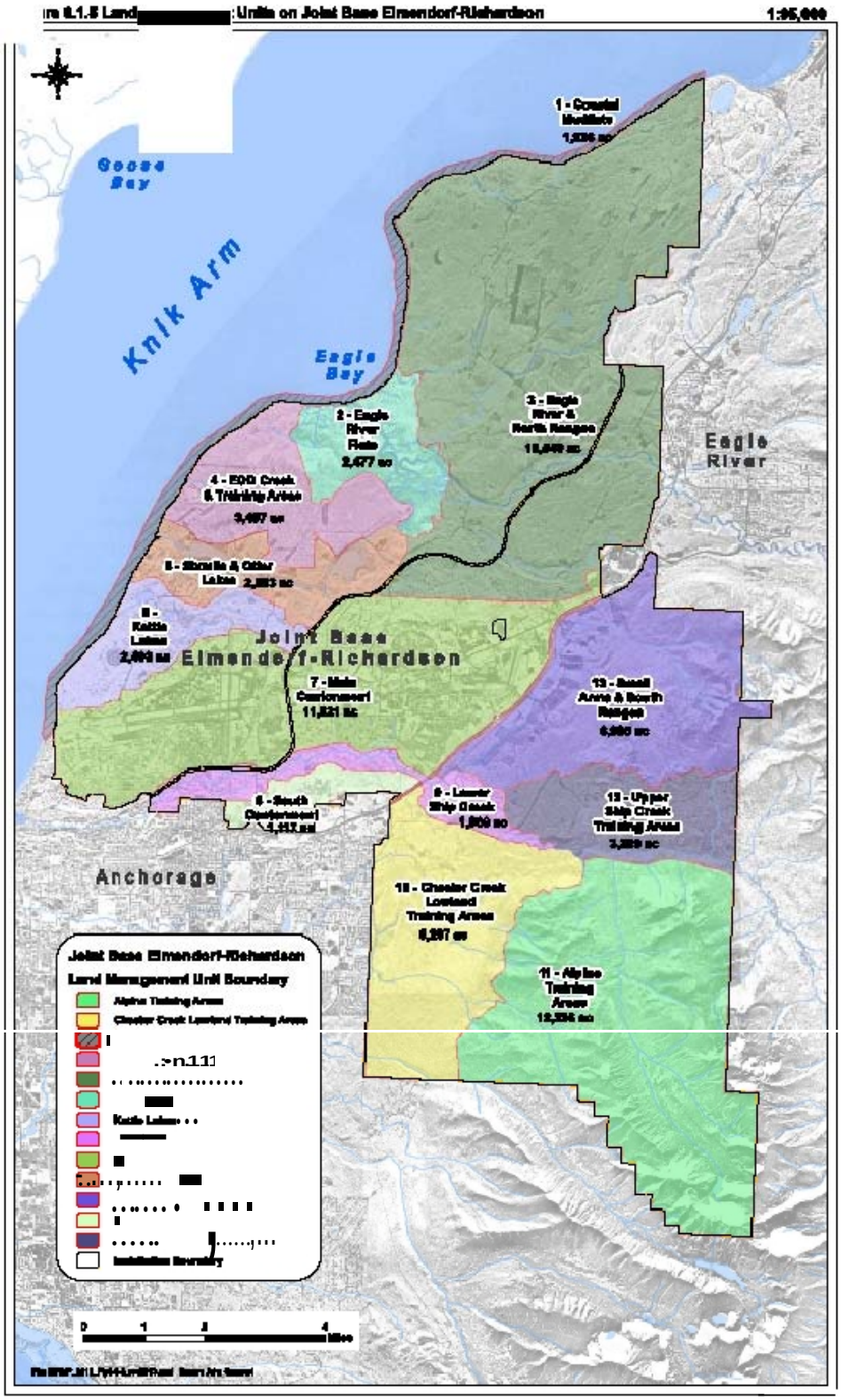


Figure 6.1.5 Land Management Units on Joint Base Elmendorf-Richardson

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**Table 6.1.5. Descriptions of JBER Land Management Units**

| LMU # | Descriptive Name | Watersheds | Acres (est.) | Main Uses | Environmental Issues |
|---|---|---|---|---|---|
| 1 | Coastal Mudflats | Eagle River; Fire, EOD, Sixmile, and Ship creeks | 1,938 | Military training, Wildlife habitat | CIBW critical habitat (primary constituent element), wildlife movement corridor, bald eagle nests |
| 2 | Eagle River Flats | Eagle River | 2,477 | Military training, Impact area, wildlife habitat | CIBW critical habitat (primary constituent element), wetlands, migratory birds, bald eagle nests, anadromous stream |
| 3 | Eagle River and North Ranges | Eagle River and Fire Creek | 19,040 | Military training, wildlife habitat, recreation | Wetlands, bald eagle nests, anadromous stream |
| 4 | EOD Creek and Training Areas | EOD Creek | 3,497 | Military training, munitions storage, safety fan, wildlife habitat, recreation | Wetlands, bald eagle nests |
| 5 | Sixmile-Otter Lakes | Sixmile Creek and Eagle River (Otter Creek) | 2,593 | Military training, wildlife habitat, recreation | Anadromous streams, migratory birds, wetlands |
| 6 | Kettle Lakes | Moonshine Creek | 2,493 | Military training, communications, wildlife habitat, recreation | Wetlands, bald eagle nests, migratory birds |
| 7 | Main Cantonment | Ship Creek and Cherry Hill Ditch | 11,021 | Facilities, housing, airfield, recreation | BASH, wetlands, wildlife corridor |
| 8 | South Cantonment | Ship Creek | 1,117 | Hospital, military mall, housing, recreation, gravel extraction, leased land | BASH, wetlands |
| 9 | Lower Ship Creek | Ship Creek | 1,969 | Wildlife habitat, recreation, golf courses | Floodplain, wetlands, BASH, bald eagle nests, wildlife corridor, anadromous stream |
| 10 | Chester Creek Lowlands Training Areas | Chester and Campbell creeks | 6,287 | Military training, wildlife habitat, recreation | Wetlands, anadromous streams |
| 11 | Alpine Training Areas | Ship, Chester and Campbell | 12,326 | Military training, wildlife habitat, | Sensitive habitat, wetlands |

| LMU # | Descriptive Name | Watersheds | Acres (est.) | Main Uses | Environmental Issues |
|---|---|---|---|---|---|
| | | creeks | | recreation | |
| 12 | Upper Ship Creek Training Areas | Ship Creek | 3,299 | Domestic watershed, wildlife habitat, recreation | Wetlands |
| 13 | Small Arms and South Ranges | Ship Creek and Eagle River | 6,985 | Military training, safety fan, wildlife habitat | Wetlands |

### 6.1.6 Out-Grants

About 3,695 acres of JBER-Richardson 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[2] (water, electrical, cable, gas, etc), schools, fish hatchery, and the Alaska Army National Guard area (Camp Carroll, Camp Denali, and Bryant Army Airfield). On JBER-Elmendorf about 350 acres are out-granted. These areas include but are not limited to utility easements (gas, electric, communications and cable), schools, bank, Credit Union, fish hatchery, parks, and Federal Aviation Administration. In addition, about 960 acres of JBER are used for private-sector financed housing under a fifty-year lease.

## 6.2 Current Major Impacts

### 6.2.1 Mission-Related Impacts

New installation-level developments can individually or cumulatively impact natural resources. In the last decade, JBER has gone through substantial facility upgrades and expansions to meet growing support needs as well as meeting a new joint installation support requirement.

Included in those changes were the new hospital complex, the joint military mall and support services, and new family housing that came in the form of private-sector financed housing. This housing construction required approximately 350 acres of undeveloped land leased to developers on which new homes were constructed. Those three activities alone account for the loss of approximately 500 acres of forested habitat. Providing gravel to the Port of Anchorage for expansion of its facility accounted for the loss of over 150 acres. Just outside the JBER boundary, approximately 100 acres of forest habitat was converted to a large shopping mall (not a direct military mission impact). Similarly, on JBER-Richardson, habitat losses via development of advanced training ranges and facilities amounted to 450 acres in the last five years.

Other land conversion includes the Air National Guard, F-22A and C-17 bed-downs, fighter fuel cell maintenance, realignment of the Alaska railroad right-of-way, Arctic Warrior realignment (Army action), rapid gravel pit expansion in support of the many JBER and Port of Anchorage projects, and erection of security fences in support of 9/11 force protection. These particularly impacted remaining outwash plain

[2] 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.

areas east of the runway, the Ship Creek flood plain, and the southern face of the Elmendorf moraine. They are leading to habitat fragmentation and wildlife movement corridor restrictions. Environmental impact statements on military construction should address these natural resources concerns.

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 in the face of hurried, inadequately coordinated development and gravel extraction has become an issue, and an ever increasing risk for wildlife-human conflicts.

As a direct result of the September 11, 2001 attack on the United States, funding was made available for immediate resolution to security weaknesses on military installations. Fencing was rapidly designed and erected, creating disruption in wildlife movement corridors. Fencing improvements provided much needed resolution to BASH risks by large animals, moose specifically, around the airfield. But the fencing now limits travel corridors between undeveloped ecosystems.

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 these impacts to the highest degree possible. Forethought given to project siting decisions are often the best opportunities to minimize impacts to ecosystem functionality.

#### 6.2.1.1 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 waste 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. Survey of training lands to identify special interest areas and 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 (Section 7.6.2 *Range and Training Land Assessment*). Conversely, training exercises can be used as a tool to accomplish natural resource management objectives.

#### 6.2.1.2 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 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 Defense Environmental Restoration Program 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 5.5.6, *Eagle River Flats* includes a more detailed description of ERF. The remaining four Superfund sites have little effect on natural resources.

### 6.2.2 Other Impacts

#### 6.2.2.1 Public Access

Public access is allowed by instruction (16 U.S.C. 670 *Sikes Act*), 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 7.16.2, *Public Access*.

#### 6.2.2.2 Fish Passage Initiatives

Ship Creek traverses JBER. 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. This goal is shared by the Native Village of Eklutna in hopes of re-establishing potential subsistence sources for salmon. The natural resource goal, however, may generate human-wildlife conflicts, mission risks (BASH), and facility maintenance risks if not carefully evaluated. In 2009, EAFB and BLM signed an agreement in which providing land for the expansion of the ADFG fish hatchery, the Air Force would not be required to allow salmon escapement above the existing dam at the Elmendorf hatchery. Section 7.4.2.8, *Fisheries/Aquatic System Conflict Issues* further discusses the former Ship Creek Fish Passage Project.

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.

Improvements have been made to Chester Creek and North Fork of Campbell Creek to improve passage of anadromous fish. Improved fish passage will increase upstream breeding salmon numbers, thus attracting bears, which may impact training and may generate addition human-wildlife conflicts.

In 2010, JBER and ADFG initiated development of Otter Lake/Creek restoration project, partially funded through Port of Anchorage wetland mitigation funds. The project was designed to rotenone Otter Lake/Creek waters to remove all pike, enhance spawning habitat, and reintroduce salmon into the system. Baseline data was collected in 2011-2013 and reported in 2014 (MWH Pre-treatment Report, 2014). This is action is anticipated to occur late September-early October 2015.

## 6.3 Potential Future Impacts

### 6.3.1 Military-Related

#### 6.3.1.1 Land Withdrawal

Impacts of current and future military activities on Army lands are addressed in the *Final Environmental Impact Statement for Transformation of U.S. Army Alaska, Vols. 1 and 2* (U.S. Army Alaska 2004). The *Environmental Assessment and Finding of No Significant Impact for Conversion of the Airborne Task Force to an Airborne Brigade Combat Team* covers additional changes (U.S. Army Alaska 2005). These NEPA documents address regular ongoing impacts of U.S. Army Alaska's recent mission change, the transformation/conversion of the 172$^{nd}$ Separate Brigade Combat Team and the 1$^{st}$-501$^{st}$ Airborne Task Force. Impacts of maneuver missions will be predicted using the Army's Training and Testing Area Carrying Capacity methodology (U.S. Army Alaska 2004).

In 2013, the Army evaluated the impacts associated with force reduction throughout various Installations across the US, including JBER. The potential impacts were identified in the, *Programmatic Environmental Assessment for Army 2020 Force Structure Realignment*. Specifically for JBER, the Army analyzed the impacts associated with a reduced force of 4,300 Soldiers and Department of the Army Civilians. Natural resource management activities were not expected to result in a significant adverse environmental impact. Currently, the Army is preparing a Supplemental Programmatic Environmental Assessment (PEA) to reduce the Army force at JBER by 6,500 Soldiers and Civilians. This Supplemental PEA will analyze the potential impacts associated with the removal of 6,500 Army personnel. The action is expected to result in a Finding of No Significant Impact (FONSI) and be completed in mid to late 2014.

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 is typically a required mitigation for all of these NEPA documents.

#### 6.3.1.2 Noise Impacts on Beluga Whales

Military mission-generated noise becomes a natural resources issue when it has the potential to affect an endangered species or designated critical habitat, such as the recently designated critical habitat for the CIBW (76 CFR 20180). Since 1997, the NMFS has been in the practice of using 160 $dB_{rms}$ re 1 μPa SPL @ 1 m as a proxy for prohibited acoustic "take" (i.e. behavioral harassment) under the MMPA and often by extension under the ESA as well. Thus, any instance in which a cetacean is subjected to underwater sound equal to or greater than 160 decibels would constitute "take" under the MMPA and by extension under the ESA (National Marine Fisheries Service, Alaska Region 2011).

JBER and NMFS also conducted two separate informal consultations on the potential effects of military fighter aircraft over flights of Knik Arm. In both cases, one for the addition of seven F-22 aircraft and one for the proposed relocation of twenty-one F-16 aircraft to JBER, the NMFS agreed 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 the following: 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 operation of these aircraft in addition to the F-16's were included in JBER's final may affect, not likely to adversely affect determination.

#### 6.3.1.3 Eagle River Flats

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. Because actions considered under this alternative could potentially affect the CIBW, U.S. Army Garrison Alaska proposed to engage in Section 7 consultation with NMFS. A biological assessment (U.S. Army Alaska 2010b), based on the best information available to the Department of the Army, summarized the proposed action at ERF Impact Area and presented existing and proposed measures to prevent or mitigate potential impacts.

After careful study, the Army determined that Alternative 2 of the resumption of year-round, live-firing at ERF Impact Area is likely to adversely affect the CIBW in light of noise impacts associated with certain high explosive munitions training. U.S. Army Garrison Alaska requested that NMFS concur with this determination and initiate formal consultation under Section 7 of the ESA. The biological assessment was submitted to NMFS and a biological opinion (National Marine Fisheries Service, Alaska Region 2011) was issued on 27 May, 2011. Section 7.5.2, *Protection of the Cook Inlet Beluga Whale on JBER* includes conservation recommendations to minimize adverse effects to the CIBW and conservation measures to protect beluga whales, their habitat, and their prey specified in the biological opinion. Mitigation measures for year-round firing in ERF (if selected) are included in Section 7.5.2.

NMFS issued a biological opinion (Biop) on this proposed action in 2011 and determined that CIBWs may be exposed to impulsive noise less than 180 decibels but more than 160 decibels in Eagle River and less than 160 decibels in Eagle Bay. An incidental take statement 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 for CIBW as appropriate (National Marine Fisheries Service, Alaska Region 2011).

JBER is working on a revision to the biological assessment of the effects to the CIBW and its critical habitat from the proposed Resumption of Year Round Firing based on changes to the proposed action and new information published since the issuance of the Biop. This document is expected to result in a revised biological opinion from the NMFS sometime in 2015-2016.

#### 6.3.1.4 Ongoing Military Activities

JBER and NMFS concluded informal consultation under section 7 of the ESA on the potential effects to the CIBW and its critical habitat resulting from existing explosive ordnance activities (demolition training/EOD activities) on JBER. The resulting Letter of Concurrence from NMFS concurred with JBER’s determination that these activities may affect, but were not likely to adversely affect the CIBW or its critical habitat. A NEPA assessment and corresponding ESA analysis of a proposed increase in demolition/EOD capabilities on JBER are currently underway. In support of these analyses, JBER conducted two noise studies (October 2012 and June 2013) designed to measure the in-water effects resulting from explosions on JBER land. None of the explosions tested during these studies caused in-water sound pressure levels exceeding 160 $dB_{rms}$ re 1 μPa. These results will be incorporated into the NEPA and ESA analysis expected to be completed in 2015.

### 6.3.2 Non-Military Related

#### 6.3.2.1 Encroachment

Encroachment is defined in Air Force Policy Directive (AFPD) 90-20 (April 12, 2012) 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." AFPD 90-21 groups encroachment challenges into five broad categories: environmental, health or safety regulatory restrictions; compatible use issues; competition for resources; security; and long-term mission sustainment challenges. 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 five Air Force categories and many Army examples exist within and around the installation and the JBER installation complex/mission footprint.

Encroachment challenges identified by the JBER Installation Encroachment Management 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 Knik Arm Crossing upon Elmendorf Field and the AN/FLR-9 antenna; lack of knowledge among community stakeholders of the military mission leading to unreasonable expectations; conflicts with recreationists in military training areas; and various BASH concerns related to Bryant Army Air Field and, in particular, the current operations and proposed expansion of the Anchorage Regional Landfill. 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 approximately double between 2010 and 2035.[3]

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 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 Joint Land Use Study program, which provides assistance to state and local governments to ensure mission compatibility.[4]

#### 6.3.2.2 Port of Anchorage

The Port of Anchorage serves 85 percent of the population of Alaska by providing 90 percent of all consumer goods for the state, including military materials and supplies. The Port is in the process of rehabilitation and expansion of its facilities, known as the Port Marine Terminal Redevelopment Project. The project will provide additional land and facilities expected to be used to support military deployments during and after construction. The Port is one of 19 nationally-designated Strategic Ports with direct calls scheduled by the Department of Defense for deployments in-and-out of Alaska's military installations and

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[3] Eddie Hunsinger, David Howell, and Sara Whitney. *Alaska Population Projections: 2010-2035*, Juneau, Alaska: Alaska Department of Labor and Workforce Development, Research and Analysis Section, April 2012.

[4] www.oea.gov/programs/compatible-use/start

training facilities. The designation requires the Port to provide the military with 25 contiguous acres for their operations within a 24-hour notice.

The Port Marine Terminal Redevelopment Project will enlarge docking and loading facilities, working space, and road and rail transportation. 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.

#### 6.3.2.3 Climate Change

According to a number of scientists, effects of climate change are already taking a toll in Alaska. Damage to forests, loss of wetlands, degradation of salmon (*Oncorhynchus* spp.) habitat, rising ocean levels, and widespread melting of permafrost 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 evidenced in both Alaska and Canada over the last 20 years. While soils on JBER are subject to seasonal freezing, thermokarst (melting of permafrost) is not a major problem due to only small isolated areas being underlain with permafrost.

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 bark 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 catastrophic long-term loss of 60–80 percent of spruce trees larger than nine inches in diameter. 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.

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 has resulted in further blue joint grass dominance. The two major methods for dealing with this problem are proper soil disturbance and prescribed fires. Even properly disturbed soils following logging can be ineffective if blue joint grass is already established in wet soils. Prescribed burning opportunities are limited due to narrow burning windows and air quality standard conflicts. Invasive plant species are further discussed in Section 7.9.3, *Noxious Plant/Invasive Species Management*.

Rising world ocean levels is also identified as a likely source of impact to JBER, even if minor. 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. Efforts will be made to anticipate their future impacts on the military mission for planning purposes (see Section 7.2.4, *Inventory and Monitoring Programs*).

## 6.4 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.

## 6.5 Natural Resources Constraints to Missions and Mission Planning

### 6.5.1 General

There are inherent physical and biotic components of the JBER landscape that may present constraints to utilization for training. 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, 16USC 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, such as the ERF settlement agreement. 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.

Wildlife conflict issues are common on JBER. Wildlife is found in close proximity to large numbers of people, facilities, and developments. As development continues and remaining pockets of vegetation close to humans are cleared, wildlife-human conflicts are likely to increase. Primary among conflicts with the JBER mission are those species that pose risks to personnel safety and equipment losses. The management of wildlife conflict issues, while mentioned elsewhere in this document, is generally described in Section 7.4.3.2, *Wildlife Conflict Management*.

### 6.5.2 Bird and Wildlife Aircraft Strike Hazard (BASH)

The BASH program is foremost in the management of reducing BASH risks. Species of BASH concern include large birds, such as ducks, geese, hawks, eagles, gulls and ravens; mammals that pose a risk on the runway, including moose, bears, and canids; microtines that attract raptors to the airfield; and beavers that create attractive waterfowl habitat within the waterfowl exclusion zone. Grasshoppers 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. Section 7.15, *Bird/Wildlife Aircraft Strike Hazard Management* further discusses BASH.

### 6.5.3 Wildlife Risks to Human Safety and Health

Large, potentially dangerous animals are also a management concern, including moose, black and brown bear, and wolves. Their aggressive offensive or defensive actions can cause human injury or death, as well as vehicle collisions. Species that pose a human/pet health risk as well as risk to facility integrity include beaver, swallows, and small canids, both wild and feral. Notable is that JBER is in a low risk area of Alaska for the rabies virus.

#### 6.5.3.1 Wildlife dumpster mapping

The purpose of this mapping is to determine which dumpsters on JBER are nuisance bear (brown or black) attractants. This is accomplished through an inventory of installation dumpsters (type; bear resistant or not) and location mapping. All nuisance wildlife incidents are mapped and layered over the

dumpster inventory. The resulting map is provided to the building custodian and their leadership to address the potential public safety hazard that their dumpster presents and used as a tool to facilitate a change of the dumpster to a bear resistant type. Nuisance bear activity is reported by direct contact or an email with photos of bears in their dumpster to the building custodian and/or their leadership. Annually, a meeting of AAFES, National Guard, Aurora Housing, and 673rd CES leadership, usually in early spring, is held to identify potential upcoming seasonal dumpster/wildlife issues from the previous season, in orde r to fix it before it becomes a public safety problem.

### 6.5.4 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.

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# 7.0 Natural Resources Program Management

## 7.1 INRMP Implementation Roles

### 7.1.1 JBER Organizations

Primary responsibility for the stewardship of JBER natural resources belongs to the 673d Air Base Wing acting primarily through the Environmental Element (CEIE). The Environmental Element program ensures that Air Force actions are in compliance with all applicable environmental laws. Civil Engineering is the lead agency for program consolidation, tracking, and management. Natural resource program funding requirements are submitted through Civil Engineering channels via the Automated Civil Engineering System program. Funding for revenue-generating activities is based on previous years' income. All other functional areas of the Wing, including employees, contractors, military personnel, deployed units and tenants, are responsible for ensuring that their personnel, including federal employees, military personnel and contractors carry out their activities in accordance with this plan.

In order to ensure that natural resources are protected, in addition to goals, objectives, and management actions/projects described in this plan, JBER has implemented an Environmental Management System in accordance with EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management.* Land is identified as an environmental aspect of the Air Force's activities on JBER and issues are addressed through the Environmental Management System.

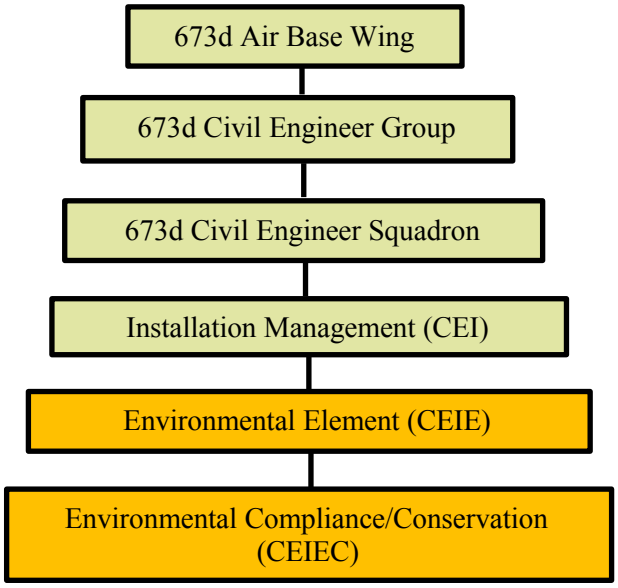


**Figure 7.1.1.** Organizational Chart of the 673 ABW, Emphasizing the 673d CEI Environmental Element.

#### 7.1.1.1 673d Air Base Wing

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 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 Group**
The 673d Civil Engineer Group (CEG) provides most of the natural resources direction for JBER. Figure 7.1.1 shows organizations within the 673d CEG that are involved with natural resources management. Annual INRMP reviews/updates changes to the INRMP will be approved by the 673d CEG Commander.

**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.

**673d Logistics Readiness Group**
The 673d Logistics Readiness Group Commander is part of the Bird Hazard Working Group. BASH program responsibilities include giving guidance to maintenance and fuels personnel for reporting hazardous bird activity to proper channels and procedures for the preservation of bird remains found on aircraft during maintenance. The 673d Logistics Group provides munitions, vehicles, and equipment to support the bird dispersal efforts when necessary.

**673d Security Forces Squadron**
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 officiers (CLEOs) and the volunteer Military Conservation Agent (MCA) Programs.

**773d Civil Engineer Squadron**
The 773 CES is responsible for control and management for pest management activities on JBER, with exception of pest issues within privatized housing units.

#### 7.1.1.2 Major Mission Partners and Tenant Organizations
Major Mission Partners and tenant organizations on JBER include the 11th Air Force, 3d Wing; 477 Fighter Group; U.S. Army Alaska's 4/25th Infantry Brigade Combat Team (Airborne); 732d Air Mobility Squadron; 373d Intelligence, Surveillance, and Reconnaissance Group; PACAF Regional Support Center; Utility Aircraft Detachments; 176th Wing (Alaska Air National Guard); Alaska Army National Guard;

and Army Corps of Engineers, Alaska District Office. All tenant organizations have some responsibilities in supporting the BASH program, and most have a representative on the Bird Hazard Working Group.

**3d Wing Vice Commander**
The Vice ABW 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**
The 3d Wing Safety has primary responsibility in regard to 3 WGI 91-212 or BASH Program. The 3d Wing Safety 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.

**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 will retain 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 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. They also provide contract service to the natural/cultural resources program.

**Air Force Civil Engineer Center**

The Environmental Directorate, located at Joint Base San Antonio-Lackland, Texas, is part of the Air Force Civil Engineer Center, a field operating agency of the Air Force Civil Engineer. It is responsible for planning, managing, and programming Air Force restoration, compliance, sustainability, technical support, and operations. The directorate provides environmental technical assistance and advice to Air Force headquarters and installations. The directorate develops execution strategies for environmental compliance and natural and cultural resource projects and programs. This Directorate is principally responsible for programming and distributing funding to meet the INRMP goal and objectives.

### 7.1.2 Other Defense Organizations

The following Air Force organizations or persons provide oversight and guidance for the preparation and implementation of the INRMP:

- The Assistant Secretary of the Air Force for Installations, Environment, and Logistics;
- The Civil Engineer, Headquarters United States Air Force; and
- Pacific Air Command.

### 7.1.3 Federal Agencies

JBER partners with other federal agencies for natural resources management support, including agencies discussed below. Accredited conservation representatives of federal agencies furnishing professional advice and technical assistance under this plan will be allowed access to JBER, in accordance with appropriate security arrangements.

#### 7.1.3.1 U.S. Fish and Wildlife Service

In accordance with the Sikes Act, the USFWS is a signatory cooperator and partner in the implementation of this plan. 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.

#### 7.1.3.2 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 3.2b). 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. The BLM Alaska Fire Service (AFS) provides interagency fire suppression services throughout Alaska. JBER has historically used AFS to accomplish fire suppression requirements. Section 7.11.4., *Legal Factors* discusses BLM vegetative rights on JBER forest lands and includes procedures JBER will use for commercial timber sales and personal-use wood sales.

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. If the land was intended to be managed primarily for multiple uses, it would not be managed by a military service. Under JBER management, land is used primarily for national security purposes (*e.g.*, training and testing) but may also be managed to accommodate additional uses as long as they do not impinge on the primary military readiness mission.

Multiple-use of the lands it manages is an integral part of the mission of the BLM. As defined by Federal Land Policy and Management Act, multiple-use implies that each authorized use of the land has an equal level of priority. DoD, on the other hand, is fixated on accomplishing its primarily mission, deter war and

to protect the security of our country. JBER multi-use land obligation is to allow multiple uses compatible with the military mission.

Stewardship is an inherent responsibility of anyone who has activities on the public lands, regardless of legislated land management responsibilities. Stewardship implies acting responsibly in the public interest in the use and, as appropriate, restoration, improvement, preservation, and protection of federal lands and their associated resources. Good stewardship is a mandate for all users of the land and a fundamental policy of all land management agencies, including BLM and JBER.

The forestry stewardship MOA designed to ensure long term ecological sustainability of both military and multi-use BLM lands, designated primarily for national security, remains unsigned.

#### 7.1.3.3 U.S. Environmental Protection Agency

The Environmental Protection Agency (EPA) is involved in various federal programs related to natural resources management, particularly the wetlands 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.

#### 7.1.3.4 U.S. Department of Agriculture

**Animal Plant Health Inspection Service 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 is developing an airfield BASH plan. Finalizing the Bryant Army Airfield BASH plan for is expected to occur in 2014.

**Natural Resources Conservation Service**
This agency provides technical assistance in identification and conservation of soils.

**U.S. Forest Service**
JBER, the U.S. Forest Service, and the Alaska Division of Forestry (DOF) have a memorandum of agreement (MOA) regarding wildland fire response on JBER. This MOA (JBER-MOA-216) was finalized on 22 March 2015.

#### 7.1.3.5 National Oceanic and Atmospheric Administration National Marine Fisheries Service

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 7.5.2, *Protection of the Cook Inlet Beluga Whale on JBER*) and is a key partner in implementation of this plan.

#### 7.1.3.6 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.

#### 7.1.3.7 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.

### 7.1.4 State Agencies

JBER partners with state agencies for natural resources management support, including agencies discussed below. Accredited conservation representatives of state agencies furnishing professional advice and technical assistance under this plan will be allowed access to JBER, in accordance with appropriate security arrangements.

#### 7.1.4.1 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 Cook Inlet Management Area for fisheries and Game Management Unit 14C for wildlife. The ADF&G assists JBER in fish and wildlife management. ADF&G is actively involved in fish stocking, moose management, wildlife conflict and BASH management.

The ADF&G Habitat Division is responsible for issuing permits for activities that may impact anadromous/diadromous 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.

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." More collaborative discussions with ADF&G will occur in 2014 with the possibility of finalizing additional cooperative agreements.

#### 7.1.4.2 Alaska Department of Natural Resources

**Division of Forestry**

The Division of Forestry (DOF) is responsible for fire suppression on all lands, regardless of ownership, in the southern half of Alaska. 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.

**Plant Materials Center**
The Plant Materials Center has the skills to assist or advise JBER on habitat enhancement, rehabilitation, or maintenance. Historically, the Plant Materials Center has grown seedlings from seeds collected on JBER for re-vegetation projects.

#### 7.1.4.3 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 and disposal of solid or hazardous waste.

### 7.1.5 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 14, 2006) and the new 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 Native Alaskan tribal governments to provide meaningful and timely input on actions or policies that might be of tribal 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 Denaina 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. A Memorandum of Agreement between JBER and the Native Village of Eklutna ((JBER-MOA-316, 18 May 2010) formally recognizes the government-to-government relationship and mutual areas of concern and support. Two federally recognized Denaina villages, Eklutna Native Village and Knik Village, are primary points of contact for Native Alaskan consultation. JBER also consults with local Alaska Native corporations when issues are relevant.

### 7.1.6 Universities
JBER partners with universities for natural resources management expertise through a Corp of Engineers cooperative agreements. Experts from universities have provided specialized knowledge needed to effectively manage natural resources on JBER lands.

### 7.1.7 Contractors
Private contractors are important to all facets of military installation management as the DoD continues to scale back the number of federal employees. JBER uses contractors for many programs associated with

natural resources, such as NEPA documentation, natural and cultural resources surveys, implementation of the BASH program, water quality studies, and INRMP preparation.

### 7.1.8 Other Interested Parties

Non-governmental organizations play an important role in the management of natural resources on JBER. FRA partnered with The Nature Conservancy to evaluate regional ecosystem management. FRA also participated on the Alaska Invasive Species Council. JBER participates with the Boreal Partners in Flight; a partnership of federal and state agencies, educational institutions, and non-governmental organizations committed to managing neo-tropical migratory birds. Other interested parties may include Anchorage Waterways Council and JBER Citizen Environmental Board and various neighborhood community councils.

**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 coordinate with Anchorage, which controls air quality permits for any planned prescribed burns on JBER.

## 7.2 Ecosystem Management

### 7.2.1 Policy and Background

Ecosystem management philosophy, policy, and background are discussed in Section 2.4, *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
5. Evaluating conflicts in land use issues
6. Specification of the land use mosaic
7. Regional management efforts

### 7.2.2 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 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 forging partnerships with various agencies to manage its natural resources. Major partners in the implementation of this plan are BLM, USFWS, and ADF&G. Other partners in this effort include the Alaska Department of Natural Resources, NMFS, universities, 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. 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 U.S. 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.

> **Task 7.2.2:** Review and update all cooperative agreements and memorandums of agreement/understanding (listed in Appendix G c) to reflect joint basing. Timeframe: 2015
> Specifically:
> - Determine the need to establish partnerships e.g., cooperative agreement with ADF&G regarding moose and fisheries management.
> - Finalize BLM MOA providing forest stewardship agreement ensuring the long term ecological sustainability of withdrawn and fee simple lands.
> - Explore the possibility of establishing a USFWS boreal bird monitoring MOA.

### 7.2.3 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 (Schick et al. 2003, draft).

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 7.2.3 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 or threatened by the USFWS, NOAA and/or ADF&G or are protected under the Marine Mammal Protection Act (MMPA). 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 7.2.3. Potential JBER Monitoring Species**

| Group | Species | Ecotypes Represented | Species Category |
|---|---|---|---|
| Mammal | Little Brown Bat | Human modified, Upland, Lowland | M, L |
| Mammal | Gray Wolf | All but Human modified | M, K |
| Mammal | Lynx | Upland, Lowland, Subalpine | K |
| Mammal | Wolverine | Alpine, Subalpine, Upland | M |
| Mammal | Harbor Seal | Coastal | L |
| Mammal | Harbor Porpoise | Coastal | L |
| Mammal | Black Bear | Upland, Lowland, Subalpine | M |
| Mammal | Brown Bear | All but Human Modified | M, K |
| Mammal | Beluga Whale | Coastal | L, I |
| Mammal | Moose | All but Pavement | M |
| Mammal | Dall's Sheep | Alpine | M |
| Mammal | Beaver | Lowland, Riverine | K, M |
| Mammal | Microtines | All but Pavement | I |
| Mammal | Collared Pika | Alpine | I |
| Mammal | Snowshoe Hare | Upland, Lowland, Subalpine, | K, M, I |

| Group | Species | Ecotypes Represented | Species Category |
|---|---|---|---|
| | | Riverine | |
| Bird | Canada Goose | Lowland | M |
| Bird | ***Trumpeter Swan | Lowland | L |
| Bird | All grouse species | Upland, Subalpine, Alpine | M |
| Bird | Loons (Common and Pacific) | Lowland | I |
| Bird | Bald Eagle | Upland, Lowland, Riverine | L, M |
| Bird | Northern Goshawk | Upland | I |
| Bird | ***Golden Eagle | Alpine | L |
| Bird | Sandhill Crane | Coastal, Lowland | M |
| Bird | *Solitary Sandpiper | Upland, Lowland | L |
| Bird | *Lesser Yellowlegs | Lowland | L |
| Bird | Boreal Owl | Upland | I |
| Bird | *Olive-sided Flycatcher | Upland, Lowland | L |
| Bird | American Dipper | Riverine | I |
| Bird | **Varied Thrush | Upland, Subalpine | I |
| Bird | **Blackpoll Warbler | Upland, Subalpine | L |
| Bird | ***Townsend's Warbler | Upland, Riverine, Subalpine | L |
| Bird | White-crowned Sparrow | Upland, Subalpine | I |
| Bird | Golden-crowned Sparrow | Subalpine | I |
| Bird | *Rusty Blackbird | Lowland | L |
| Amphibian | Wood Frog | Lowland, Upland | I |
| Fish | Northern Pike | Lowland, Riverine | K, I |
| Fish | Coho Salmon | Lowland, Riverine | K, M, I |
| Fish | Sockeye Salmon | Lowland, Riverine | K, M, I |
| Fish | Rainbow Trout | Lowland, Riverine | M |
| Insects | *Odonates* | Lowland, Riverine | I |
| Vascular Plant | *Prunus padus* | Lowland, Riverine | I |
| Vascular Plant | *Picea glauca* | Upland | M |
| Vascular Plant | *Betula papyrifera* | Upland | K, M |
| Vascular Plant | *Viola selkirkii* | Alpine | L, # |
| Vascular Plant | *Taraxacum carneocoloratum* | Alpine | L, # |
| Vascular Plant | *Saxifraga adscendens ssp. Oregonensis* | Alpine | L, # |
| Vascular Plant | *Vicia cracca* | Upland, Human modified | I |
| Vascular Plant | *Phalaris arundinacea* | Human modified, Lowland, Riverine | I |
| Vascular Plant | *Hieracium aurantiacum* | Upland, Human modified | I |
| Vascular Plant | *Elodea canadensis* | Aquatic | I |

* U.S. Fish and Wildlife Service ** 2010 Audubon Watch List
*** Bureau of Land Management # Needs research

### 7.2.4 Inventory and Monitoring Programs

#### 7.2.4.1 Inventory

**Remote Sensing and GIS Monitoring and Assessment Program on JBER**
JBER has established long-term vegetation 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.

> **Project 7.2.4.1**: Long-Term Ecological Trend Monitoring. Timeframe: every three years starting in 2012 and continuing in 2015, 2018, 2021, etc.

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 (see Table 7.2.3). Desktop analysis and image scanning are planned to be complete by 2014. 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.

The management concept discussed above enables the monitoring of ecosystem health and change on JBER, focusing on vegetation. Managing in this way allows JBER to articulate and map the vegetation and habitat associated with priority management species. Working with established scientists and biologists, the habitat required and preferred by a suite of wildlife, particularly those having management implications, can be monitored and management guidelines as a function of habitat loss or conversion can be articulated. Ground surveys are needed to provide resolution to questions of diversity, abundance, and occupancy of the identified habitats. Field monitoring will be completed as needed to provide the necessary feedback as new information is included.

> **Task 7.2.4.1**: Perform on-the-ground vegetation/wildlife surveys to provide resolution to questions of diversity, abundance, and occupancy of the habitats identified through remote sensing or other appropriate techniques. Timeframe: 2012 - 2016 and as needed thereafter.

Through a cooperative agreement with APU, JBER is looking at modeling species and habitats. It is hoped that minimally, we will have a model for Pika and also for volume estimation of the forest (based on data collected in 2013) in working condition by 2017.

- Currently, JBER is establishing the baseline monitoring portion against which future trend and effectiveness monitoring will be compared.

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 monitoring, trend monitoring, and effectiveness monitoring.

Baseline monitoring is an initial inventory of resources. Monitoring in general, and trend monitoring in particular, 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. All three types of monitoring will be used in the JBER inventory and monitoring program.

#### 7.2.4.2 Monitoring

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 7.2.3. The following species sections are currently employed survey/monitoring technologies applied to the priority JBER species. As monitoring survey techniques are identified or refined they will be incorporated into subsequent INRMP revisions. Appendix H has additional information on JBER monitoring/management programs, protocols, and results.

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.

> **Task 7.2.4.2.1**: Incorporate priority species monitoring data into ecotype (habitat) classes and develop a map with key habitats highlighted to be used for management and land use recommendations. Timeframe: 2012 - 2016 and as needed thereafter.

Species currently in monitor status includes: beluga whale, microtines, collared pika, loons, Bald Eagle, Rusty Blackbird, wood frog, Pacific salmon, European bird cherry, paper birch, reed canary grass, orange hawkweed, Canada thistle, and elodea.

CIBW health and behavior, among other things, monitoring is conducted on JBER. Section 7.5.2, *Protection of the Cook Inlet Beluga Whale on JBER* discusses CIBW monitoring and management. Appendix J includes CIBW study protocol and results.

Scientifically-sound inventory and monitoring protocols are needed to gather accurate population and habitat information that serves as the foundation for effective natural resource management objectives. 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 and conflict wildlife, etc.), and;
- develop statistically valid inventory and monitoring protocols for future efforts, stressing cohesion among projects, departments, and outside agencies.

**Project 7.2.4.2.1**: Natural Resources Inventory and Monitoring Protocol Development. *Long-term Monitoring Protocols: Vegetation, Birds, and Small Mammals*. Timeframe: funded – FY12; Completed - FY13; Refined – FY14; To be updated – FY15

**Task (in-house) 7.2.4.2.2:** Monitoring vegetation, birds, and small mammals according to long-term protocols. Timeframe: ongoing

Scientifically-sound inventory and monitoring protocols are needed to compare and validate changes to justify future management actions. Annual review of data collection, methodology, and recommendations for adaptive management are necessary. Baseline development in this effort was addressed in a 2013 project titled Long-Term Ecological Trend Monitoring.

**Project 7.2.4.2.2**: MGT, Inventory and Monitoring Statistical Oversight. Timeframe: annually beginning in 2014 following completion of a survey-inventory protocol plan.

ADF&G and JBER will annually evaluate the need to monitor brown and black bear because of their importance to the ecosystem (keystone species) or to man (*e.g.* economic, subsistence, wildlife conflict issues) and their sensitivity to management activities. Black and brown bears are difficult and expensive to monitor. Monitoring possibilities include scent stations, photographic scent stations, hair snare stations and individual DNA identification, mark and recapture using traps to capture and dogs or camera scent stations for recapture, and track counts. Levels of nuisance bear activity cannot be used as a reliable indicator of bear populations, as many other factors, such as natural food availability or habituation levels of bears, can have an effect on nuisance bear activity levels. The bear study report completed in 1997 recommended that several types of monitoring be conducted as a check against inaccurate censuses.

Currently, Natural Resources personnel monitor both nuisance bear activity and bear sightings, but annual numbers of sightings offer only rough indicators of bear population trends 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. Funding and availability of drugs to capture and process bears has become difficult. Mark-recapture calculations using camera and hair snare monitored scent stations may be practicable with continued bear capture and collaring. If the number of collared bears at any given time is known, a ratio can be determined and calculations can be performed using the Lincoln-Peterson estimator. Data useful for population estimates are not currently available.

In spite of cyclic populations, 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. Snowshoe hare and lynx are inventoried on JBER through winter track surveys (Golden 1993). Procedures and results of snowshoe hare inventories are summarized in Appendix H. Monitoring of this species is presently discontinued due to staffing and funding constraints.

The collared pika (*Ochotona princeps*) was selected as an indicator species due to its interrelationship with the alpine ecotype. A collared pika survey will be performed on JBER.

**Task 7.2.4.2.3:** Conduct a collared pika survey in alpine areas on JBER. Timeframe: 2016.

Little brown bats are the only known species of bat on JBER, but presence of their maternal roosts has not been documented. If maternal colonies are identified, protection and monitoring programs will be initiated. If any mines, caves, or buildings are found to house bats, notices will be posted to ensure proper sanitation of clothing and equipment to prevent introduction of the *Geomyces destructans* fungus. JBER will work and coordinate with USFWS and ADF&G to ensure protection of bats and to prevent the fungus introduction.

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 and labor constraints will likely limit in-house surveys. JBER staff is interested in facilitating future bat research by other agencies on JBER lands.

Moose were selected for monitoring largely based on their importance as a hunted big game species on JBER. Monitoring of this indicator species requires population numbers and composition to assess productivity. Winter browse use must also be monitored to ensure habitat-to-population levels are compatible. The JBER moose herd is typically aerially surveyed each fall/early winter by ADF&G and JBER Natural Resources staff. Annual surveys of this herd, whose range includes JBER and Ship Creek in Chugach State Park, have been attempted in most years since the 1960s. A summary of survey data through 2015 is presented in Appendix H.

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. Recommendations generated from this study will be incorporated in 2015, as appropriate. Moose habitat assessment on JBER should be formalized but must optimize results with available staff resources. The remote sensing and GIS monitoring and assessment program, and future monitoring of long-term vegetation plots, will also document browse use.

**Project 7.2.4.2.3:** MGT, Species, Moose. Timeframe: annually.

**Project 7.2.4.2.4**: MGT, Habitat, Winter Moose Browse Utilization Inventory. Timeframe: baseline inventory - 2013, sub-sampling resurvey - 2014-2016.

An annual beaver census has been conducted in past years through inventory of caches and lodges. Once lodges were counted, an estimated number of beaver per lodge was applied to get an overall population estimate (Sinnott 1995a). Beaver harvest statistics can also be used as a rough trend indicator of population levels from year to year. These data are available through the ADF&G Anchorage office. JBER-Elmendorf harvest is summarized in Appendix H. Continuation of this survey is not planned due to staff funding constraints.

Several bird species selected as indicator species can be monitored with breeding bird surveys through a combination of point counts and roadside surveys (Appendix H). Roadside counts more fairly represent the complete breeding season but are weighted toward developed areas while point counts represent more undeveloped habitats. In addition to fixed stop breeding bird surveys, wetland areas are potential breeding habitat for rusty blackbirds and are visited through the breeding season by Natural Resources staff and Alaska Loon Watch volunteers to record rusty blackbird breeding activities.

**Project 7.2.4.2.5**: MGT, Species, Eagle and Breeding Bird Surveys. Timeframe: annually.

Bald eagles are protected under the Bald Eagle Protection Act, but they also pose a serious BASH risk. Documenting their distribution and population levels on JBER is necessary to support future BASH actions. In 2011, bald eagle surveys conducted with fixed-wing aircraft were begun to identify the locations of all active nests. This survey is conducted prior to leaf-out but late enough that active pairs are sitting on eggs on nests. Subsequent ground checks late in the season (August) can identify productivity. This monitoring system is relatively easy to duplicate with little cost, not exceeding 10 total hours of flying time. Locating and documenting active bald eagle nests is included as part of Project 7.2.4.2.5.

Northern goshawks have narrow habitat type preferences, thus are fairly easy to survey. 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 surveys for presence and productivity of northern goshawks is included as part of Project 7.2.4.2.5

Canada geese within the Bird Exclusion Zone pose BASH risks, and their population level on JBER reflects effectiveness of BASH reduction management and procedures. Fall counts of feeding Canada geese on JBER-Elmendorf have been conducted since 1989. In 1995 spring counts began. Counts are used both as a rough population trend estimate and a means to monitor effects of management activities. Since 1995 considerable data has been compiled concerning geese dispersal. This effort, though modified from original monitoring efforts, is on-going through the dispersal reports provided by USDA-APHIS-WS. USDA-APHIS-WS maintains that database. A contract needs to be developed to generate a goose-use index for JBER using available BASH data. The index will be evaluated for effectiveness at measuring BASH program effectiveness.

Common and Pacific loons are visually monitored on JBER each year, including nesting success using Alaska Loon Watch volunteers (Appendix H). Loon Watch volunteers report their results through the USFWS, per the ADF&G Conservation Action Plans.

**Task (Volunteers) 7.2.4.2.5:** Conduct visual monitoring of common and Pacific loons, and red-throated and horned grebes using Alaska Loon Watch volunteers. Timeframe: annually.

Owls were identified as potential 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. Owl cavities also often occur in advanced successional stage boreal forests. Boreal and other owls are monitored with breeding season call surveys using techniques recommend by Andres (2001). Surveys are conducted on established routes that provide coverage of most of JBER-Elmendorf (Appendix H). These surveys have been instrumental in identifying the presence of these difficult to observe species. Continuation of owl surveys will occur once the biological staff lost in 2013 level is replaced. Replacement of the biological staff did not occur in 2014, therefore, the surveys are not anticipated to resume in the near future.

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 (Appendix H). 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.

> **Project 7.2.4.2.6**: MGT, Species, Wood Frog Baseline Survey. APU developed a protocol and completed a survey in 2013. Natural Resources staff will determine the feasibility and methodology of this survey effort. Timeframe: 2014.

Sockeye and coho salmon, as well as other salmon species, have been annually enumerated at the Sixmile Creek fish weir since 1988 (Appendix H). In 1998 this weir was moved to near the entrance to Lower Sixmile Lake and is still used to enumerate salmon. Pink and chum salmon, near-intertidal spawners, are enumerated by stream walk counts. Stream walks consist of three people, two conservation officers and another person focused solely on counting fish, starting at the mouth of Sixmile Creek. All three walk upstream trying to stay out of the water as much as possible. The person counting the fish should be wearing polarized sunglass and be equipped with a Rite-in-the-Rain note pad. In the note pad, the counter tallies by species the number of salmon and whether each salmon is alive or not. The salmon are counted all the way to the bottom of the fish ladder on Lower Sixmile Lake. Enumerating pink and chum salmon through stream walks is presently discontinued due to staffing and funding constraints. Salmon smolt production from Sixmile Lake has been monitored periodically since 2003 using a fyke net weir under the outlet bridge. Adult salmon escapement will continue to be monitored annually. Out-migrating smolt monitoring became periodic after 2006, resumed again during the 2009-10 field season with ADF&G and JBER personel took over the monitoring of the out-migrating smolt in 2012.

In 2011, JBER personnel started monitoring the salmon returning to Eagle River. Monitoring equipment consists of a Dual Frequency Identification Sonar (DIDSON) and a fish wheel. The DIDSON allows for the enumeration of the salmon, while the fish wheels allows for the species apportionment. Eagle River is a challenging environment and during the 2013 season, a flooding event occurred which caused the loss of the DIDSON stand and the weir associated with the stand. Therefore, the data collected from the DIDSON for 2013 is limited.

In the past, JBER personnel have conducted annual streamside surveys of adult coho salmon in South Fork Chester Creek as it exits JBER lands to determine timing and abundance of spawning coho in addition to delineation of important spawning areas along the stream. In the past, streamside salmon surveys were conducted in tandem with the collection of brown bear hair for the brown bear population estimation component of the brown bear telemetry project, an example of the kind of project synergy that JBER endeavors to exploit whenever possible.

In the past, JBER personnel have also conducted annual streamside surveys along North Fork Campbell Creek on JBER lands to determine timing and abundance of spawning sockeye, coho, and Chinook salmon in addition to delineation of important spawning areas along the stream.

Historically, Northern pike have been confirmed in two lakes, Otter and Gwen, although Gwen Lake experiences heavy winter die-off and is currently not thought to harbor pike. 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 are likely to be highly impacted. The presence/absence of pike in JBER lakes is monitored (Appendix H). Section 7.4.2, *Fisheries Management* includes discussion of the Otter Lake/Creek restoration project, which includes removal of all pike from the system. Delineation of potential prime pike spawning and rearing locations will be accomplished for all JBER water bodies.

> **Project (In-house) 7.2.4.2.7:** Invasive Pike Survey. Timeframe: 2014 and 2016, as funding and staffing allows.

Macro-invertebrates were identified as important indicator species, and they have been identified in the ADF&G Comprehensive Conservation Strategies Conservation Action Plans. Water quality in wetland habitats was identified as an important habitat type. The dependence of insects on water quality is well established. The order Odonata was selected for lentic aquatic systems due to their visibility and ease of sampling in both larval and adult stages. Notable also is their importance as food to rusty blackbirds during nesting. Baseline data for this group of insects, however, is absent 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.

> **Project 7.2.4.2.8**: Macroinvertebrate Survey and Monitoring. Timeframe: 2014 and 2015.

Five invasive vascular plants are included as JBER indicator species; *Prunus padus*, *Vicia cracca*, *Phalaris arundinacea, Hieracium aurantiacum,* and *Elodea canadensis*. These species were chosen as indicators to track ecosystem health or status on JBER. Any vegetative surveys performed on JBER should include documentation of the presence, abundance, distribution, and condition of these indicator species.

Other species included as potential JBER monitoring species (Table 7.2.3) and not discussed above, will generally be inventoried or monitored incidental to projects and tasks specified above. However, as funding and manpower become available specific tasks or projects may be developed for these species during 2015-2017. No additional monitoring is planned in 2014.

Staffing, in addition to Natural Resources federal employees, is required to accomplish tasks included above as well as tasks identified in other sections of the INRMP. Outside expert support will provide professional technical services for natural resources. The technical support will provide JBER land managers the ability to maintain a healthy and diverse ecosystem necessary to provide realistic military training by sustaining the natural infrastructure to support military readiness, training, and operations. The specific focus of the services include resource inventory and monitoring of forest ecology and wildfire risk; watershed and wetland survey/delineation support; ascertain wildlife population trends and habitat conditions; monitor brown/black bear, wolves, moose, beluga whales, public encroachment, and human/wildlife conflicts; and monitor and modify habitat conditions to maximize training opportunity.

> **Project 7.2.4.2.9:** Contractor Support, CN, (Fisheries). Timeframe: annually.

**Project 7.2.4.2.10:** Contractor Support, CN, (Forestry). Timeframe: annually.

**Project 7.2.4.2.11:** Contractor Support, CN, (Land MGT). Timeframe: annually.

**Project 7.2.4.2.12:** Contractor Support, CN (REC/Outreach/Volunteer MGT). Timeframe: annually.

**Project 7.2.4.2.13:** Contractor Support, CN, (T&E). Timeframe: annually.

**Project 7.2.4.2.14:** Contractor Support, CN, (Wildlife). Timeframe: annually.

### 7.2.5 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 7.10.8.6.

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 Chapter 8 and Appendix A. Authority for annual updates to project and budget endorsement should be delegated to the Commander 673d Civil Engineer Group to expedite this process. Yearly reviews and revisions 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.

**Task (In-house) 7.2.5.1:** Delegate authority for annual INRMP update to projects and budgets to the 673d Civil Engineer Group Commander.

During 2011, INRMP review meetings were held with cooperating agencies, native representatives, and local community representatives (Appendix C).

**Task (In-house) 7.2.5:** Plan Update, INRMP. Timeframe: annually.

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 many cases, the annual INRMP review and update will keep the plan current and negate the requirement for a costly major revision.

> **Task 7.2.5.2:** Conduct annual external reviews for operation and effect and prepare INRMP updates and revisions as necessary based on results of these reviews. Timeframe: ongoing

## 7.3 Geographic Information System

### 7.3.1 Policy and Background

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 specifys 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 hard copy of the digital data.

### 7.3.2 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.

The U.S. Army Garrison Alaska (USAG-AK) GIS contained a multitude of data layers similar to the existing data in the JBER database. The USAG-AK GIS was one of three management components of the decision support system used by USAG-AK. The other two components were the Range Facility Management Support System and Integrated Facility System. FRA's GIS data has been combined/integrated with the former EAFB's GeoBase data into the JBER GeoBase geodatabase. 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.

The Army's Range Facility Management Support System is a multi-user, personal computer, web-based software package that automates the real property inventory, scheduling, firing (operations) desk, and management functions at an installation Range Control Center. The Range Facilities Management Support System was developed to optimize the scheduling, use, and operations and maintenance functions for FRA's live-fire ranges, maneuver training areas, and other related training facilities and assets. This system will remain active under Range Control at JBER. ITAM GIS layers have been incorporated into the JBER GIS. These include the military operations feature data sets with data such as live fire range areas, military restricted access areas, impact areas, and surface danger zones associated with the various weapon systems soldiers are train on. The GIS component of the ITAM program is discussed in Section 7.6, *Integrated Training Area Management*.

The Army's Integrated Facility System is a facility engineer automated information evaluation system that encompasses life cycle management of real property resources, and is the official source of real property information on Army installations. In addition to real property information, the system performs a wide variety of other functions, such as work estimating and work order tracking. The Army's Integrated Facility System data will be incorporated into the Air Force's Automated Civil Engineering System. This data includes all the common installation picture feature data sets within the JBER GeoBase geodatabase, such as roads, buildings, and installation utility (gas, electric, water, and wastewater) data.

Both JBER-E and JBER-R have used GeoBase data and information to support numerous mission objectives including improvement of land and resource management decisions. Now combined with USAG-AK GIS data sets, GeoBase provides a valuable JBER planning tool. It will eventually incorporate 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.

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.

> **Task (In-house) 7.3.2:** Analyze GIS data to support natural resources management by evaluating development and use impacts on natural resources and documenting and tracking resource management actions. Timeframe: on-going.

### 7.3.3 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.

> **Project 7.3.3:** Use out-sourcing or secure contract to acquire the necessary INRMP data layers. Timeframe: 2015.
>
> **Task (In-house) 7.3.3:** Require that contracts that go to outside agencies or contractors include a clause that any spatial data developed from the study is incorporated into a compatible GIS format, and that Natural Resources will get digital and hard copies of data. Timeframe: annually.

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* (October 2007).

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.

## 7.4 Fish and Wildlife Management

### 7.4.1 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 B). 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; this translates into functional ecosystems that 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.

Population management includes working with ADF&G, which establishes hunting, trapping, and fishing regulations and harvest objectives, stocks fish in JBER lakes, controls nuisance animals, conducts habitat enhancement, and coordinates other projects to conserve and enhance game and nongame populations. Wildlife populations will be managed in accordance with the objectives set forth in this INRMP. A discussion of the history of natural resources management on JBER is in Appendix I.

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 7.2.4)
- Policies, Programs, and Methods Used to Control Feral Animals (Section 7.4.3.2)
- Wildlife Pest Problems and Techniques Used for Wildlife Control (Sections 7.4.3.2, 7.14, and 7.15)
- Migratory Bird Management (Section 7.5.4)
- Hunting and Fishing Program Organization and Management (Section 7.16)
- Permitted Access for Hunting, Fishing and Wildlife Related Outdoor Recreation (Section 7.16.2)
- Demand for Hunting, Fishing and Non-Consumptive Resource Uses (Section 7.16.3)
- Hunting and Fishing Policy, Regulations and Fee structure (Section 7.16.3.8)
- Natural Resources Law Enforcement (Section 7.19)
- Watchable Wildlife Areas (Section 7.20)
- Wildlife Education and Interpretive Programs (Section 7.20)

### 7.4.2 Fisheries Management

#### 7.4.2.1 Non-Anadromous Fisheries

Lakes and ponds occurring on JBER are discussed in Section 4.5.2.1, *Freshwater Lakes and Ponds*. JBER lakes include Upper and Lower Sixmile, Spring, Hillberg, Fish, Triangle, Green, Otter, Clunie Thompson, Waldon and Gwen lakes. These lakes vary in size between 3 and 124 acres (Table 4.5.2.1). Most are relatively shallow with the exception of Otter and Clunie Lakes that attain 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. Other bodies of water, which have only small numbers of fish, include the golf course cooling pond and Oval Lake. Rainbow trout concentrate along the shores of JBER lakes in spring and attempt to spawn, but due to inadequate spawning habitat, no spawning takes place. Past studies of JBER lakes have found slow growth for fish in Clunie and Thompson lakes, possibly due to tapeworms that were frequently found in the intestines of fish from those lakes.

**Task (In-house) 7.4.2.1.1:** Install signs regarding invasive species and preventing their spread (ie. northern pike, quagga and zebra mussels, and *Myxobolus cerebralis*). This task is included in Section 7.20, *Public Outreach*). Timeframe: 2014

**Otter and Clunie Lakes**
Otter and Clunie lakes attain depths of over 30 feet and may contain warm springs that provide sufficient oxygen levels for supporting fish over winter. There is historical evidence of rainbow trout spawning in Otter Lake (capture of juvenile rainbow trout), but no such observations have been recorded in recent years; northern pike are believed to be the reason for this. 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 obstructions to salmon passage, enhance spawning habitat, and reintroduce salmon into the system. Baseline data was collected in 2011-2012. Otter Lake does connect to the saltwater via Otter Creek which flows into Eagle River. 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. Despite historic evidence of salmon presence, however, there is no evidence of anadromous fish reaching Otter Lake in recent years. This is likely due to the presence of several large beaver dams on Otter Creek downstream from the lake which appear to act as impermeable barriers to adult salmon which have been observed spawning (coho salmon) below the dams in Otter Creek. See Section 7.2.4.1, *Monitoring* regarding monitoring pike.

Clunie Lake does not have connectivity with the saltwater despite a small stream at its outlet. There is also no evidence that the stream or lake ever supported anadromous runs of salmon.

**Task 7.4.2.1.2:** Continue the project to rotenone Otter Lake/Creek waters to remove all pike, remove obstructions to salmon passage, enhance spawning habitat, and reintroduce salmon into the system; and complete collection of baseline data. Timeframe: 2012-2016.

**Green Lake**
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. At extreme high water there could be connection and future hydrologic modification could return the system to anadromous. A feasibility evaluation of restoring some degree of anadromy is scheduled (See Task 7.4.2.2).

**Thompson and Waldon Lakes**
Thompson and Waldon lakes are smaller in surface area than Green Lake and are not as deep as Otter or Clunie lakes. They are therefore marginal in supporting over-wintering fish stocks. Some years no fish survive over winter in these lakes.

**Gwen Lake**
Gwen Lake supports a large population of fresh water amphipods in summer that provide a rich food source for fish stocks. The amphipod population is thought to flourish due to the fertilizer effect of winter-killed fish stocks. Rainbow trout, stocked by ADF&G, in Gwen Lake grow faster and put on weight at higher rates than in any other lake in south-central Alaska.

### 7.4.2.2 Anadromous Fisheries

**Ship Creek**
Ship Creek is the only anadromous creek on JBER that runs through developed lands, 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 crosses onto JBER-Elmendorf, 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 dams. ADF&G fishery enhancement programs for coho and Chinook salmon have resulted in increased numbers of fish returns to lower Ship Creek. Upstream of the golf course, fish are limited to small rainbow trout and possibly Dolly Varden. Upstream activities on 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-E, the Air Force would not be required to allow salmon escapement above the existing dam.

During the fall of 2014, it was discovered that coho salmon are using a small side channel found on Eagleglenn Fitness Park to spawn. There is no other information regarding how long these salmon have been utilizing the small side channel or if it is even a viable spawning location. It is thought that these were once/are hatchery fish that found this small channel and are trying to utilize it for spawning. The channel itself is very shallow and there is little to no good spawning substrate.

**Otter Creek**

This creek connects Otter Lake to Eagle River. Historically adult salmon used this creek to migrate into Otter Lake. Juvenile salmonids appear to use the majority of this creek, to include the tidally influenced reaches as well as the upland section below the lowest beaver dam, as a rearing area. Little further information is available. This creek is currently closed to fishing. Opening Otter Lake/Creek to salmon fishing will be considered once restoration project is completed and an excapment goal has been set.

**Sixmile Creek**

Upper and Lower Sixmile lakes, and the one-mile stretch of Sixmile Creek that connects them to the Cook Inlet, are managed as one system. This anadromous system is home to annual runs of sockeye, pink, and small numbers of coho salmon each year. It is also home to rainbow trout and three-spine stickleback. Lower Sixmile Lake is the only JBER Lake that is not stocked. Upper Sixmile Lake is stocked occasionally with triploid (sterile rainbow trout). These lakes are managed as a trophy trout fishery, and rainbows up to 27 inches have been taken from this system. Trout populations in both lakes appear to be stable, and adequate spawning takes place.

This one-mile stretch of stream connects Lower Sixmile Lake with Cook Inlet. Sockeye and coho salmon, as well as other salmon species, have been annually enumerated at the Sixmile Creek fish weir since 1988 (Appendix H). In 1998 this weir was moved to near the entrance to Lower Sixmile Lake and is still used to enumerate salmon. Pink and chum salmon, near-intertidal spawners, are enumerated by stream walk counts. Salmon smolt production from Sixmile Lake has been monitored periodically since 2003 using a fyke net weir under the outlet bridge. Adult salmon escapement has been monitored annually, but out-migrating smolt monitoring became periodic after 2006. No fishing is allowed in this stream upstream from the high tide marker at the mouth of the creek where it runs into the Cook Inlet. See Section 7.2.4.1, *Monitoring* regarding enumeration of salmon near the entrance to Lower Sixmile Lake, monitoring adult and smolt out-migration from Sixmile Lake, and conducting stream walk counts on Sixmile, South Fork Chester, and North Fork Campbell creeks. Management efforts will focus on improving data on salmon runs and lake productivity and improving spawning habitat and passageways for migratory salmon. When the CIBW became listed as endangered, four species of Pacific salmon (Chinook, chum, coho, and sockeye) were identified as one of five primary constituent elements deemed essential for CIBW survival and recovery. CIBW critical habitat comes up to the mouth of Sixmile Creek. The importance of salmon necessitates a thorough monitoring process and enhancement actions that benefit salmon and the CIBW.

Current monitoring actions include smolt outmigration and adult escapement species identification and temporal enumeration

> **Project 7.4.2.2.1:** MGT, Species, Beluga Prey. Enumerate salmon species near the entrance to Lower Sixmile Lake and monitor adult and smolt out-migration from Sixmile Lake. Timeframe: annually.

Salmon appear to be fully utilizing all existing spawning redds in the 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.

**EOD Creek**

Coho salmon smolts were observed trapped in EOD Creek, just north of Sixmile Creek, during a wildlife survey in 1983 (Rothe *et al*. 1983). Little further information is available, but its size and substrate suggest poor spawning habitat. This small creek is closed to fishing.

**Chester 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.

JBER personnel have periodically conducted annual streamside surveys of adult coho salmon in South Fork Chester Creek as it enters JBER lands to determine timing and abundance of spawning coho in addition to delineation of important spawning areas along the stream. Data generated from this survey has been used for a variety of management decisions.

In the summer of 2014, JBER had a contractor investigate the number of out-migrating smolts from lower Chester Creek. The enumeration results of the out-migrating smolts are expected in 2015.

**North Fork Campbell Creek**

North Fork Campbell Creek is closed to salmon fishing on JBER. Four species of salmon adults or smolts have been recorded within JBER waters: Chinook, coho, pink and sockeye. JBER personnel have periodically conducted annual streamside surveys along North Fork Campbell Creek on JBER lands to determine timing and abundance of spawning sockeye, pink, coho, and Chinook salmon in addition to delineation of important spawning areas along the stream. Surveys started at the footbridge on Bulldog Trail and proceed upstream for approximately 100 yards past the last observed salmon and downstream to the installation boundary. ADF&G monitors the trend in salmon populations and spawning habitat selection as state management activities change.

**Eagle River**

Eagle River and its tributaries support habitat for all five species of Pacific salmon as well as a variety of other fish species. Army and Air Force personnel sampled the tidally influenced portions of Eagle River and its tributaries within ERF between 2007 and 2011 and captured the following fish and macroinvertebrate species: chum salmon (*Oncorhynchus keta*), coho salmon (*Oncorhynchus kisutch*), pink salmon (*Oncorhynchus gorbuscha*), sockeye salmon (Oncorhynchus nerka), Chinook salmon (*Oncorhynchus tshawytscha* ), 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, saffron cod (*Eleginus gracilis*), eulachon[1] (*Thaleichthys pacificus*), snailfish (*Careproctus spp*), rainbow smelt[2] (*Osmerus mordax*), polychaete worms and sand shrimp (*Crangon spp*).

Eagle River on and above JBER has access areas that provide fishing opportunities, but ADF&G has limited information on fish populations using that system. The importance of this system for CIBW recovery and the criticality of the Eagle River Flats for military training demands research to document and monitor fish species present in this system (see Project 7.4.2.2.2). During summer 2011, Natural Resources staff installed a DIDSON and a fish wheel to monitor the fish populations. 2011 was the pilot year with limited data collected. Within the next 10 years, a population trend should occur. Natural Resources partners with ADF&G to better define and understand salmon population trends in this system.

> **Project 7.4.2.2.2:** MGT, Species, Beluga Whale Prey. Enumerate salmon species in Eagle River. Timeframe: annually
>
> **Task (In-house, w/ADF&G) 7.4.2.2:** Consider the feasibility of restoring the anadromy to or creating a terminus run in the Green Lake or another system. Timeframe: by 2017

### 7.4.2.3 Saltwater Shoreline

The 20-mile JBER stretch of shoreline falls under state jurisdiction below the tide line for management purposes. However, JBER is seeking an MOU with the State of Alaska to enforce state fishing and hunting regulations in this area. JBER management activities are limited to enforcement of saltwater fishing regulations and protection of marine mammals and salmon habitat only as it occurs from within JBER boundaries.

The entire stretch of JBER saltwater shoreline is open to fishing under state saltwater fishing regulations; however, land-based access is restricted. 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. Exact numbers of salmon harvested here are unknown. To understand how many salmon are being taken from JBER, creel surveys are periodically conducted. These surveys will be conducted through the electronic recreational access permit system with traditional creel surveys as a check. Enforcement of fishing regulations at this site is complicated due to land status.

> **Task 7.4.2.3:** Monitor the fishery through creel checks and expand checks to include the mouth of Sixmile Creek, other popular fishing areas, and saltwater fishery through the electronic recreational access permit system. Timeframe: annually.

### 7.4.2.4 Native Trout Fisheries

The trout fishery in the Sixmile system appears to be stable and apparently has adequate numbers and size of fish and some spawning habitat. However, little data exists, and more study of this system will be

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[1] Only a single eulachon was captured at the mouth of Eagle River and was likely bound for another system. A eulachon run has not been observed in Eagle River to date.

[2] Only a single rainbow smelt was captured at the mouth of Eagle River and was likely bound for another system. A smelt run has not been observed in Eagle River to date.

considered. Trout fisheries in other lakes depend on the stocking program as little spawning habitat exists there. Occasionally larger fish are caught, but it is believed that most stocked fish are caught each year.

**Project 7.4.2.4:** Rainbow Predation Rates, Sixmile Salmon Smolt. Timeframe: 2016.

### 7.4.2.5 Stocking Program

JBER is part of the ADF&G Anchorage Management Area for sport fisheries. There are 30 stocked lakes in this management area with nine 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 and landlocked salmon

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. Stocking levels diminished in response to the loss of hot water from the power plants as a result of the slower growth rate of trout. Also, in 2006 landlocked salmon were not stocked in JBER lakes because the entire cohort of fingerlings at the Ft. Richardson hatchery was destroyed due the presence of disease.

Beginning in 2009, hatchery operations were substantially reduced to accommodate construction of a new hatchery on JBER-E. The new hatchery was up and running as of June 2011. The stocking program is operated at no cost to JBER through an agreement with ADF&G. JBER will continue to lease the land at the hatchery site to ADF&G.

**Task (In-house) 7.4.2.5:** Review and comment on ADF&G annual stocking plan. Timeframe: annually.

### 7.4.2.6 Freshwater Fishing

JBER stocked lakes, portions of Ship Creek, Eagle River, and Chester and North Fork Campbell creeks are open to fishing under state regulations and bag limits. Sixmile, Otter and EOD creeks are closed to fishing. To understand how many fish are being taken from JBER, creel surveys will be conducted. These surveys will be conducted through the electronic recreational access permit system with traditional creel surveys as a check. This is discussed in Section 7.4.2.3, *Saltwater Shoreline* above. Permit requirements are discussed in Section 7.16.3.8, *Outdoor Recreation Permits and Fee Structure*.

### 7.4.2.7 Fish Habitat Improvement

Fish habitat improvements will focus on addressing the limiting factor(s) present in specific systems. For salmon with a freshwater rearing phase, juvenile rearing habitat may be a limiting factor. Winter and summer temperatures and low water can also be factors. Improving habitat could allow both trout and salmon numbers to increase to a new carrying capacity. Primary criteria for selection will be those areas degraded due to human impacts. These improvement projects will eventually increase salmon fishing opportunities on JBER as well as increase potential prey for CIBW.

**Task 7.4.2.7.1:** Conduct habitat improvement projects such as improving trout and salmon rearing habitat, bank stabilization, and restoring damaged or degraded fish habitat. Timeframe: as needed.

**Project 7.4.2.7.1:** MGT Habitat Otter Creek/Lake, Salmon Reclamation. Timeframe: 2016-2017.

Prior to initiating habitat improvements in either lakes or streams, surveys need to be conducted. These surveys will focus on stream/lake water quality as it relates to fish along with fish community richness. These surveys will increase understanding of locations needing habitat improvement and, if possible, to enhance the lake or stream with fish.

> **Project 7.4.2.7.2:** JBER Stream, Lake and Habitat Survey. Timeframe: 2014-2016 and ongoing for long-term monitoring.

Mitigation funds from lost wetlands by the Port of Anchorage have been made available to ADF&G for salmon and wetland enhancement on JBER. ADF&G is committed to treating Otter Lake/Creek waters with rotenone to remove all pike with the available mitigation funding. Planned watershed enhancement efforts include several JBER programmed projects including, Otter Lake treatment and enhancement of spawning redds in appropriate locations.

### 7.4.2.8 Fisheries/Aquatic System Conflict Issues

**Ship Creek Fish Passage Project**

There is a growing public awareness of Anchorage watersheds 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 states that restoring fish passage in Ship Creek is not tied to creating or maintaining the existing recreational fishery, but admits that certain fish passage strategies may affect the fishery. 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 resolved 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. This is discussed further in Section 6.2.2, *Other Impacts*.

> **Task (In House) 7.4.2.8:** Removal of the JBER-R Dam to prevent hazards from ice damming and flooding in the vicinity of the dam. Timeframe: January 2015

**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 confirmed in Gwen Lake, although Gwen Lake experiences heavy winter die-off and is currently not thought to harbor pike. 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 are likely to be highly impacted. Natural Resource personnel plan to monitor for the presence/absence of pike in JBER lakes (Appendix H) and remove as many pike as possible from water bodies harboring pike. This issue is discussed in Section 5.3.6, *Invasive or Deleterious Fish and Wildlife Species*. A determination of the distribution of northern pike on JBER should be completed every other year or 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 USFWS requirements to determine the impact on existing flora and fauna and the installation mission.

In 2010, a project was identified to remove pike and enhance Otter Lake for salmon. This is discussed in Section 7.4.2.1, *Non-Anadromous Fisheries*.

Section 7.4.2, *Fisheries Management* includes discussion of the Otter Lake/Creek restoration project, which includes removal of all pike from the system. Delineation of potential prime pike spawning and rearing locations will be accomplished for all JBER water bodies.

> **Project (In-house) 7.4.2.8.:** Invasive Pike Survey. Timeframe: 2014 and 2016, as funding and staffing allows.

### 7.4.3 Wildlife Management

Wildlife management on JBER consists of managing harvest and protection and management of habitat. Wildlife inventory and monitoring is discussed in Section 7.2.4, *Inventory and Monitoring Programs*, which includes projects and tasks specific to some of the species discussed below. Results of past wildlife inventory and monitoring are in Appendix H.

#### 7.4.3.1 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 the ADF&G maintain population goals. Hunting and fishing, are conducted under regulations promulgated by the ADF&G to ensure that population numbers can be supported by available habitat as well as being able to sustain meeting 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.

> **Task (In-house) 7.4.3.1.1:** Establish a long-term management plan for wildlife populations and habitat, accomplished through annual meetings with our INRMP collaborators and yearly INRMP updates. Timeframe: annually.
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> **Task (In-house) 7.4.3.1.2:** Establish individual population and habitat objectives that are measurable and monitor them. Timeframe: ongoing.
>
> **Task (In-house) 7.4.3.1.3:** Identify and monitor essential habitats that provide for nesting/denning, travel corridors, and other seasonally important habitats, and minimize fragmentation by promoting natural landscapes and connectivity of habitats. Timeframe: ongoing.
>
> **Task (In-house) 7.4.3.1.4:** Integrate wildlife/habitat issues into land-use planning and decision-making processes. Timeframe: ongoing.

JBER monitoring data collected over the years for below wildlife groupings are not readily available and have not been fully assimilated into this document. This will be accomplished during the period covered by this plan. Likewise, harvest data for some below groupings, such as small game and furbearers, are in raw data form and have not been tabulated.

> **Task (In-house) 7.4.3.1.5:** Assimilate JBER monitoring data into this document and tabulate data that is currently in raw form. Timeframe: 2014-2016.

**Black Bear**
Black bears are common on JBER. Black bear populations were estimated at 35-42 bears for the JBER area, excluding cubs of the year (Bostick 1997). This population appears to be generally stable. Conducting a similar study to develop another estimate is unlikely to be funded unless repeatable DNA sampling techniques are used.

**Brown Bear**
Increased brown bear sightings on JBER and the Anchorage Bowl between 1978 and 2011 may imply brown bear numbers may have increased. This is likely due to the increasing salmon runs in the area, including Sixmile Creek, and population growth resulting from past restrictive harvest regulations for the Anchorage area and in Chugach State Park set by the Alaska Board of Game. More recent liberalization of brown bear hunting in Chugach State Park reflects Board of Game concurrence of this increasing trend. 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 is unknown.

**Bear Population Management**
In spite of human-caused mortality, bear populations on JBER are believed to be stable or increasing. No population control is currently necessary, based on total population numbers, but accurate bear number estimates are not available. A preliminary report on the nuisance black bear study completed in 1997 recommended that bear populations for EAFB and FRA be held to a total of no more than 40 black bears. While verifying the actual population size is impracticable with available in-house resources, levels of nuisance bears and sightings suggest an abundant population that would not be harmed by a modest harvest. The 2013 conservation budget included funding to initiate a JBER bear population study in conjunction with ADF&G; principally to establish a population baseline for both brown and black bear using JBER. The thinking behind this study was the data would help determine the need for ADF&G and JBER to initiate bear hunt to minimize wildlife conflict and provide a sustainable recreational opportunity. After carefully consideration, the ADF&G researchers determined a bear population study was not necessary to initiate a bear hunt on JBER.

The outfall from this collaborative discussion was the termination of Project 7.2.4.1.3, Bear Population Estimate and Conflict Trend Analysis. This three-year study was programmed to begin in 2013 and conclude in 2015. The other bear management recommendation from the ADF&G and JBER collaborative meetings was the desire to initiate a permit lottery black bear hunt on JBER-Richardson using only shotgun with slug beginning as soon as possible. JBER is working to complete all documentation necessary to begin this black bear hunt.

A memorandum of agreement, *Joint Management of Bear/Human Conflicts on Military Lands Near Anchorage, Alaska* (JBER-MOA-301) between FRA, ADF&G, USDA-Wildlife Services, and EAFB was initiated in 1995, rewritten in 2006, and terminated in September 2013. This agreement established joint management responsibility and spells out control actions to be taken against specific types of nuisance bears. A small number of bears were destroyed under the authority of this agreement. This action, as well as intensified levels of garbage control, public education, and hazing of other nuisance bears, resulted in a significant decrease in nuisance activity from 1995 through 1997 (Bostick 1997). In the early 2000s, nuisance bears were also live captured and sent to the University of Alaska Fairbanks for bear hibernation research. Those bears were destroyed as part of the research. Trends in nuisance bear activity seem to be more variable in recent years, reaching relatively high levels prior to an increased presence of bear-resistant dumpsters on JBER. Section 7.4.3.2, *Wildlife Conflict Management* further discusses bears as part of the JBER wildlife conflict management program.

Current management concerns and activities include upgrading all JBER dumpsters and garbage management procedures. One stipulation of the above bear conflict agreement is the goal of becoming a bear resistant installation, which has not been defined, but has intentions of minimizing opportunities for bears to be rewarded with human or pet foods. JBER spent $50,000 on bear-resistant trash bins in 2011 in the cantonment area to help alleviate this problem.

> **Task 7.4.3.1.6:** Continue bear management activities, such as upgrading dumpsters and garbage management procedures. Timeframe: as needed.

**Lynx/Snowshoe Hare**

Winter track surveys and observations of animals along EAFB roads suggest a relatively stable snowshoe hare population with a decline in the dependent lynx population (Appendix H). No lynx tracks were recorded in the few track surveys conducted in winter 2004-2005 while a handful of track sets were observed the preceding winter. Snowshoe hare numbers do not fluctuate as dramatically on EAFB as they do in interior Alaska or on the Kenai Peninsula. Management actions to maintain adequate abundance of dense shrub habitat, including alder, is key to maintaining refugia for snowshoe hares even during lows in their cycle. No winter track surveys have occurred since the winter of 2008-9. No surveys are planned until the Natural Resources staffing stabilizes.

**Moose**

The fall population objective for the north Anchorage moose herd is 500 moose with a bull:cow ratio of 35:100 and a cow:calf ratio of 50:100 (U.S. Army, Alaska 1998). Fall moose numbers on JBER have been in a slight decline since the early 1990s (Appendix H) while herd composition seems to be meeting management objectives.

The population objective of 500 animals was deemed too high for the available level of browse by ADF&G. This population objective is a reduction from past years and is based on striking a balance between moose hunting and viewing opportunities and concerns about severe over-browsing in primary wintering areas, increasing numbers of moose-auto collisions, and increased conflicts with people and pets. Changes in the number of moose observed on JBER-Elmendorf (Appendix H) could be related to habitat degradation and a shift in habitat selection by moose. In general, herd productivity in the JBER-Elmendorf sample has fluctuated from 24-75 calves: 100 cows. In the last five surveys the average was under 25 calves:100 cows. Section 7.4.3.2, *Wildlife Conflict Management* further discusses moose as part of the JBER wildlife conflict management program.

Decisions for management actions are coordinated with ADF&G and are based on the overall herd status. In addition to fall surveys, other periodic monitoring is investigated to evaluate use patterns. Since this moose herd has a great deal of seasonal movement, data for JBER is secondary to the overall herd status.

> **Task 7.4.3.1.8:** Manage moose and its winter habitat with the objective of no more than 80% utilization of preferred winter browse (Salix, Betula, and Populus) and work with the ADF&G to maintain minimums of 25-50 calves per 100 cows and 35 bulls per 100 cows. Timeframe: Annually.

The only big game animal legally harvested on JBER is moose. Prior to joint basing moose hunting occurred on FRA 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 FRA 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 FRA 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. Annual harvest levels and sex ratio objectives are cooperatively determined (U.S. Army, Alaska 1998). Because of reduced hunter success and a perception of increasing wounding rates, a proficiency skills test was initiated for all permittees. Results of the proficiency testing (Appendix H) will be compared to resulting wounding rates.

Moose hunting areas are shown on Figure 7.4.3.1. Hunting areas are subject to closure to manipulate hunter effort. The opening of two hunt areas near the JBER-Elmendorf cantonment area and housing has been successful in eliminating individual problem moose prior to winter. The Alaska Board of Game has also authorized JBER, with coordination with ADF&G, the use of unsuccessful hunters in earlier hunts to hunt moose identified as problem animals from 15 October – 15 November. The problem moose hunt is by invitation from Natural Resources and may occur in any area directed by the same.

In addition to hunting mortality, several moose each year are destroyed after being struck by cars or trains, and one or two are destroyed each winter due to excessive aggressiveness and human conflicts in the cantonment area. The occurrence of nuisance moose during winter on J 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. Non-hunting mortality is reported to ADF&G.

> **Task (In-house) 7.4.3.1.9:** Continue to manage JBER moose hunts. Timeframe: ongoing.
>
> **Task (In-house) 7.4.3.1.10:** Develop and finalize moose hunt reporting protocols. Timeframe: 2014

**Beaver**

Beaver are common on JBER. EAFB had at least eight active lodges in 2005 (Appendix H). Annual beaver control is necessary in Ship Creek along the golf course and in the cooling pond area, which is within the wildlife exclusion zone where waterfowl habitat is discouraged. Culvert clearing and occasional beaver control work had been necessary at the culvert between Upper and Lower Sixmile lakes until a beaver/brush baffle was added to the culvert. The culvert modification allows adult and young fish passage. In 1996 a beaver dam temporarily blocked Sixmile Creek at approximately stream mile 0.4, causing the death of an estimated 1,000 migrating sockeye salmon.

Some methods of discouraging beaver problems, especially damming culverts, have shown some promise. However, even with these techniques, beaver population control is commonly required. Beaver control has 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 or donated to the Alaska Zoo, and pelts are turned over to ADF&G unless the volunteer trapper chooses to keep them. A change to regulations in 1997 allows beaver trapping in certain portions of Unit 14C, including JBER. Trapping by volunteer trappers was initiated during 2003. Annual harvest for such a season has been based on current year beaver cache surveys, with any additional problems during summer handled by depredation permit as they have been in the past (Appendix H). Section 7.4.3.2, *Wildlife Conflict Management* further discusses beaver as part of the JBER wildlife conflict management program.

**Geese**

Nesting pairs of Canada geese on EAFB have declined to an annual average of less than 1.0 over 2002-2006. The number of geese being observed on the ground within the wildlife exclusion zone has also decreased substantially since 1995 due to an aggressive BASH program. Numbers of birds observed, hazed, and killed are maintained by USDA-APHIS-WS.

The need exists to develop an index of goose presence within the wildlife exclusion zone by calculating goose-days/observation effort (see Section 7.2.4.1, *Monitoring*). BASH dispersal activities being conducted by USDA-APHIS-WS, which are recorded by event, will be fed into the formula to develop a goose-days index. This index will be compared to historical count data to evaluate BASH program effectiveness.

**Figure 7.4.3.1 Moose Hunt Areas on Joint Base Elmendorf-Richardson** **1:95,000**

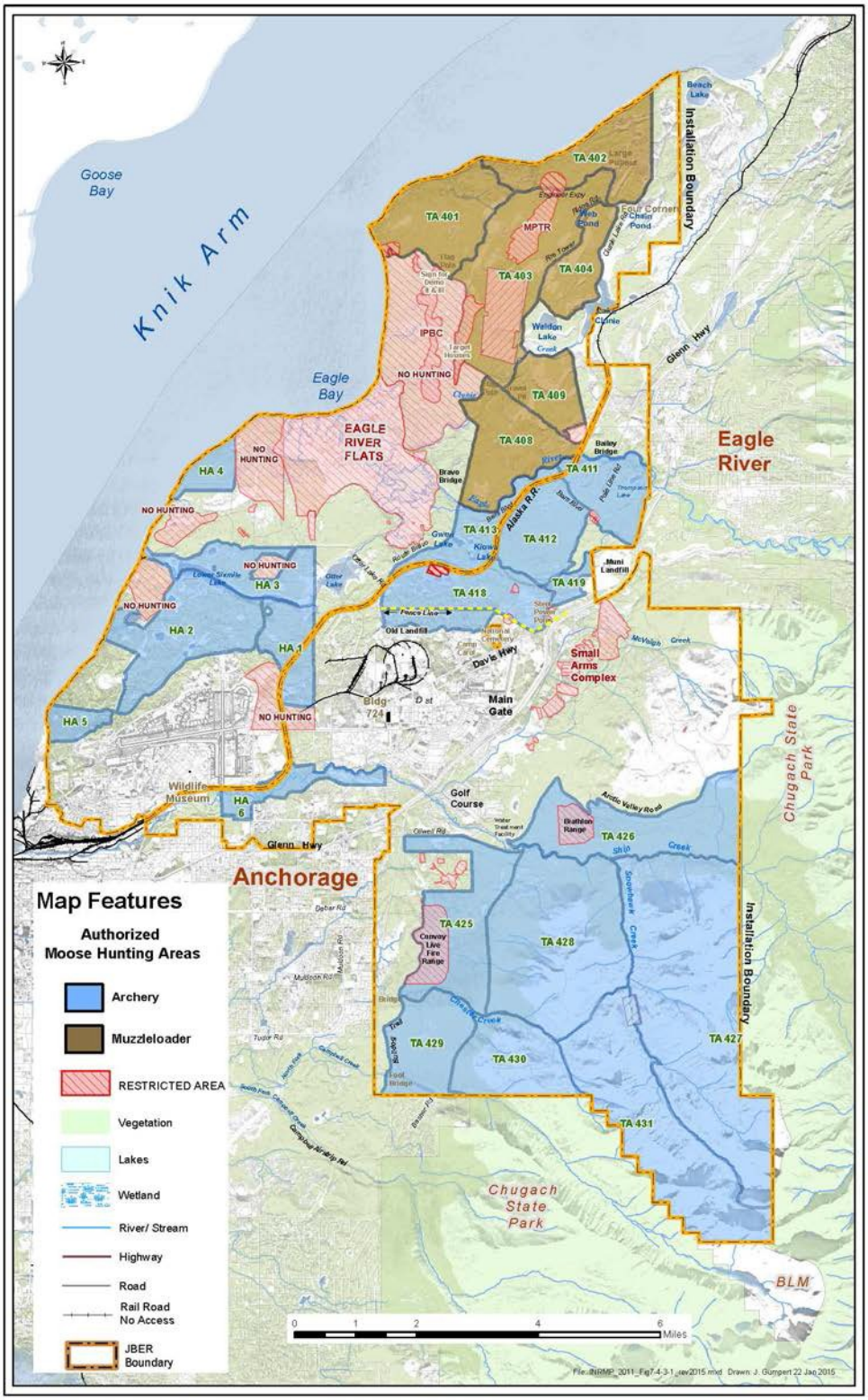


**Figure 7.4.3.1 Moose Hunt Areas on Joint Base Elmendorf-Richardson** **1:95,000**

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**Passerines**
Many of the priority species that are vocal during June can be adequately monitored through breeding bird surveys, an index survey. Olive-sided Flycatchers, warblers, and sparrows can most easily be monitored with breeding bird surveys through a combination of point counts and roadside surveys (Appendix H). Bohemian Waxwings numbers feeding on berry-producing ornamentals on JBER-Elmendorf during winter months have recently responded to reduced habitat caused by private sector housing projects that have eliminated a large number of berry-producing trees in a portion of the cantonment area.

> **Task (In-house) 7.4.3.1.12:** Document and digitally illustrate nesting habitats of passerines of conservation concern during the 2015 INRMP review. Timeframe: 2015
>
> **Task (In-house) 7.4.3.1.13:** Incorporate wetland-dependent migratory bird and wood frog habitat into Wetland Functional Assessment. Timeframe: 2016

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 7.8, *Wetland and Riparian Area Protection*.

**Loons**
Loon pairs and chick production seem very consistent over the years (Appendix H). The management activity employed to maintain a productive loon population is public education. Public education is discussed in Section 7.20, *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 7.8, *Wetland and Riparian Area Protection*.

**Owls**
Owl surveys (2003-2005) have shown a stable trend in great horned owls, a declining trend in northern saw-whet owls, and an increase in Boreal owls (Appendix H).

**Bald Eagles**
Bald eagle populations are currently displaying a stable to increasing trend. Section 7.5.3, *Bald Eagle* discusses eagle management activities, which is primarily protection eagle nesting trees.

**Northern goshawk**
Nesting pairs of northern goshawks in the last 2-3 years seemed to be in decline, probably in response to lower prey species as well as habitat loss caused by construction projects in the southeastern portion of JBER-Elmendorf. Forest management (see Section 7.11, *Forest Management*) is the primary management program affecting goshawk populations on JBER.

**Wood Frogs**
While wood frog monitoring surveys suggest a well distributed population on JBER, there are aquatic systems with very low densities (Appendix H). 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. APU, through a cooperative agreement, is currently compiling the results from an FY13 study on wood frog breeding and the incidence of tadpole deformities. During this study APU sampled 38 water bodies and found 24 to have reproducing adults (63%). Of the 24, only 12 (31% of total) were found to have egg masses later in the season. Tadpoles were collected systematically from the 12 active water bodies. In total, 960 metamorphs were collected and 47 (~4.8%) displayed abnormalities. More research is proposed for 2014.

**Macro-invertebrates (including dragonflies and damsel flies)**
Surveys and monitoring programs have not been initiated. A baseline survey to establish composition and spatial and temporal distribution of Odonata, identify habitat correlations, and develop a species monitoring protocol is part of the JBER ecosystem monitoring program and was scheduled for funding in 2011. However, the survey did not occur and has been reprogrammed for 2014 (see Section 7.2.4.1, *Monitoring*).

**Other Birds and Mammals**
Management of other birds and mammals, including others listed in Table 7.2.3 and not discussed above is primarily limited to protection from poaching and management/protection of habitats. Management activities for small birds and mammals, such as porcupines and squirrels frequently involve translocation if these species conflict with the BASH program or become a nuisance in housing or facilities.

On JBER-Richardson small game and waterfowl harvest is allowed. Principal small game animals harvested are snowshoe hare and spruce grouse. There are anecdotal reports of ruffed grouse being harvested, but no documented reports. Waterfowl hunting is allowed north of Eagle River.

No trapping is allowed on JBER, other than that discussed above 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 have not historically been tracked on JBER-Richardson. The current iSportsman system provides an exit survey to collect harvest data.

### 7.4.3.2 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 of means previously used by USARAK that will be 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 Eagle River Flats when belugas are present in Eagle River (proposed under the preferred alternative for Resumption of Year-round Firing Environmental Impact Statement) (U.S. Army Garrison, Alaska 2007a).

The JBER BASH program is described in Section 7.15, *Bird/Wildlife Aircraft Strike Hazard Management*.

**Bear Management Program**

JBER has an extensive bear-human conflict management program in place. The focus of the bear management program is an aggressive combination of public education, garbage 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.

EAFB had been placing radio collars on brown bears as opportunities arose, in order to track locations and head off potentially lethal conflicts. The brown bear study initiated in 2005 aided in understanding the presence of brown bears on JBER lands. Black bears that were consistent nuisances were captured, marked, collared, and subjected to various non-lethal and lethal control measures based on their history, sex, and reproductive status. Nuisance behavior and location are tracked by databases. Currently bears found in housing or developed areas are hazed out of the area, if possible, or tranquilized, if ADF&G staff are available, or destroyed.

In 1990 the Elmendorf Air Force Base/Fort Richardson Joint Black Bear Study (Bostick 1997) was initiated. The objectives of the study were to determine basic population parameters and to test various types of nuisance bear management techniques such as aversive conditioning and relocation. A total of 23 black bears were trapped or darted and fitted with radio collars and were subsequently radiolocated by both aerial and ground teams over a seven year period. Nuisance bears were subjected to chemical, sonic, and physical types of aversive conditioning, and particularly difficult animals were translocated to determine effectiveness of this management technique. Physical conditioning proved to be the most effective type of aversive conditioning, however, bears eventually habituated to all forms of aversive conditioning.

Bostick (1997) included the following recommendations concerning bear management on military lands in the Anchorage area:

- Increased effort at public education, garbage management, and enforcement of feeding laws is needed.
- Modification of dumpsters in critical areas (such as recreation sites or golf courses) is needed to make them more bear resistant.
- Apply risk classifications to known nuisance bears and monitor their behavior.
- Identify the worst offenders and target them for elimination by translocation (black and brown bears) or capture and euthanasia (black bears).
- Consider instituting a limited restricted weapons bear hunt, with ADF&G concurrence, based on inventory and monitoring results (see Section 7.2.4.1, *Monitoring*). The hunt could be conducted concurrent with the archery moose hunt to take advantage of moose carcasses. Another option is to use bear dogs to send bears up trees and allow “wounded warriors” or disabled veterans to harvest the bears with close controls by MCAs.
- Manage bears jointly with ADF&G and establish a Joint Advisory Board to make recommendations on an annual basis.

Bear-human conflicts have also been addressed in a Joint Agency Bear Management Memorandum of Agreement. The *Joint Management of Bear/Human Conflicts on Military Lands Near Anchorage, AK* (AK-MOA-054) between EAFB, FRA, ADF&G, and USDA-APHIS, was initiated in 1995 and rewritten in 2006. This agreement establishes joint management responsibility and specifies control actions to be taken against specific types of nuisance bears. In the 2006 update, EAFB and FRA staff, now JBER staff would be key participants in an Anchorage Bear Committee, coordinated by ADF&G, with a goal to reduce human/bear conflicts through education and garbage management. However, the MOA has been modified and JBER staff is no longer qualified to possess and operate capture drugs and associated equipment.

> **Task (In-house) 7.4.3.2.1:** Reduce human-wildlife conflicts with large, potentially dangerous animals such as bears and moose through an aggressive program of public education, garbage management, and enforcement. Timeframe: ongoing.
>
> **Task (In-house) 7.4.3.2.2:** Create a geo-based map annually depicting all solid waste dumpster locations and designating the ones that are considered "bear-proof" and illustrating all wildlife conflict responses annually. Update this map annually in the INRMP and share this map with user groups in early spring. Timeframe: annually.

**Wild and Feral Canids**

Foxes and coyotes are occasionally problems in housing areas, often caused by feeding 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, aversive conditioning, and removal of offending animals. Attempts had been made to live-trap offenders with limited success. Leg-hold traps and snares have been used to remove foxes and coyotes associated with the airfield but those capture devices cannot be used in most problem areas due to safety considerations. Some problem animals have been captured and relocated; however, most have been young that have been transferred to local zoos. Translocation or euthanasia of foxes or coyotes requires approval by ADF&G.

Beginning in 2007 fox trapping around the EAFB airfield perimeter was conducted by volunteer nuisance trappers. Objectives were to avoid waste of the furbearer resource by allowing harvest during prime pelt seasons, reduce BASH risk, and provide some limited trapping opportunity for residents. A maximum of two experienced and Alaska Trappers Association-trained trappers have been used. The red fox harvest by volunteer trappers for 2007-2009 was 38 animals.

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 7.14, *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 November-late March, with severity increasing during the later portion of this period. MCAs attempt to haze moose from housing areas using noisemakers and occasionally rubber bullets. Aversive conditioning of moose is difficult and potentially dangerous and appears to have limited effect on their behavior. Moose have severely injured dogs, chased people, and become aggressive with responding agents. Several individuals in the Anchorage area have

been severely injured or killed by moose. Due to these factors and concern for public safety, one or less excessively aggressive animals have to be destroyed each winter.

Property damage also occurs as a result of moose-vehicle accidents. Even at the relatively slow speeds posted on JBER, 3-6 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. Other possible options include testing moose repellants, and possibly population reductions. The JBER landscape plan and/or urban forestry plan should specify approved shrubs and plants for landscaping that are low in moose-palatability. A list of moose-resistant plant species would be a valuable addition to urban moose conflict resolution on JBER. Additionally, at least some moose habitat enhancement efforts should be located where they are likely to draw moose from the airfield and residential areas. Moose archery hunting should also help to reduce moose problems during the following winter by eliminating people-habituated moose.

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

**Beaver**

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

Beaver conflict management includes both preventative measures and population control. Possible preventative measures include painting or fencing large trees near beaver lodges and installing beaver-resistant culverts and dams, particularly along golf courses. Population control focuses primarily along developed areas bordering Ship Creek. Because of the excessive labor cost to live-trap problem beavers, use of kill traps or shooting are the preferred methods of removal. ADF&G issues depredation permits for the removal of beaver 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.

**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. European starlings exist on JBER. The 773 CES Pest Management Section is responsible for control of these birds (see Section 7.14, *Integrated Pest Management*).

**Project 7.4.3.2.1:** Equipment Maint, CN Support. Timeframe: annually.

**Project 7.4.3.2.2:** Equipment, CN Activities. Timeframe: annually.

**Project 7.4.3.2.3:** Supplies, CN. Timeframe: annually.

## 7.5 Management of Threatened and Endangered Species and Habitats

### 7.5.1 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: conserve and maintain self-sustaining populations of threatened and endangered species, consistent with military policy, mission sustainability, and carrying capacity of the ecosystem; avoid jeopardizing the continued existence of threatened and endangered species within JBER; and aid in the recovery of CIBW by maintaining or enhancing prey species habitat/production and contributing to the scientific knowledge base. JBER recognizes that maintaining the environmental health of the landscape is essential for realistic and sustainable military training. A healthy ecosystem (including healthy populations of rare plant and animal species) is better able to withstand both natural and man-made disturbances.

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. On JBER lands management focuses on species of special concern (Table 5.4.4). The exception is the endangered Cook Inlet Beluga Whale, which use marine habitat directly adjacent to JBER (Knik Arm) and the tidally influenced portions of Eagle River over 2 miles within JBER's border. Section 5.4, *Threatened, Endangered, and Protected Species* discusses the occurrence of rare, threatened, and endangered species on and near JBER.

### 7.5.2 Protection of the Cook Inlet Beluga Whale on JBER

Section 5.4.2, *Rare, Threatened, and Endangered Fauna* briefly discusses the designation of CIBW as an endangered species and the designation of critical habitat for the CIBW distinct population segment. It also discusses steps taken with regard to possible reinstatement of year-round, live-fire training at ERF

Impact Area. Those steps included a draft environmental impact statement (U.S. Army, Alaska 2010a) and a biological assessment (U.S. Army, Alaska 2010b) which resulted in a biological opinion (National Marine Fisheries Service, Alaska Region 2011). The biological opinion concluded that implementation of 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. However, the opinion included the following conservation recommendations to minimize adverse effects to CIBW from in-water noise generated by 120 mm mortar and 105 mm howitzer high explosive rounds:

- JBER will coordinate with NMFS to determine specific dates to cease firing all high explosive munitions that could cause take in Eagle River into ERF Impact Area during peak fall waterfowl migration periods.
- JBER will continue to develop methods that better identify beluga whale presence in Eagle Bay, especially when whales are not at the surface.

NMFS further recommended that the following additional conservation measures be put in place to protect beluga whales, their habitat, and their prey.

- JBER will coordinate with NMFS to determine specific dates to cease firing all high explosive munitions that could cause take in the Eagle River into ERF Impact Area during the peak fall waterfowl migration period. While this prohibition is primarily enacted to protect migratory birds, the timing of the fall migratory period coincides with peak beluga activity in Eagle Bay and Eagle River.
- JBER will continue to monitor for marine mammals with the following additional provisions.
    - Place additional personnel in the field during summer field seasons for beluga whale monitoring.
    - Continue photo-identification of individual beluga whales in coordination with NMFS as funding is available.
    - Use a hand-held, high-definition video camera to compile a catalog of whale behaviors to further refine quantitative analysis, coordinate data collection among various research entities, and for educational purposes.
    - JBER will continue to explore the technological feasibility of installing an automated monitoring system at the mouth of Eagle River to detect beluga whale presence.
- JBER will monitor suspended sediment loads in waterways as an indicator of increased erosion and possibly develop specific erosion monitoring programs.
- JBER will expand monitoring to further investigate sedimentation changes at ERF due to detonation of munitions within the impact area.
- JBER will develop a long-term trend monitoring program at ERF to establish ecosystem baselines, define critical metrics, and evaluate ecosystem changes over time.

Lastly, the NMFS requested in the biological opinion that in order for them to be kept informed of actions minimizing or avoiding adverse effects or benefiting the endangered CIBW, they receive notification of the implementation of any conservation recommendations. JBER is currently completing a supplemental EIS (draft) and revised biological assessment for this proposed action.

JBER will protect the CIBW as listed below.

**Project 7.5.2:** Fly aerial imagery every three years to satisfy the long-term trend monitoring requirement cited in the NMFS biological opinion. Timeframe: Every three years beginning in 2015.

### 7.5.2.1 Endangered Species Act Management Goals for CIBW

Management goals include, but are not limited to, the following:

- Minimize impacts to CIBW from military training.
- Minimize impacts to CIBW critical habitat.
- Minimize impacts to and protect/enhance, where possible the Primary Constituent Elements identified in designated critical habitat (76 FR 20180).
- Monitor occurrence of CIBW and other marine mammals in waters on or adjacent to JBER
- Evaluate impacts of training on CIBW and other marine mammal species. JBER will avoid those military activities that could result in "take," as defined by the ESA, to the greatest extent practicable. If "take" cannot be avoided, JBER will enter into formal consultation with NMFS to obtain an incidental take authorization under the MMPA, and a biological opinion with incidental take statement under the ESA.
- Contribute to the scientific knowledge base on CIBW, their habitat and prey.

#### 7.5.2.2 CIBW Conservation Measures

The following conservation measures will be implemented 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;
- restriction of boat launching from JBER lands in Knik Arm, with exception of national security or activities coordinated with NMFS;
- regular shoreline patrols of Knik Arm at beach access points during salmon runs; and
- no tracked or wheeled maneuvering permitted within a 50-meter buffer around all streams, lakes, and any open, flowing water located on JBER lands during the summer unless crossing at a 90-degree angle to the stream; fish spawning streams not to be crossed during 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:

- kiosks at all (two) JBER shoreline access sites;
- inclusion of species information and ESA restrictions in Newcomers' brief;
- briefing for Commanders, range control, and flight operations;
- regular news media articles on any aspect of the JBER activities to enhance CIBW primary constituent elements or their protection; and
- sustaining a JBER recreation access control program that specifies restricted areas and activities.

Monitor the following:

- seasonal/daily use by CIBW off-shore and in Eagle River, as outlined in protocols in Appendix J, incorporating improved methods and technologies allowing for greater detection and ethological sampling, to possibly include but not limited to photo-identification of individuals, the use of high-definition cameras (including FLIR), DIDSON, and passive acoustic monitoring
- CIBW take through mitigation agreements with NMFS;
- salmon escapement on or through JBER and smolt production on JBER spawning grounds;

- stormwater discharges, specifically focusing on deicer and suspended solid (sediment) concentrations, identified in the current JBER Storm Water Pollution Prevention Plan; and
- noise levels (in-air and in-water) of various military training activities.

Consider the viability of the following enhancements:

- replacing Sixmile Creek fish ladder ,
- creating wintering ponds on or near lower Sixmile Creek,
- enhancing spawning substrate in appropriate locations,
- building Upper Sixmile Lake fish passage bridge,
- enhancing Otter Lake/Creek coho salmon population by conducting invasive species control, and
- conducting stream bank restoration and erosion control projects on all anadromous streams on JBER to minimize effect on beluga whale habitat and their prey.

Protective actions for firing in ERF Impact Area:

- Live-fire activities may never intentionally target wildlife.
- Harassment of fish and wildlife is prohibited. Any action that disturbs fish and wildlife is considered harassment by federal and Alaska State law.
- Units will not fire munitions outside military reservation boundaries. Surface danger zones may not extend beyond military reservation boundaries.
- Munitions containing phosphorous as the primary constituent element will not be fired into wetlands.
- Units will not intentionally fire into Eagle River, Otter Creek, or any other open water at any time. Units will not intentionally fire at targets within specified 130-m/50-m habitat protection buffers around Eagle River and Otter Creek. Habitat protection buffers are defined for each weapon system and munitions type.
- There will be no firing across or into navigable waters unless listed in the Federal Register as a "Restricted Area."
- Units will not fire 120 mm high explosive rounds into a 1,000-meter habitat protection buffer along the Eagle Bay shoreline in ERF Impact Area.
- Range Control will not place new targets within the defined habitat protection buffers and will cease using any old targets within these buffer areas.
- ERF Impact Area is permanently off-limits to maneuver training.
- Recreational activities will be permanently prohibited in ERF Impact Area.
- JBER will not provide recreational boat access to Knik Arm and Eagle Bay waters.
- JBER will prohibit rafting access to ERF Impact Area but may allow rafting above the Route Bravo Bridge. The takeout point for Eagle River rafters is four kilometers upstream from the mouth of the river, approximately 100 meters upstream of Route Bravo Bridge.
- JBER AFCEC/CZ or Compliance will monitor levels of white phosphorus and other munitions constituents at the impact area and at firing points to ensure that constituents are not migrating off-site or increasing in concentration.
- Eagle River will remain unobstructed to normal passage of beluga whales and prey species through the entire ERF. Military activities will not cause any impedance to either ingress or egress of beluga whales or their prey species along the stretch of Eagle River from Bravo Bridge downstream to the mouth at Eagle Bay.

Increase scientific knowledge base on CIBW, their habitat and their prey by:

- continuing to work cooperatively with NMFS to monitor beluga whales in Eagle Bay and Knik Arm;

- assisting with beluga or beluga-related studies in Eagle Bay/Knik Arm to the greatest extent possible as dictated by funding, staffing and military constraints.

  **Task 7.5.2.2.1:** Ensure conservation measures are implemented for the protection of the CIBW as well as other marine mammals in Cook Inlet. Timeframe: ongoing.

  **Task (In-house) 7.5.2.2.2:** Investigate surfacing rates of beluga calves vs cows. Timeframe: ongoing

  **Project 7.5.2.2.1:** Investigate feasibility of use of Unmanned Aerial Vehicle for monitoring of belugas in Knik Arm. Timeframe: 2017

  **Project 7.5.2.2.2:** Investigate beluga usage of Eagle River during late fall and winter, support beluga acoustical monitoring. Timeframe: 2017.

  **Task 7.5.2.2.3:** Investigate amount of ice cover on Eagle River and Otter Creek throughout the winter. Timeframe: 2015- 2016

  **Project 7.5.2.2.3:** Endangered Species Act analysis (Biological Assessment or informal analysis) for Demolition Activities. In-water noise studies to support the demo range siting and beluga impact analysis were conducted in 2012-13. Submittal of EA and ESA analysis is anticipated for completion in 2015. Note: If project delays or additional requirements are identified, funding to satisfy the need will have to come from the proponent (USARAK). Timeframe: 2012-2015.

  **Project 7.5.2.2.4:** MGT, Species, Beluga Acoustical Monitoring. Timeframe: if required; 2017

  **Project 7.5.2.2.5:** MGT, Species, Tissue Sampling Eagle River Flats Prey Species. Timeframe: if required by ESA agreements.

### 7.5.3 Bald Eagle

Bald Eagles are year-round residents of JBER, with the highest numbers and visibility occurring between May and October. JBER offers attractive habitat for eagles; rivers and lakes are abundant and forested areas cover 39,053 acres or 52% of the land area (JBER GeoBase 2011). Field surveys have identified up to 35 bald eagle nests on JBER; 15 of which were active in 2014 (Figure 7.5.3). 27 of the nests are in mature black cottonwood (*Populus trichocarpa*) trees, 3 are in balsam poplar (*Poplar balsamifera*) trees and 5 are in paper birch (*Betula papyrifera*) trees. 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 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.

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. See Appendix H for Bald Eagle productivity monitoring results.

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 7.5.3. 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:<br>330 feet. Clearing, external construction, and landscaping between 330 feet and 660 feet should be done outside breeding season.<br>Category B:<br>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 response to proposed continuation of year-round firing into the ERF Impact area, the Army will protect nesting bald eagles by not firing from any firing point that is within ½ mile of an active eagle nest. Nor will training units target with high explosive rounds any portion of the ERF Impact Area that lies within ½ mile of any active bald eagle nest, though a "take" permit can be authorized for firing within ½ mile of a nest. A permit is needed for each individual nest.

> **Task (In-house) 7.5.3.1:** Continue eagle nest protections implemented in response to proposed continuation of year-round firing into the ERF Impact area. Timeframe: ongoing.

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.

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Figure 7.5.3 Bald Eagle Nests on Joint Base Elmendorf-Richardson 1:75,000

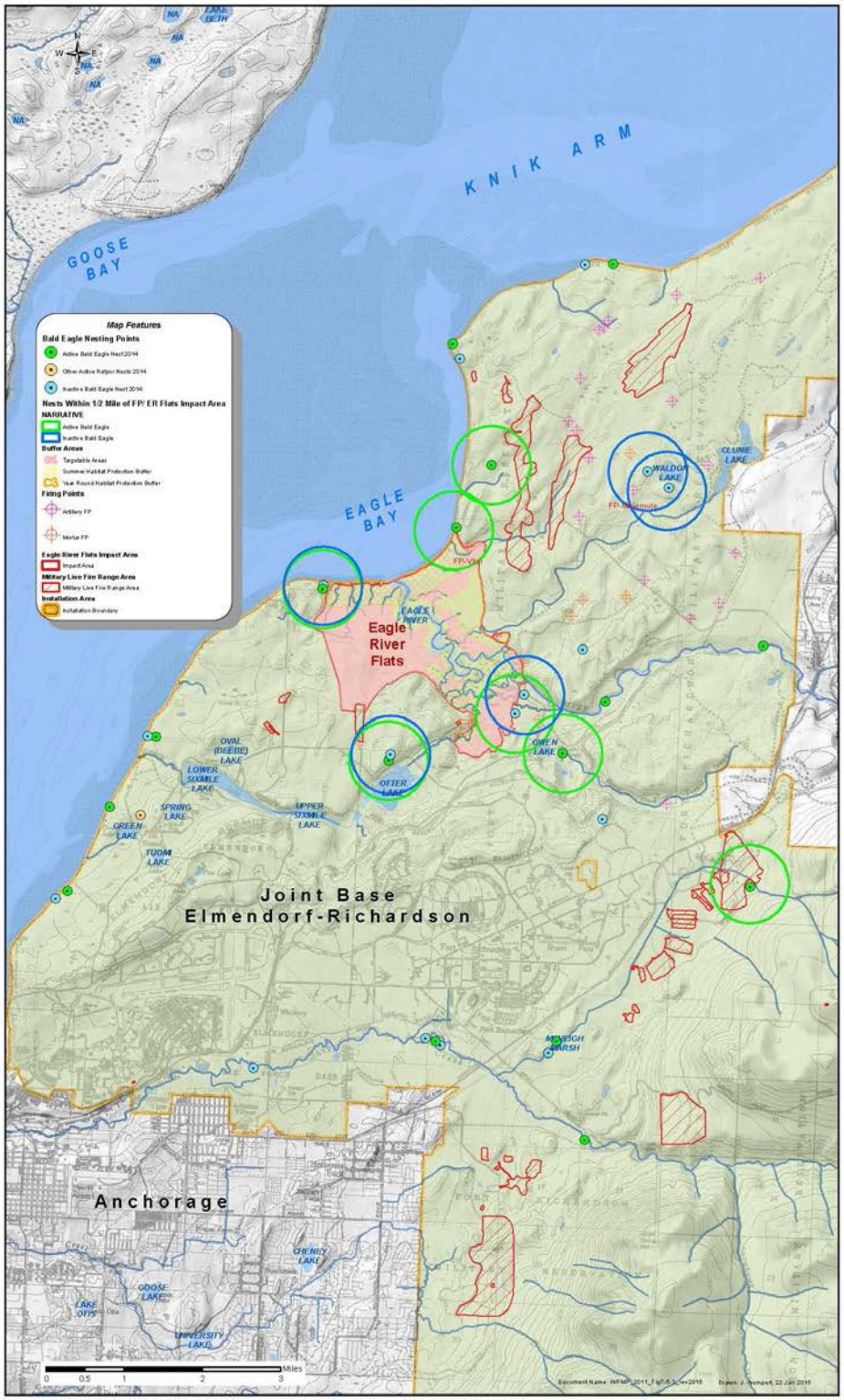


Figure 7.5.3 Bald Eagle Nests on Joint Base Elmendorf-Richardson

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During 2011 JBER was issued two nest take permits, one for a range development project and one for human safety as a BASH conflict. As mitigation for these nest removals, JBER purchased four transmitters, with intention of equipping two eagles with transmitters, and performing a three-year satellite tracking project of those eagles. The eagle capture efforts proved to be unsuccessful.

**Project 7.5.3:** P&F, CN. Bald Eagle Permit. Timeframe: annually.

### 7.5.4 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 consider decisions that may affect rare or candidate species, as they may be listed in the future. JBER will avoid taking actions that 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, is listed as a Focal Species of Conservation Concern by the USFWS (USFWS 2011). JBER recognizes there are other boreal waterbirds of conservation concern. A letter of support was provided for the Legacy project described below.

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*), and Tree Swallows (*Tachycineta bicolor).*

**Project 7.5.4.1:** Boreal Wetlands Birds at Risk--Abundance, Nesting, & Migration. Timeframe: 2016 - 2017

**Task 7.5.4.1:** Develop polygons around nesting sites for species of concern; discourage use that will have a detrimental effect on these areas. Timeframe: When available; 2017.

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 2008); and Alaska Natural

Heritage Program rare species (AKNHP 2013). In addition to species lists, DOD Partners in Flight has developed migratory bird conservation strategies (DODPIF 2002).

> **Task (In-house) 7.5.4.2:** Monitor migratory bird populations, particularly birds of conservation concern accomplished through Alaska Landbird Monitoring Surveys or other DOD Partners in Flight strategies. Timeframe: ongoing.

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 2006). 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.

There are also 20 vascular plant species of concern that are known to occur on JBER-Richardson. The Alaska Natural Heritage Program tracks plants thought to be uncommon or rare in Alaska and/or uncommon or rare globally (AKNHP 2013).

> **Project 7.5.4.2:** JBER Rare Plant Inventory. Timeframe: 2015. This project should include identification of resources and mapping of historic occurrences of formerly and currently listed species of concern.

## 7.6 Integrated Training Area Management

### 7.6.1 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. Integrated Training Area Management (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.

### 7.6.2 Training Requirements Integration

The primary focus of TRI is to ensure sustained accessibility to adequate training lands to support training to standards under realistic natural conditions and provide military trainers and land managers with technical and analytical information to integrate doctrinally-based training and testing with the environmental land constraints. TRI is a decision support procedure that integrates all requirements for land use with natural and cultural resources management processes. TRI integrates the installation training and testing requirements for land use derived from the RTLA program, range operations and training land management processes, and installation training readiness requirements with the installation's natural resources conditions. It provides trainers and range managers with technical information to balance training needs with land constraints. The integration of all requirements occurs through continuous consultation among the Directorate of Plans, Training, Mobilization, and Security; JBER natural and cultural resources managers; and other environmental staff members. TRI supports the Army's requirements for environmentally sustainable training lands. TRI improves coordination and facilitates cooperation, decision-making, and allocation by providing uniform information regarding land conditions, trends, and any necessary modification of requirements. TRI goals are achieved when training and environmental requirements are balanced in the decision-making process.

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. Weekly meetings occur between the ITAM and Range Staff and daily coordination occurs as issues arise throughout the year. JBER Coordination occurs on a weekly basis between ITAM Staff and the JBER Forester throughout the winter months. Informal meetings and coordination efforts occur on a daily basis during summer months to help maximize efforts between LRAM and Forestry work crews. Spring coordination occurs to combined seasonal ITAM field crew training with JBER staff including moose and bear safety training, chainsaw 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.

**Task 7.6.2.1:** Provide natural and cultural resources technical guidance and expertise to support the ITAM program. Timeframe: ongoing.

**Task 7.6.2.2:** Coordinate with ITAM personnel to ensure Natural Resources and ITAM programs manage JBER lands to support JBER military missions. Timeframe: ongoing.

**Task 7.6.2.3:** Regularly schedule coordination meetings. Timeframe: twice annually.

**Task 7.6.2.4** Coordinate closure of roads and trails not needed for mission accomplishment or other purposes to decrease fragmentation. Timeframe: as needed.

### 7.6.3 Range and Training Land Assessment

The focus of RTLA in Alaska is to provide information that supports land management decision processes for sustained mission use. Information gathered includes assessing impacts of live training and testing as well as assessing the capability of training lands to support mission activities. Information gathered is used to make recommendations that enhance training land capacity, capability, and condition and to help prioritize land rehabilitation, maintenance, and reconfiguration activities.

RTLA is the component of the ITAM program that collects, inventories, monitors, manages, and analyzes tabular and spatial data concerning land conditions on all three Army managed installations. RTLA collects data to evaluate the capability of training lands to meet multiple use demands on a sustainable basis. The RTLA component performs a number of individual assessments including training land sustainability, maneuver corridor, vegetation recovery, maneuverability, and RFMSS data mapping assessment. It incorporates a relational database and GIS to support land-use planning decision processes, including location and timing of military training events, natural resources management, and prioritizing land rehabilitation and restoration. RTLA collects physical and biological resources data to relate land conditions to training and testing activities. These data are intended to provide information to effectively manage land use and natural resources.

RTLA annually conducts surveys to document disturbances to the soil and vegetation. Soil disturbance monitoring focuses on areas impacted by military training. The RTLA program at JBER-Richardson provides data to military trainers on the condition of training lands with respect to both ecological land condition and land potential to support training. Current and past disturbance resulting from military training and recreational use is delineated and quantified in terms of "land condition". Annual RTLA reports detail the levels of disturbance and land condition on JBER-Richardson.

Training areas are broken up into polygons based on military land use, such as maneuver areas, bivouac areas, foot-use, observation points, , firing points, firing ranges, and drop zones A random sampling method is used to allocate sampling points within polygons. RTLA data provide RTA-wide summaries of land use, disturbance, erosion, plant cover, and tactical concealment.

The majority of RTLA assessments are performed during the growing season from June - mid September. Assessment data is processed and analyzed during the fall and winter months and a final report is created and shared with the range community, federal, State or non-profit entities providing ITAM or INRMP support.

Coordination efforts between RTLA and the Forestry staff occur at least weekly during the winter months and daily during the field season to help coordinate work crew efforts to accomplish training area asset hand thinning objectives. In addition, efforts are made to combine spring training with JBER staff to include seasonal employee moose and bear safety training, chainsaw safety training and Red Cross first aid training.

USARAK RTLA Assessments

1. Maneuverability Assessment
    - This is a mission support assessment that identifies physical limitations to maneuver, and helps direct LRAM efforts if they are deemed necessary.
        i. Direct support of land navigation capabilities and limitations.
        ii. Direct support of vehicle off road capabilities.

A component of army training includes traveling across the landscape, whether that be mounted with the use of Strykers or HUMMVs or dismounted foot travel. Each Alaskan Army post offers different settings to simulate different maneuver conditions and training efforts. This may include off road driving courses, roads and trails of different ground substrates, and foot maneuver corridors offering different aerial and horizontal cover conditions. Impediments to maneuver, both mounted and dismounted, include physical limitations such as tree spacing, large rocks, fences, micro-topography, shrubs, and downed trees. This assessment quantifies these limitations on lands currently used for maneuver training and to assess adjacent trafficable lands for increased opportunities. Additionally, this assessment produces information to help delineate trafficable areas for mounted and dismounted training, based on soils, slope, and wetlands. Results are used to develop LRAM vegetation management projects to improve conditions at existing training sites or increase land availability for maneuver training. Information for this assessment was gathered from FM 3-21.21, FM 3-21.220, FM 3-22.3, and FM 3-25.26. In support of Stryker acquisition, an LCTA study entitled Mission EIS LAV Tracking Study Status Report was conducted in 2001 at Fort Wainwright and was utilized in developing this assessment.

2. Trail Inventory and Condition Assessment
    - This is an LRAM based assessment to determine trail reconfiguration and/or maintenance needs.
        i. Direct support of mounted maneuver training.

This assessment identifies trail conditions and locations and suggests trails that are in need of reconfiguration and/or maintenance in order to sustain heavy and light maneuver training activities throughout USARAK lands. Physical characteristics to included rutting, drainage issues, encroaching vegetation, and width data are collected along with GPS data to locate individual trails and trail segments. The ideal trail size for two way Stryker vehicle traffic is 30 feet wide with a total clearing of 60 feet wide. Because of the weight of a Stryker, optimally the soil needs to have a major gravel component to hold up. Information for this assessment was gathered from FM 3-21.21, FM 3-21.220, and FM 3-22.3.

3. Training Asset Accessibility Assessment
    - This is an LRAM based assessment to determine what training facilities need access maintenance and or reconfiguration.
        i. Direct mission support of access to training facilities.

In each training area there are various types of training assets which include landing zones, drop zones, bivouacs, and firing points. These assets have various stages of accessibility and accessibility condition and many are overgrown with alder and/or are under constructed for Stryker use. It is imperative that these areas be readily accessible to Stryker vehicles for readiness and training purposes. This assessment identifies maintenance locations and training assets are given a rating on the current accessibility status. Data collected will help drive maintenance and/or reconfiguration efforts under LRAM.

4. RFMSS Data Mapping Assessment

- This a mission support assessment to prioritize RTLA assessment efforts based on land use patterns and to highlight the success of past LRAM projects by analyzing prior and post project site utilization.
    i. Direct support of all training across the post.

This assessment queries Range Facility Management Support System (RFMSS) data for facility utilization days and the number of personnel trained at each training area facility. This is done to make a visible reference of how training is distributed each year across the three Alaska Army posts. If a facility had no RFMSS data associated with it, it was given a value of zero. USARAK lands total approximately 1.6 million acres in size. Currently, only between 20-30% of our training areas are accessible by ground year round. RTLA assessments will be conducted in the areas of heaviest training to show how training is effectively being dispersed across the landscape as a direct result of improved access. RTLA will also conduct assessments in areas that show little training to determine what LRAM efforts are needed to make the areas more usable for training

5. Vegetation Recovery Assessment
    - This is an LRAM based assessment to determine additional LRAM efforts needed to reach soil stabilization and project effectiveness in support of troop construction and/or in house projects.
        i. Direct support of mounted maneuver training.

Completed ITAM ground-disturbing activities will be analyzed through the RTLA Vegetation Recovery Assessment to determine if further LRAM actions are needed. This assessment has also been designed to directly correlate with the Environmental Protection Agencies Storm Water Pollution Prevention Plan (SWPPP) notice of termination requirements under the State of Alaska General Construction permit through the Alaska Department of Environmental Conservation (ADEC). Therefore, these assessments directly support the regulatory requirements imposed on all ground disturbing troop construction, in house, or LRAM projects over 1 acre in size. The intent of this assessment is to determine site stabilization using methods that are repeatable and will hold up in a court of law in the event future litigation is brought against the Army. Information for this assessment was gathered from FM 3-21.21, FM 3-21.220, and FM 3-22.3.

6. Landing Zone Size Assessment
    - This is a mission support assessment to determine the current capability of landing zones and help direct LRAM efforts if they are deemed necessary.
        i. Direct support of helicopter landing zone training.

The capability of landing zones was determined by placing a circle with diameters ranging from 25 meters to 150 meters (table 1) inside the footprint of landing zones on USARAK lands. These landing zone size requirements came from Army Field Manual FM 3-21.28. The size chosen was based on the trees visible in the imagery, knowledge of the location and the size of the footprint of the landing zone.

Each landing zone is looked at using geographic information system (GIS) imagery to estimate the number of landing points that are available for each helicopter size. This assessment is only an estimate based on the latest imagery available and on the ground knowledge of the area. Trees and shrubs may not be visible in the imagery that may affect the actual number of suitable locations.

7. Landing Zone Assessment
    - This is an LRAM based assessment to determine the quantity of trees in landing zones to determine appropriate LRAM efforts that are needed.
        i. Direct support of helicopter landing zone training.

Determine the approximate number of trees greater than 1 meter in height that may affect the safety of a landing zone for helicopter maneuvers.
Visit each landing zone every five years and obtain an estimate on the number of trees (live or dead) in the landing zone area that are greater than 1 meter in height. Observers will go to each landing zone and visually estimate the number of trees by category (0 trees, 1-10 trees, 10-25 trees, 25-50 trees, or more than 50 trees). Data will be used to determine the appropriate LRAM maintenance effort that is needed at each landing zone. Information from this assessment was gathered from FM 3-21.28.

8. Land Use Sustainability and Potential Development Zone Assessment
    - This is a mission support assessment to monitor the capability and sustainability of the land to support the overall training mission.
        i. Direct support of the LRAM component of ITAM to support training.

Maintaining ecological processes and functions is essential to provide opportunities for soldier training in a realistic environment which is not heavily degraded due to past training impacts. Training impacts can cause an area to cross a threshold in which the land cannot recover on its own and availability and realism for training is diminished and/or substantial investments are needed to rehabilitate the site. Land Condition is a measure of the divergence of a site in terms of ecological processes, not necessarily structures, from a natural state. Indictors of ecological health include erosion, ground cover, and plant species composition. This assessment monitors these indicators and generates information for LRAM projects to restore ecological function and contributes to land management planning by identifying areas of concern. Areas currently and historically used for on-the-ground training are monitored along with adjacent trafficable areas with potential for use. These areas, termed Potential Development Zones (PDZ), have been identified by the Alaska ITAM program as most likely to be impacted by training and most likely targeted for development.

9. Hazard Tree Assessment
    - This is an LRAM based assessment to determine what areas need maintenance efforts.
        i. Direct support of bivouac training.
        ii. Direct support of mounted and dismounted maneuver training.

Trees are a dominant feature in USARAK's forested training lands. Every tree will ultimately die and decay and can pose a threat to soldiers and facilities. Locating bivouacs and other facilities in forested areas is a necessity to provide for realistic training opportunities. To mitigate the inherent danger of hazard trees in these areas, a method for assessing both sites and trees is required in order to maintain realism and effectively manage resources. Trees are rated based on structural defect and distance to a facility or maneuver trails. Structural defects include dead trees, dead or broken tops, broken limbs, root and bole rot, cracks and poor tree architecture. Assessment results are provided to the LRAM Vegetation Maintenance crews to help determine optimal work locations.

10. Bivouac Potential Assessment

- This is a mission support assessment that is done to show the current capability of the land to support bivouac and to direct LRAM efforts if they are deemed necessary.
    i. Direct support of bivouac training.

Bivouac training is an integral part of any field exercise that extends beyond 1 day. Changes in mission focus are leading to a need for more bivouac areas, particularly near other training facilities, such as artillery and/or mortar firing points, landing zones and drop zones. The RTLA program will assess these areas for adjacent bivouac potential. Requirements include appropriate size and configuration, and hardened surfaces to support expected vehicles, such as Strykers. Surfaces can be naturally graveled, graveled from a past project, or planned for future improvements. Information will be used to inform range control, and help direct LRAM efforts. Information for this assessment was gathered from FM 5-20C.

11. RTA Maneuver Corridor Condition Assessment

- This is an LRAM based assessment to determine the current conditions of the maneuver corridor to pinpoint areas that are becoming unusable from repeated training events.
    i. Direct support of mounted maneuver training.

The Richardson Training Area Maneuver Corridor stretches from Malemute Drop zone west to the Infantry Platoon Battle Course and north to Firing Point 7. The Corridor was completed in the 2010 and encompasses a total of 13.3 kilometers of trails to Navigate. To help keep this facility functional, the Range and Training Land Assessment (RTLA) Program will monitor its condition to keep it sustainable for long term use. Because this maneuver corridor supports off road mounted maneuver training on unimproved native soil the potential of major rutting is extremely high. This assessment will determine locations of for trail damage and determine areas with a high probability of damage. Information for this assessment was gathered from FM 3-21.21, FM 3-21.220, FM 3-22.3, and FM 3-25.26 a document entitled Tactical Concealment Area, Planning and Design Guidance was also used for this assessment. In support of Stryker acquisition, a LCTA study entitled Mission EIS LAV Tracking Study Status Report was conducted in 2001 at FWR and was utilized for this assessment

12. DTA Aufeis monitoring assessment

- This is a mission support assessment done to monitor river water overflow to determine when to deploy corrective action of river ice, and to prevent and/or reduce seasonal flooding on the Jarvis North training areas.
    i. Direct support of unit training.

Aufeis is known to start forming in late December and reach its greatest extent by March. Depending on the frequency of rainfall and snow melt, some flooding can occur as early as March, but the most significant flooding events take place in late April and early May. The formation of aufeis is highly dynamic and displays wide variability from winter to winter. Because of this annual variability it was not possible to forecast the occurrence or extent of aufeis on Jarvis Creek without annual monitoring. When corrective action is needed and conducted, available training days are increased. This assessment will also help establish the possibility of a permanent corrective LRAM solution to better support live-fire maneuver training on the Attu Battle Area Complex, the Kiska Combined Arms

### 7.6.4 Land Rehabilitation and Maintenance

The LRAM primary focus is to repair, maintain, and reconfigure training lands to eliminate safety hazards and sustain Army training and testing lands to support realistic training conditions and maintain training to standard. LRAM is a preventative and corrective land rehabilitation and maintenance procedure that reduces long-term installation training and testing impacts. It mitigates training and testing effects by combining preventive and corrective land rehabilitation, repair, and/or maintenance practices. It includes training area redesign and/or reconfiguration to meet training requirements. LRAM uses such technologies as re-vegetation and erosion control techniques to maintain soils and vegetation requirement in support of the military mission. These specifically designed efforts help maintain quality military training lands and minimize long-term costs associated with land rehabilitation or additional land purchases.

LRAM consists of strategies and resource allocations for resting and repairing the soils on training lands on a rotational basis as well as repairing other problem erosion areas as the need arises. LRAM includes programming, planning, designing, and executing land rehabilitation and maintenance projects based on requirements and priorities identified by the TRI and RTLA components of the ITAM program. LRAM Projects are conceptualized and planned by the Range and ITAM staff and refined through the Palmer Soil and Water Conservation District (PSWCD). The PSWCD provides additional expertise and any professional engineering resources needed to refine project plans and to assist in identifying proper drainage requirements and final placement of any required culverts. In addition, projects are coordinated through the establish JBER work order and NEPA processes for review prior to the commitment of funds. Regulatory permit requirements are identified and obtained through the appropriate regulatory agency prior to project execution.

#### 7.6.4.1 USARAK Maneuver Access Landscape Conditions

Approximately 1,700 miles of existing maneuver trail access within the 1.6 million acres of Army training area lands that are managed through the ITAM program. US Army Alaska is responsible for fulfilling the ITAM requirements. Almost 15% of all Army training areas within Alaska including JBER do not currently have year round trail or road access. Poorly developed soils and heavy vegetation reduce training area accessibility and pose an issue providing for and maintaining sustainable access. Unimproved training area assets typically results in significant rutting and erosion which is greatly exacerbated during periods of precipitation and thawing. The training areas are primarily identified by thick stands of mature birch and spruce trees with other species of vegetation that continually encroach upon established trails. Large amounts of trees and vegetation, approximately 7.27 acres per mile, must be removed in order to reconfigure old maneuver trails or when creating new trails. Optimally, USARAK

training area maneuver trails will be reconfigured and maintained at a minimum of 18 feet wide for single lane Stryker traffic and 30-40 feet wide to accommodate two lane Stryker traffic.

**LRAM Goal 1**: Support specified Lines of Effort from the USARAK Fiscal Year (FY) 12 Annual Training Guidance (ATG). Support Mounted and Dismounted Training Requirements for the 1-25 Stryker Brigade Combat Team, 4-25 Airborne Brigade Combat Team, 2nd Engineer Brigade, 16th CAB and USARAK EAB Units.

Facilitate the 1-25 Stryker Brigade Combat Team pre-mobilization training mission requirements; ensure USARAK training areas replicate in-theater heavy and light maneuver mobilization conditions.

**Prepare the Force.** Provide relevant training at home station that adequately portrays the operational environment in training venues and facilities that allow units and staffs to achieve **Mission Essential Task List (**METL**)** proficiency. The training process for **brigade combat team (**BCT) and echelon above brigade (EAB) units is to gain proficiencies in four levels: (1) individual skills and marksmanship; (2) squad level collective training; (3) unit's transition to critical collective tasks at platoon and company levels, and (4) mission validation for battalion and brigade level operations. Units must comply with current published pre-deployment training guidance as well as AR 350-1 training requirements.

USARAK airborne units conduct airborne operations to train and sustain individual paratrooper skills, hone collective task execution, and provide the Army with deployable, airborne capable units. Given limited training time to devote to airborne operations, priority will be given to individual jumper and jumpmaster proficiency and collective proficiency up to battalion level. Airborne operations will be executed IAW the USARAK Airborne Standard Operating Procedures (ASOP). At a minimum, a battalion headquarters will be designated to provide command oversight for each airborne operation. Airborne troop leading procedures inherent to airborne operations will not be abrogated.

Marksmanship and Gunnery: Every soldier must strive to be an expert in employing his/her assigned weapon. Small arms mastery is achieved by effective employment of soldiers' assigned weapons, optics, lasers, and night vision devices. Leaders at all levels will maximize the use of the engagement skills trainers and ensure that soldiers are exposed to more advanced skills such as close quarter or short range marksmanship tables, long range marksmanship, non-standard firing positions, high angle fire, target discrimination, and firing under physical stress. Direct, indirect, and aerial gunnery will be planned, resourced and executed as part of a unit's training glide path. Minimum platforms for gunnery requirements include: machine gun crew, mortar, howitzer, Stryker and aviation.

**Protect the Force**: Improvised Explosive Devices/Counter Improvised Explosive Devices (IED/C-IED). This threat continues to produce the greatest number of combat casualties. All soldiers, no matter their job or MOS, are entitled to the most current and effective counter-measures training available prior to deployment. It is also critical that IED awareness, identification, and countermeasures training be based on an analysis of the nature of the threat for the geographical deployment area. Every Commander will ensure that CIED training plans be developed based on the most current threat analysis applicable to the units deployment.

Driver Training: USARAK units will implement a challenging driver's training program at Brigade and Separate battalion level consistent with Army regulation 600-55. Unit’s driver training programs will also leverage the use of modern combat vehicles including MRAP, MATV, or others available.

Cold Weather and Mountain Training: Cold weather injuries diminish our combat strength, degrade the trust between the leader and those led, and adversely affect training. Leaders that are trained to lead

soldiers in cold weather and mountainous regions maintain a focused awareness on their environment and closely monitor the well being of their soldiers. Training safely in cold weather and mountains enhances leader and Soldier confidence in themselves and their equipment.

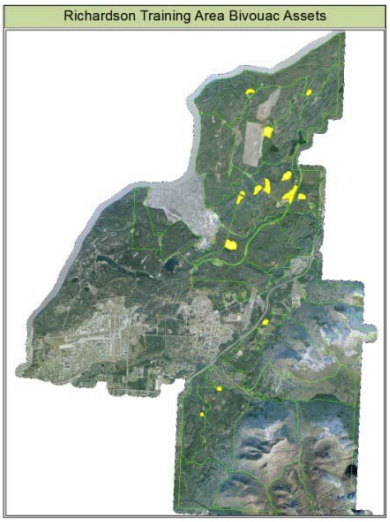
**Objective A:** Enhance 750 acres of mounted and dismounted USARAK maneuver area lands including bivouacs from 2014 through 2024 through vegetation management. Reduce training area, maneuver corridor and bivouac site tree and vegetation encroachment obstructions on approximately 750 acres to ensure safe access and maneuverability.

**Objective B:** Enhance between 2.5 and 10 miles of USARAK Maneuver Trails and one to five acres of bivouac areas annually from 2014 - 2024 through vegetation management and soil stabilization. Maintain and enhance dismounted and mounted training area accessibility and maneuverability by utilizing vegetation management techniques and soil stabilization best management practices to provide sustainable bivouac sites and maneuver trail access to existing training land assets and remote portions of USARAK training lands.

**2014 LRAM Projects at Richardson Training Area:**

**Trail Reconfiguration:** Training Area 425, Assembly Area 1 Trail (Approximately 5.81 Acres of vegetation clearing).

**Bivouac Site Hand Thinning:** JBER bivouac hand thinning efforts focused on reduction of encroaching vegetation at these training asset locations.




### 7.6.4.2 USARAK Airborne Training Landscape Conditions

USARAK currently has 10,352 acres of Drop Zones and Landing Zones (DZ/LZ) across 67 sites. Of the total area, 4,142 acres are road accessible while the remaining sites are remote and only available by air, ATV, or seasonally via snow/ice roads. Conditions range from natural landscapes characterized by dwarfed conifers and shrub cover to maintained sites managed for grasses and forbs. DZ's and LZ's vary in size providing for multiple training opportunities ranging from single small aircraft and squad sized personnel/equipment drops to multiple large aircraft and battalion sized personnel/equipment drops. DZ/LZ sizes range from under a tenth of an acre for size 1 aircraft LZ's to over 4,000 acre Division level DZ's. Encroaching woody vegetation is an issue on virtually all sites and accounts for approximately 32%

of DZ/LZ's being unavailable for doctrinal training on a year round basis. Constant maintenance is required to reduce vegetation hazards to personnel, equipment, and aircraft. Landing points are required to have vegetation maintained at less than one foot and Drop Zones should exclude tall shrub and tree cover to ensure safety standards are met. Snow cover seasonally mitigates some hazards for up to 6 months of the year however cold temperatures and limited daylight hours hinder training opportunities. RFMSS generated utilization rates show that 87% of DZ/LZ totaling 5,532 acres was utilized in the past 5 years.

**LRAM Goal 2:** Support specified Lines of Effort from the USARAK FY12 ATG. Support the aviation and airborne operations training requirements for the 16th Combat Aviation Brigade, 4- 25 Airborne Brigade Combat Team and 2nd Engineer Brigade.

**Objective A:** Maintain 5,532 acres of DZ/LZ throughout USARAK training lands from 2014 through 2024 through vegetation management. Reduce drop zone and landing zone tree and vegetation encroachment obstructions to ensure DZ/LZ safety and sustainability. Annually maintain approximately 550 acres of currently and historically utilized DZ/LZ's to ensure desired dimensions and capability.

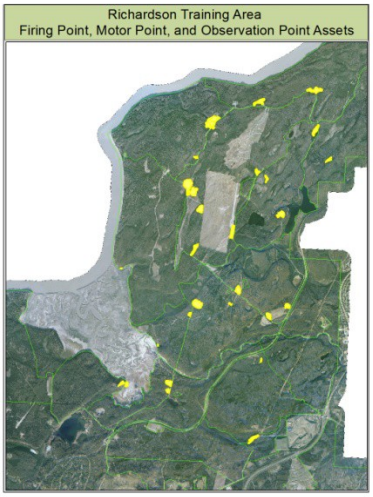
**Objective B:** Maintain 5,532 acres of landing and drop zones throughout USARAK training lands annually from 2014 through 2024 utilizing soil stabilization techniques and best management practices and surface hazard reduction. Maintain and enhance DZ/LZ accessibility and safety by utilizing soil stabilization best management practices and hazard mitigation. Annually maintain approximately 550 acres of currently and historically utilized DZ/LZ's by rehabilitating areas of exposed soils and active erosion to ensure DZ/LZ capability and sustainability.

#### 7.6.4.3 USARAK Artillery Training Landscape Conditions

There are currently 103 FP, MP and OP artillery assets within 1.6 million acres of USARAK training lands. Each site currently varies in size between one and ten acres. 98% of the existing firing points are undersized and are heavily overgrown with woody vegetation. The training areas where these artillery assets exist are primarily identified by thick stands of mature birch and spruce trees with other species of vegetation that encroach upon established sites and prevent line of sight for direct and indirect artillery training. In addition, the FP, MP and OP sites characteristically have poorly stabilized soils prone to rutting and are in need of repair and reconfiguration in order to maintain these areas for training. Approximately 36% of all USARAK firing points are inaccessible due to poor maneuver trail access into remote training areas. USARAK artillery firing points will be maintained at 9.88 acres in size in order to accommodate current artillery mission requirements.

**LRAM Goal 3:** Goal 3: Support specified Lines of Effort from the USARAK FY12 ATG. Support Artillery Direct/Indirect Fire and Demolitions Training Requirements for the 1-25 Stryker Brigade Combat Team, 4/25 Airborne Brigade Combat Team and the 2nd Engineer Brigade and ensure USARAK training areas replicate in-theater artillery direct/indirect firing conditions.

**Objective A:** Reduce vegetation encroachment for approximately 354 acres of artillery assets including FP's, MP's and OP's throughout USARAK training lands from 2014 through 2024. Reduce FP, MP and OP vegetative encroachment obstructions to ensure line of site and safe access and maneuverability for artillery training assets. At this time, it is impossible to determine exactly which locations and how much acreage will be thinned due to training activity and scheduling conflicts. 2014 Richardson Training Area FP, MP and OP hand thinning efforts will focus on reduction of encroaching vegetation at these training asset locations. At this time, it is impossible to determine exactly which locations and how much acreage will be thinned due to training activity and scheduling conflicts.



**Objective B:** Repair, maintain and reconfigure 354 acres of FP's, MP's and OP's from 2014 through 2024 throughout USARAK training lands by improving surface conditions through soil stabilization. Repair, reconfigure, and maintain approximately artillery training assets through soil stabilization best management practices and techniques to replicate in-theater artillery conditions.

> **Task 7.6.4:** Support prevention activities and restoration of disturbed areas performed through the ITAM program. Timeframe: ongoing.

### 7.6.5 Sustainable Range Awareness

Sustainable Range Awareness is the component of the ITAM program that seeks to foster a conservation ethic in military personnel. SRA consists of the following three elements: training/education materials, an implementation plan for awareness training, and sustainability training. The Sikes Act requires *no net loss in the capability of military lands to support the military mission*. SRA supports this compliance goal by reducing maneuver damage, reducing long-term maintenance costs for repair of training lands, and improving operational security skills. When land users practice environmental stewardship in the field, they are also achieving Army mission objectives. The SRA program provides the land users with an understanding of how mission, training, testing, and other activities impact the land's capacity for sustaining a realistic training environment. SRA also educates land users on how their land use affects resident wildlife and vegetation (U.S. Army, Alaska 2011).

SRA also provides a means to educate "other land users" on their environmental stewardship responsibilities. SRA materials include information geared towards environmental professionals concerning operational requirements for Army training. Educational materials produced include wall calendars and soldier field pocket planners that describe principles of land stewardship and practices of reducing training and/or testing impacts. Another product of the SRA component, playing cards, is popular with soldiers. SRA products are updated annually and distributed to soldiers after the new year pending the availability of funding.

### 7.6.6 Sustainable Range Program Geographic Information System

The GIS is the foundational support element of the SRA component and provides geospatial data and applications support for all ITAM components. The ITAM GIS is a separate system from that of the JBER's. The ITAM GIS mission is to create, analyze, manage, and distribute authoritative standardized geospatial information, products, and services for the execution of training strategies and missions on

U.S. Army ranges and training lands. The ITAM GIS strives to achieve information excellence as a tenet of the SRM by delivering the best, most accurate, complete data sets through user-friendly GIS products and applications, supported by professionals trained in the most current releases of GIS software and geospatial data standards. ITAM GIS professionals provide focused development of standard GIS databases, adhere to federal, DoD, and Army geospatial data standards, perform advanced spatial analysis on geospatial data, and provide information delivery through all media. The ITAM GIS program participates in Army Enterprise GIS initiatives that eliminate redundancies in data development and applications and reduce costs for these items to the program.

ITAM GIS maintains cooperation with the JBER GIS community. A GIS User Working Group meets monthly, or bimonthly, to discuss any changes in structures or other features that may impact data and its representation. This working group includes GIS personnel from various offices such as Air Force GIS - GeoBase, environmental, and real property. The group maintains good communication to share GIS data, imagery and information critical to GIS, mapping and soldier support.

## 7.7 Water Resource Protection

### 7.7.1 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.

Section 4.5.1, *Watersheds and Surface Waters* discusses surface water resources on JBER. Figure 4.5.1 shows JBER watershed and significant surface water features, and Section 4.5.2.1, *Freshwater Lakes and Ponds* discusses lesser surface water bodies on JBER.

### 7.7.2 Surface Water Quality Monitoring

Water quality within the cantonment areas are tracked and managed by 673 CES/Compliance. JBER operates under a Multi-Sector General Permit. This permit is responsible for monitoring water quality that might be potentially impacted by storm water from industrial activities (aircraft refueling, quarrying operations, hazardous waste storage). The Multi-Sector General Permit identifies locations and any frequency of sampling necessary to remain compliant. Currently, JBER is not required to collect any additional surface water samples. The EAFB and FRA plans were combined and updated into a JBER Storm Water Pollution Prevention Plan. JBER has approval for its joint Municipal Separate Storm Sewer System permit and Storm Water Management Plan. This permit and plan identifies how the installation will manage and enforce not only the Multi-Sector General Permit and construction activities, but also overall protection of the installations water quality.

JBER sampling locations are indicated in Figure 7.7.2. JBER currently meets all state and federal National Pollutant Discharge Elimination System discharge requirements.

### 7.7.3 Drinking Water Quality Monitoring

The JBER water treatment plant draws surface 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). Additionally, JBER also has several groundwater wells that are available to provide potable water during periods of high demand (typically during the summer months). To maintain the water quality of the installation potable water source, JBER-Richardson 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 protect surface water quality (U.S. Army, Alaska 1998). Likewise, development along Ship Creek on JBER-Elmendorf has been restricted to the greatest extent possible. The ITAM LRAM program plays a major role in protecting JBER-Richardson water quality.

**Groundwater**

The groundwater program is important to natural resources management, but it is not considered a natural resources 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 4.5.2.4, *Sub-Surface Water*.

Ground water monitoring data on JBER-E indicated localized shallow aquifer contamination which was not impacting deeper aquifers. The Bootlegger Cove formation seemed 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.

### 7.7.4 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. Storm water 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. The EAFB and FRA Storm Water Pollution Prevention plans (673d Civil Engineer Squadron 2009) and (U.S. Army Garrison, Alaska 2003a), and *The Integrated Training Area Management Plan* (U.S. Army, Alaska 2011) include best management practices to ensure sediment and other runoff does not end up in wetlands or other waters of the U.S.

The clean-up of Eagle River Flats Impact Area on JBER-R has been ongoing since the 1980s. Once white phosphorus was identified as the cause of significant waterfowl mortality, measures were implemented to improve water and sediment quality in ERF Impact Area. The primary method has been to drain ponds to expose sediments to the air, which oxidizes (combusts) the white phosphorus and removes it from the soil (U.S. Army Garrison, Alaska 2007a).

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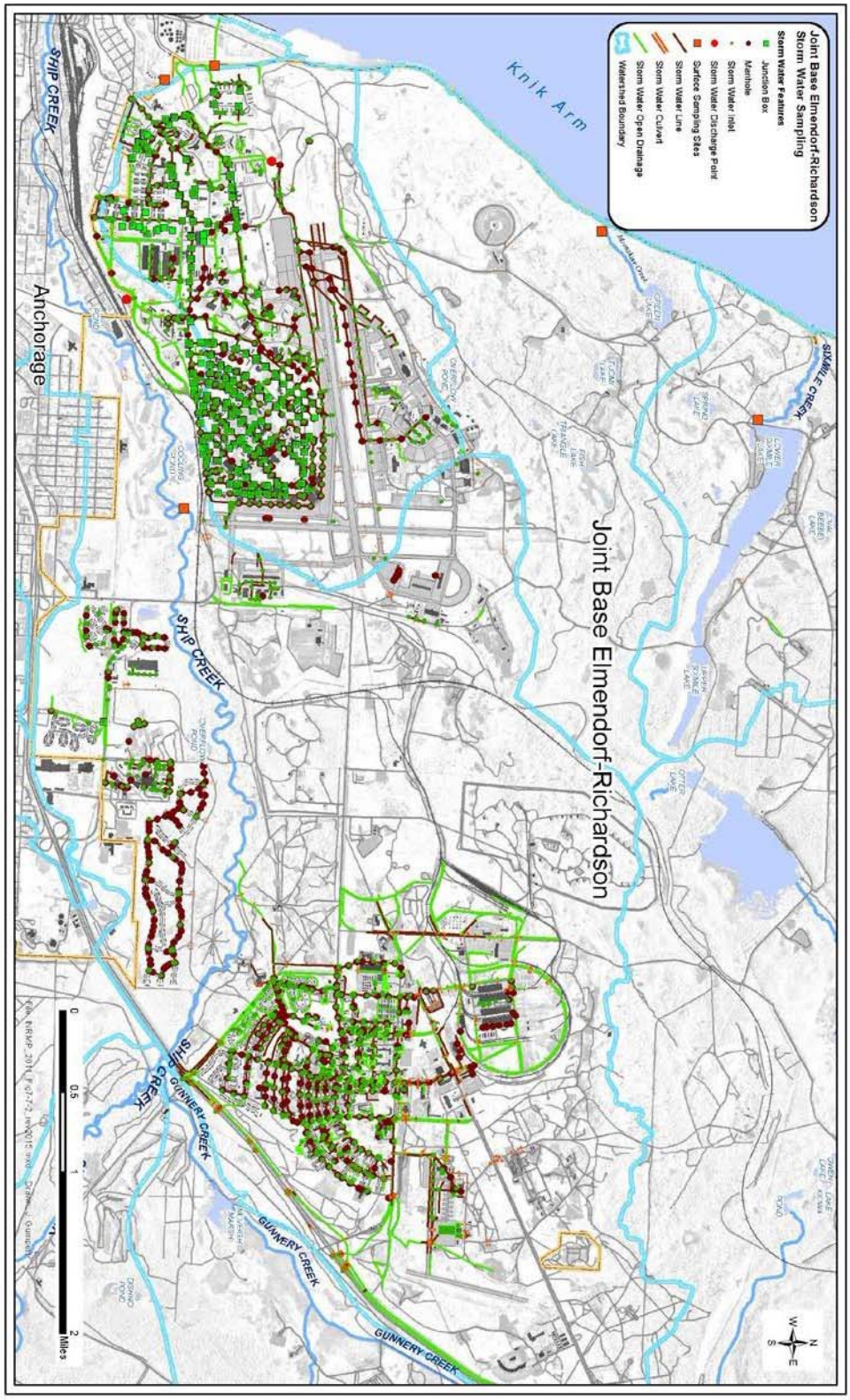


Figure 7.7.2 Storm Water Monitoring Locations on Joint Base Elmendorf-Richardson

Figure 7.7.2 Water Monitoring Locations on Joint Base Elmendorf-Richardson

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## 7.8 Wetland and Riparian Area Protection

### 7.8.1 Policy and Background

The JBER policy concerning wetlands is to protect and conserve wetlands in a manner that no net loss of wetland acreage or wetland functions occurs. Appendix B includes discussion of regulations regarding protection of wetlands.

The U.S. Army Corps of Engineers is the ultimate authority for regulation of wetlands. All wetlands on JBER are potentially jurisdictional and must be verified by the Corps of Engineers prior to impact, in order to determine mitigation requirements. Jurisdictional determinations are good for a maximum of 5 years. If impact to the wetland occurs outside of the 5-year timeframe, a new jurisdictional determination must be performed. 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 and was updated in 1996. While this plan is due for further updates, the functional criteria are still applicable to the unique urban-natural setting of JBER. From the results of the functional assessment methodology, a Debit-Credit evaluation was derived to facilitate development planning in Anchorage. The U.S. Army Corps of Engineers helped develop the Anchorage Debit-Credit Method, which is a tool for providing a consistent approach to determining the appropriate amount of compensatory mitigation for unavoidable adverse impacts from development and other construction projects in aquatic areas. This methodology is further discussed below. Natural Resources will adopt this system by integration into the current JBER wetland mapping project discussed in 7.8.2 *Wetland Inventory and Monitoring*.

**Task (In-house) 7.8.1:** Update and adapt the Wetland Functional Assessment Methodology and Credit-Debit Method to suit the more natural setting on JBER. This task will require collaboration with the Corps of Engineers. See *Project 7.8.2: Monitor, Wetlands* Timeline: 2016

#### 7.8.1.1 Riparian Area Management Setback Requirements

**Vegetative Buffer**

State BMPs[3] 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 occur but must be consistent with the maintenance of important fish and wildlife habitat.

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:

[3] AS 41.17.115 (Intent for riparian areas)

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.

### 7.8.2 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 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.

Wetland inventories accomplished on EAFB and FRA are discussed in Section 4.5.2.2, *Wetlands*. Figure 4.5.2.2 shows wetlands on JBER. Wetland functional assessments are developed to establish qualitative and quantitative benchmarks for monitoring the functions and values of wetlands within the landscape. The Anchorage wetland assessment methodology was developed by the Municipality of Anchorage and the U.S. Army Corps of Engineers to assess the biological, hydrological, habitat, and social functions wetlands within areas where development pressure was possible. This methodology was developed in 1982 and utilized resources that are outdated, but fundamentally, the assessment procedures are still relevant.

> **Project (in-house) 7.8.2:** Monitor, Wetlands. Establish an approved updated Wetland Functional Assessment Methodology for monitoring wetland functions and values on JBER Timeframe: 2015 and ongoing.

When mission support projects require unavoidable impacts to wetlands, and permitting by the Corps is required, mitigation of those wetland impacts may also be required. The values derived from the functional assessment are then considered in calculations described in the Anchorage Credit-Debit method to calculate the relative ecological value (REV) of a wetland. It is designed as a quantitative methodology to determine the appropriate amount of compensatory mitigation for unavoidable adverse impacts from development and other construction projects in aquatic areas. REV values range from 1, which are the highest functioning and valuable wetlands to 4, which are the lowest and correspond loosely to wetland designations in the Anchorage Wetlands Management Plan, (June 2012). Natural Resources will adopt the REV system into the re-inventory of JBER wetlands project discussed above. 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 REV 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 Anchorage Debit-Credit Method applies only to the determination of the extent of compensatory mitigation necessary to offset the adverse impacts of a project and/or the extent of adverse impacts that a restoration, enhancement, establishment, or preservation project could offset. Thus, the calculation of project debits and credits is not, in and of itself, sufficient to obtain project approval from the lead federal regulatory agency, even if the number of credits equals or exceeds the calculated debits. However, the method provides a scientifically supported technique to inform decisions on compensatory mitigation in a consistent, robust, repeatable, and defensible manner. It also provides a common technical framework for discussion of complex issues related to adverse impacts and compensatory mitigation. Inclusion of the REV system and coordination with agency personnel early in the process of delineating wetlands is anticipated to reduce the time and confusion when planning development projects on JBER.

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.

Wetland monitoring on FRA has concentrated on wetlands that have been used for maneuver training, including military maneuvers, bivouac (camping) activities, and live-fire operations. The goal of wetland monitoring is to quantify the extent and severity of disturbance to wetlands from both military and civilian land use. The RTLA component of ITAM considers wetland areas as part of establishing a land condition value to maintain the land for military use. Levels of disturbance and land condition on JBER-Richardson are reported in annual RTLA reports. The RTLA land disturbance methodology does not differentiate between areas that are wetland and other areas. ITAM will incorporate a new wetland functional assessment once finalized.

### 7.8.3 Wetland Management

Wetland management on JBER is primarily through protection and conservation to ensure no net loss of wetlands or wetland functions occurs. However, primary protection occurs through 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 to minimize silt movement as a result of construction or repair work. 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.

> **Task (In-house) 7.8.3.1:** Conduct a feasibility analysis of wetland mitigation options for JBER mission dependent projects. Timeframe: 2015.

JBER wetlands comprise important wildlife habitat, not only for common wetland species, such as waterfowl, frogs, and beaver, but as seasonally important feeding areas for both moose and bears as well as numerous smaller species. Because many JBER wetlands are small, they can be overlooked when conducting planning using aerial photos and GIS maps. The wetland inventory conducted in 2012 is current, but is not to be considered an exhaustive survey. On-the-ground verifications during the project planning process are critical to ensure that small wetlands are not overlooked. Few of the wetlands inventoried in 2012-2013 were field verified due to time and funding limitations. Therefore this effort is not to be confused with the process to delineate wetlands or establish jurisdictional authority. The

inventory effort is intended to be used as a planning tool. Any projects which may affect wetlands will still require a wetland delineation and functional assessment to be conducted on the ground, followed by verification and a request for a jurisdictional determination by the Corps of Engineers.

Permits for fill of wetlands are 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 damage to wetlands during military, recreation, maintenance, and fire suppression activities. U.S. Army Corps of Engineers is the authority for ensuring compliance with requirements of Section 404 of the Clean Water Act, which regulates use of wetland areas. As such, U.S. Army Corps of Engineers will conduct random follow-up inspections on a representative sample of disturbed wetlands to ensure compliance with issued permits.

> **Task (In-house) 7.8.3.2:** Follow the permitting process of Section 404 of the Clean Water Act to allow JBER to mitigate unavoidable damage to wetlands during military, recreational, maintenance, or fire suppression activities. Timeframe: as needed.

Education is an important aspect of wetland management. Natural Resources will continue to incorporate wetland conservation education into environmental awareness programs. 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.

Other uses also impact wetlands. Outdoor recreation can affect wetlands and wetland-related species (Racine *et al*. 1998). Future land use requirements, such as construction of buildings, parking areas, recreation facilities, and future mission needs may require a permit if wetland fill is required to accommodate increased demands on existing land use areas.

Some wetland protection measures conflict with the JBER BASH plan. Those water bodies within the Waterfowl Exclusion Zone (Figure 7.15.2) around the airfield attract birds, waterfowl specifically. BASH procedures call for hazing and occasionally depredating birds in these wetlands. The intent of saving wetlands is multi-faceted, but protection is focused on providing habitat for wildlife, notably water birds. However, if the wetland 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 Anchorage 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.

Wetland reclamation is conducted on JBER to repair and restore wetlands affected by military and non-military activities. Military mission-related wetland reclamation 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.

> **Task (In-house) 7.8.3.3:** Coordinate any activities occurring in anadromous streams during salmon presence with ADF&G and secure permits as necessary; minimize in-stream work during periods of salmon presence. Timeframe: as needed.

**Task (In-house) 7.8.3.4.:** Manage buffers around recreation lakes and other waterbodies to minimize erosion and other impacts to wetland fringes and waterbody edges. Timeframe: as needed.

### 7.8.4 Riparian Area Management

Riparian areas on JBER include Eagle River, Ship Creek and its tributaries, Chester Creek, North Fork Campbell Creek, Sixmile Creek, Fire Creek, Moonshine Creek, and EOD Creek. Primary efforts to protect these areas include restricting access, restricting logging to selective cutting, and in the case of Ship Creek, streambank stabilization efforts. Portions of all of the above, except Moonshine Creek, are listed as anadromous streams with ADF&G. Any activities occurring in the stream must be coordinated with the ADF&G Habitat Division, which issues permits and the US Army Corps- Regulatory. Construction work is often timed to minimize in-stream work during the times when salmon are present.

EO 11988, *Floodplain Management* 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. JBER is in the process of producing maps and a model of the type and accuracy used by FEMA and will indicate floodplain boundaries.

**Project 7.8.4:** MGT, Wetland/Floodplain. Timeframe: 2015-2017

## 7.9 Vegetation Management

### 7.9.1 Policy and Background

JBER's policy is to conserve vegetation for wildlife habitat, timber, erosion control, and military cover and concealment. JBER contributes to vegetation conservation through surveys, monitoring, rehabilitation, and effective management strategies. Vegetation is managed through the forestry, fish and wildlife, and ITAM programs.

Vegetation clearing, site preparation, or other construction activities not conducted during military readiness activities that may result in the destruction of active bird nests or nestlings would violate the MBTA. In south-central Alaska, USFWS recommended these activities not be conducted during 1 May - 15 July. Timing guidelines are not regulations, but are intended as recommendations 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.

> **Task 7.9.1:** JBER will strive to coordinate our vegetative clearing activities annually with our tenants and produce a map of cleared areas. Timeframe: annually.

### 7.9.2 Monitoring

Thirty long-term vegetation monitoring (LTVM) plots were established on EAFB by Alaska Natural Heritage Program in 1999, and include a minimum of three plots in each of six major vegetation types comprised of at least 300 acres (Tande *et al*. 2001a). A similar system was also established on FRA that included over 75 plots originally designed following USFS FIA guidelines (USFS 1998). Prior to joint basing, many of these plots had been sampled at least once. Those that were eligible were resampled at the appropriate time.

Currently, one project has been finalized that realigned these plots base wide and provided for a uniform data collection protocol (HDR 2013). This project incorporated some existing plots, removed others, and added new locations in habitats that were lacking coverage. This project will allow a unified and concerted effort to continue in a more efficient manner while making use of existing data. There are 122 plots established for long term ecological monitoring. Twelve of these were sampled in 2014.

In 2014, vegetative studies on elevational changes in shrub cover; succession of woody vegetation in wetlands, and silviculture monitoring was conducted on JBER (APU, 2014 (draft; final in process). While not conclusive, the studies searched for correlations between vegetative changes at high elevations and in wetlands with long term climatic changes. These studies were conducted in addition to long term vegetative monitoring conducted by MWH (2015).

> **Task (In-house) 7.9.2.1:** Continue sampling a minimum of 10% of the LTVM plots annually (as staffing allows). Timeframe: annually.
>
> **Project 7.9.2:** Alpine Biodiversity Study. Timeframe: 2017
>
> **Task 7.9.2.2:** Initiate and implement a program to monitor climatic indicator species to track climate influenced changes to vegetative communities. Timeframe: initiated - 2012, implement - 2012-2016.

### 7.9.3 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.

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).

Noxious and invasive plants known to occur on JBER include but are not limited to those presented in Appendix E. 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 and requirements, 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.

Invasive species inventory efforts on JBER-Elmendorf are included in Appendix E. The *Elmendorf Air Force Base Invasive Terrestrial Plant Species Survey Technical Report and Management Work Plan* (HDR Alaska, Inc. 2007) contributed significantly to knowledge of invasive plant species on JBER-Elmendorf. A formal comprehensive inventory of invasive species on JBER-Richardson was completed in 2011 and a management plan is scheduled for completion 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. The most recent RTLA plant list (May 2011) includes 60 invasive species. Appendix E includes invasive species. Invasive plant species in cantonment areas are managed by the 773 CES Pest Management Section. Faunal invasive species are discussed in Sections 5.3.6, *Invasive or Deleterious Fish and Wildlife Species*, 7.4.2.8, *Fisheries/Aquatic System Conflict Issues*.

In 2014, 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. MWH was contracted to perform management of reed canary grass at this location. Since use of herbicides abutting the water resource was questionable, management activities included hand pulling and application of black polyethylene fabric. Extremely conservative use of water-safe herbicides including glyphosate (Round-Up) will be considered for follow-up treatments. Hand wicking is a method commonly used to apply a very small amount of herbicide brushed directly on to leaves and stems of invasive plants, greatly minimizing the exposure of the water resource to the herbicide.

**Task 7.9.3:** Map JBER invasive vegetation and control efforts. Timeframe: ongoing.

**Project 7.9.3.1:** MGT, Invasive Species. Project funds will target species for manual, chemical, and/or mechanical control. Current objectives are awaiting the outcome of NEPA analysis and funding projections. Expectations include eradication, management, and control efforts in order of priority. Timeframe: annually.

**Project 7.9.3.2:** MGT, Habitat, Vegetative Plot. Timeframe: annually.

## 7.10 Land Management

### 7.10.1 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.

### 7.10.2 Management Issues and Planning

Grounds management is not a responsibility of Natural Resources on JBER. However, Natural Resources staff should play a continuing role in grounds management, meeting annually to lay out seasonal priorities. Improved grounds provide habitat for many wildlife species; urban forests can be managed for commercial value as well as for aesthetic purposes; and natural areas within improved grounds provide opportunities for education and outreach. 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.

#### 7.10.2.1 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 poor soils place great stress on new plantings. Low soil temperatures can restrict root formation to the upper 18 inches of soil. Relatively low soil fertility mandates fertilization, particularly on such areas as golf courses. Lawns established on these soils are often subject to drought during mid- to late summer. Transplanting works well with native species, but non-native species often require extra care, grow more slowly, and occasionally cannot survive the local conditions. Section 4.4, *Soils* discusses soils inventories that have occurred on JBER lands and includes a soils map and soils series information.

#### 7.10.2.2 Landscape Planning

Landscape planning on JBER will be addressed in Section 10, *Landscape Design Standards* of the Joint Base Installation Master Plan (in preparation). On JBER-R, grounds maintenance activities, such as planting, pruning, and cultivation, conform to criteria in Technical Manual 5-630 and the Installation Design Guide under the Master Plan. On JBER-E, grounds manintenance activities conform to criteria in Architectural Compatibility Standard. Landscape standards include the selection, placement, and maintenance of plant material on JBER. 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. Berry-producing trees and shrubs are highly discouraged within the Bird Exclusion Zone and Waterfowl Exclusion Zone. Trees and shrubs that attract moose to housing areas, such as mountain ash, are also highly discouraged. Native plants are preferred. In addition, caution will be taken so that no

new noxious or invasive species are introduced. Landscaping on JBER should be compatible with adjacent surroundings and complementary to architectural features and the overall natural setting of the area.

**Task (In-house) 7.10.2.2.1:** Perform a comprehensive inventory of landscaped areas on JBER. Timeframe: ongoing.

**Task (In-house) 7.10.2.2.2:** Propose locations for land conversion from improved or semi-improved land to unimproved by reforestation efforts. Vacant or abandoned woodlots may be reasonable candidates for reforestation. The level of effort is solely dependent on available land, funding, and staff, therefore varying widely from year to year. Timeframe: annually

### 7.10.3 Airfield/BASH Program

Vegetation areas around the active airfield are managed under the BASH Program to discourage wildlife use. The JBER BASH program is described in Section 7.15, *Bird/Wildlife Aircraft Strike Hazard Management*.

### 7.10.4 Golf Courses

JBER golf courses are maintained by 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 and improvement of fish habitat in this area.

#### 7.10.4.1 Eagleglen Fitness Park

Major natural resource related issues include water quality, BASH, wildlife conflict 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.

### 7.10.5 Urban Forestry

The urban forest includes individual trees as well as groupings and small tracts scattered among more dominant land uses in and adjacent to improved and semi-improved grounds as well as woodland borders. Multiple use of this resource occurs within and among this complex system of interspersed land uses. Urban forests are valued primarily for their non-consumptive contributions to quality of life.

Urban forestry on JBER is in need of attention. A comprehensive inventory of the landscaped areas on JBER has been initiated. This urban forestry inventory, once complete, will be used to develop a comprehensive JBER urban forestry plan. The urban forestry plan should address recommended species, locations of projects, tree maintenance, and urban forest inventory. Once this plan is completed, planting requirements and grounds maintenance projects should adhere to the rules and guidelines set forth in the plan.

**Project 7.10.5:** MGT Habitat, Urban Forest. Timeframe: 2017 and every 4 years.

**Task 7.10.5:** Complete Urban Forest inventory on JBER-Richardson. Timeframe: ongoing

Natural Resources personnel are responsible for planning, making recommendations, and periodic monitoring for urban forestry on JBER. Roads and Grounds are responsible for implementing an urban forestry plan in coordination with Natural Resources. Management of urban forests includes removal of hazard trees, growth support for newly planted trees, limbing trees, and other tasks as identified to be hazardous or contrary 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 Forester.

### 7.10.6 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 7.15) also includes requirements for vegetation management. Section 7.9.3, Noxious Plant/Invasive Species Management discusses development of a Do Not Plant list of invasive species for the cantonment areas and urban forestry is discussed in *Section 7.9.3, Noxious Plant/Invasive Species Management, 7.10.2.2, Landscape Planning and 7.10.5, 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.

#### 7.10.6.1 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.

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.

#### 7.10.6.2 Trees and Shrubs

Trees and shrubs can be successfully planted throughout the growing season; however, spring and fall have the highest success rate. Nursery-grown seedlings or saplings should be planted before June 15. Wild seedlings can be planted in the spring or fall. Cuttings may be planted as late as July 1, provided adequate moisture exists. Fertilizers used for trees and shrubs must have nitrogen-phosphorus-potassium ratios of at least 5-10-5.

### 7.10.7 Vegetation Maintenance Programs

#### 7.10.7.1 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 7.15, *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.

#### 7.10.7.2 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 Pest Management Section, and must be trained and certified in accordance with Air Force standards. JBER is planning to consult with NMFS to evaluate the use of herbicides on the landscape; particularly near anadromous waterbodies. Completion of this ESA consultation is planned for prior to the start of the 2015 field season.

#### 7.10.7.3 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.

#### 7.10.7.4 Urban Tree Maintenance

Tree maintenance on improved and semi-improved grounds is performed by Roads and Grounds section, the privatized housing manager (trees within leased zones), and Force Support Squadron personnel (on golf courses). Maintenance is usually limited to removing trees that are dangerous or unsightly and replacing those trees with commercially available trees, shrubs, or saplings. Native trees and shrubs are recommended to avoid introduction of non-native diseases and pest vectors. The development of the Do Not Plant list is discussed in Section 7.9.3, *Noxious Plant/Invasive Species Management* and *7.10.2.2, Landscape Planning***.**

### 7.10.8 Environmental Considerations

#### 7.10.8.1 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.

> **Task 7.10.8.1.1:** Identify stream banks needing stabilization, secure permits and recommend corrective action. Timeframe: as needed.

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.

> **Task (In-house) 7.10.8.1.2:** Control or eliminate runoff and erosion through sound vegetative and land management practices. Timeframe: as needed.

### 7.10.8.2 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.

### 7.10.8.3 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. 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 7.8, *Wetland and Riparian Area Protection*.

**Task 7.10.8.3:** Advise grounds maintenance regarding activities to preserve and protect wetlands, floodplains, wildlife habitat, and minimize pollution. Timeframe: as needed.

### 7.10.8.4 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 Anchorage and the U.S. Army Corps of Engineers. Section 6.2.1, *Mission-Related Impacts* discusses issues associated with gravel extraction on JBER. A Gravel Reclamation Priority Plan is programed for completion in FY17. 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.

**Project 7.10.8.4:** Develop the JBER Gravel Reclamation Priority Plan. Timeframe: 2017.

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.

### 7.10.8.5 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.

### 7.10.8.6 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. 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.

> **Task 7.10.8.6:** Follow the EIAP for proposed actions that may affect JBER natural resources. Timeframe: as needed.

## 7.11 Forest Management

### 7.11.1 Policy and Background

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

Forest management is an extremely important tool to protect, maintain, and enhance military training environments. Without forest management, vegetation communities become less diverse and animal species normally associated with certain successional stages may find these environments unsuitable. Forest management can be used to rejuvenate aging ecosystems and support the military mission.

USAG-AK developed a Forestry and Wildland Fire Management Plan as a component of the previous 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 FRA. This plan will be taken into consideration during development of the JBER forestry and wildland fire programs during 2012-2016. A collaborative forest management plan has been developed (currently in draft form) that broadly discusses the management of forested habitat by training area or LMU. This plan discusses the current uses of each training area and looks to the future use of each area, in anticipation of development to support training. While this plan is not a prescription plan, it does allow managers to see a comprehensive management document. It is hoped that JBER will move towards developing the commercial aspect of habitat management on the installation in the next 1-3 years. BLM will review and endorse all JBER forest management plans since BLM retaining jurisdiction over most of the forested lands on JBER.

### 7.11.2 History of Forest Management

#### 7.11.2.1 Past Forestry Practices

**EAFB**
Forest clearing occurred throughout the 1940-1950s during the initial homesteading and building eras of the military base. Clearings were restricted, for the most part, to southern and western parts of EAFB.

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. No fees were charged during this time. 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.

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. Limited personnel and budget have restricted the number of sales since. Figure 7.11.2.1 shows forest harvest and management activities on JBER from 1978 to present.

EAFB cleared 550 acres of various timberlands since 1995 to reduce wildlife use of the airfield in support of the BASH program. Wood was salvaged and sold as personal-use firewood.

**FRA**
Forest management focused on silvicultural activities, such as forest protection, habitat improvement, and supporting mission activities.

#### 7.11.2.2 Historical Timber Surveys

**EAFB**
An initial timber cruise, using point sampling of all commercial timber types, occurred as part of a 1982-1983 Natural Resources Inventory (Rothe *et al*. 1983). Pre-sale timber cruises were conducted in 1992, 1995, and 1997.

**FRA**
Point sampling cruises of all commercial timber types were conducted by forestry crews from the USAG-AK Natural Resource Forestry office. Data documenting past forest surveys for FRA has been fully assimilated into the JBER forestry program.

**JBER**
Timber surveys were completed in 2012 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 will be used to model timber volumes on JBER based on LiDAR and aerial imagery. Additional timber cruise surveys were conducted in 2014. A report including the timber cruising data and analysis was received from Alaska Pacific University (APU) in May 2015.

In addition, the LTVM plots that have been discussed previously (Section 7.9 *Vegetation*) will monitor forest health and change over time. Comparisons of historical data and current (2013) data were conducted in 2014 under the Corp of Engineers cooperative agreement with APU. Changes in spruce growth within wetlands, replacement of hardwoods in beetle-killed spruce dominated areas, and woody

vegetation growth into alpine areas were documented in their draft report. Additionally, APU used umanned aerial vehicles (UAVs) to study storm damaged areas where windthrown birch and other trees were present. Their final report was received in May 2015.

### 7.11.3 Biological Factors

#### 7.11.3.1 Biodiversity/Forest Health Factors

Biodiversity is defined as *the variety and variability of living organisms and the environment or habitat in which they exist* (The Keystone Center 1996). Forest ecosystems that have a variety of types and ages of vegetation are healthier, more resistant to attack by disease and insects, and provide better habitat for most fish and wildlife species.

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.

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. In fact, it has been visually estimated to have affected up to 50% of the forest in some areas; although it is extremely difficult to quantify. Though it was not officially recorded, micro-bursts were suspected to have occurred as well. An event of this magnitude poses significant forest health concerns as trees die and become targets for forest pests and increase vulnerability to wildfire. Management activities for areas affected by beetle kill, as well as the wind storm, included opening specific areas for public woodcutting with the intent to target efforts in areas where significant stands of beetle killed spruce and downed birch trees were available. Snagged trees, which pose a specific hazard as ladder fuels which may facilitate escalating ground fires into the canopy were targeted for cutting by JBER emergency services during training exercises. Reduction in ladder fuels, especially near firing ranges will be a priority in 2015-2016.

> **Project 7.11.3.1:** MGT, Habitat, Silviculture. Improve forest stands and wildlife habitat through silvicultural practices. Timeframe: annually
>
> **Task (In-house) 7.11.3.1:** Develop a JBER Forest Management Plan. Plan should include establishing a stand level GIS layer to facilitate forestry management, collect mapping data from ITAM, and establish baseline maps. Timeframe: 2016

Figure 7.11.2.1 Forest Harvest/Management Activities on JBER 1:95,000

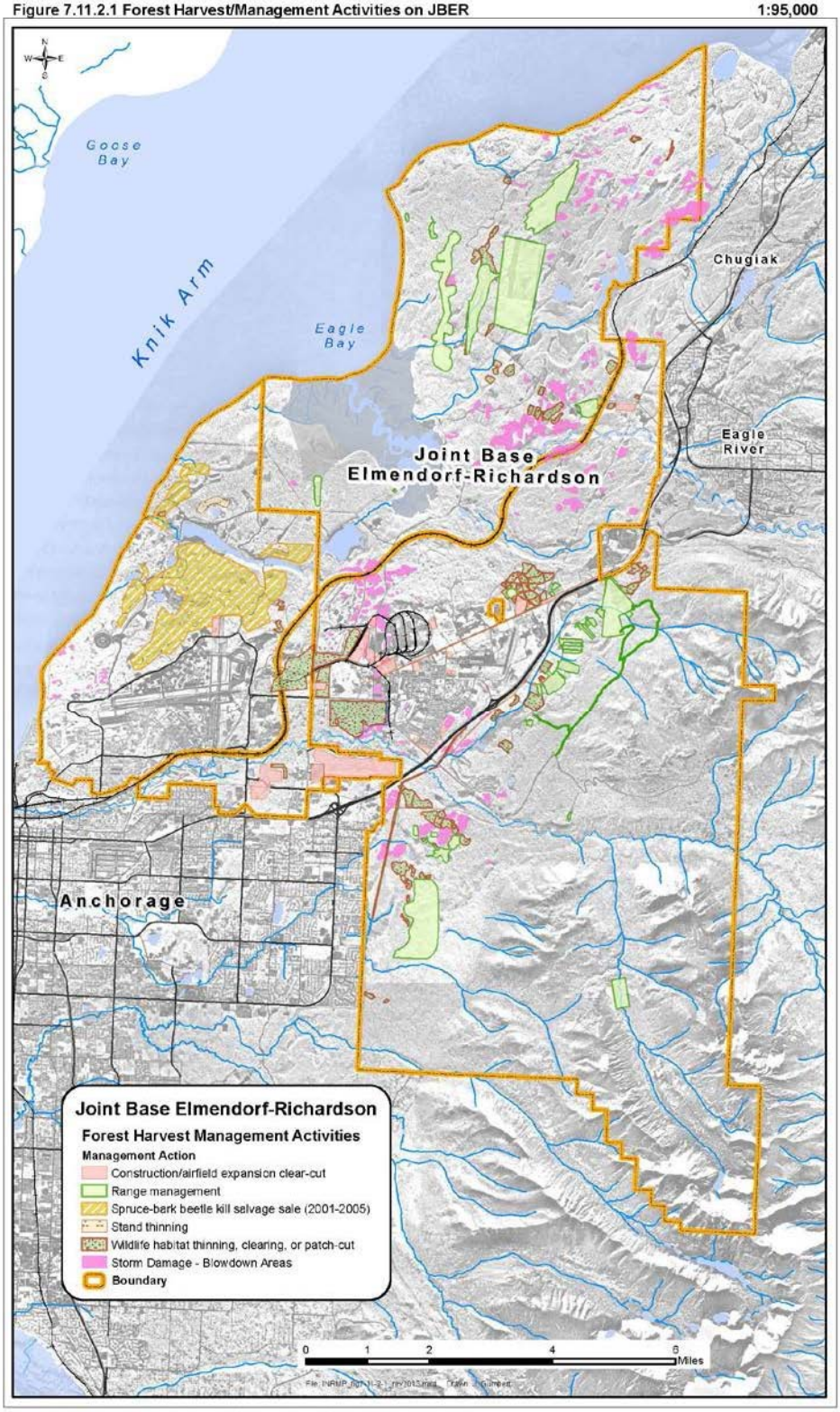


Figure 7.11.2.1 Forest Harvest/Management Activities on JBER 1:95,000

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#### 7.11.3.2 Forest Disease/Insect Problems

A major outbreak of spruce bark 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 spruces 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. Additionally, other stands have been removed by ITAM in 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 in Training Area 404 and 405 have been authorized for woodcutting, to encourage reduction of this fuel source. Affected areas will continue to be monitored to determine if the current management plan is sufficient.

Select cuts can be implemented to create stand diversity and decrease future insect risk. Placement of insect traps in actively infested areas is also an option. Infestations occurring in the cantonment area can be dealt with by insecticide use.

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 Anchorage 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. Recently, geometrid moths have been defoliating a large expanse of forest near Arctic Valley Road. This outbreak has affected five species of trees in the area. This area will be closely 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 (report pending, delivery January 2015). These areas will continue to be monitored for management needs and recovery.

> **Task 7.11.3.2:** Coordinate with the BLM and US Forest Service on insect infestation monitoring on JBER. Timeframe: 2015-2016.

### 7.11.4 Legal Factors

BLM coordination will occur prior to any harvest of timber products from JBER. JBER is pursuing an MOU with BLM to address small scale personal use forestry product sales. 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.

AFI 32-7064, chapter 8.3, requires the Air Force not to *give away, abandon or destroy forest products with marketable value. Collect payment for all forest products with economic value that are harvested on Air Force lands.* This AFI requirement is applicable to forestry products outside of the areas withdrawn by PLO 2676 and 2962.

JBER forest lands have been divided into two compartments, based on land ownership. Compartment 1 includes fee simple land that is owned (fee simple) by JBER. Stand divisions are largely based on topography, dominant species, and silvicultural needs. Compartment 2 includes land withdrawn from, but still owned by, BLM (Figure 3.2b). Management unit divisions are largely based on training area boundaries and use.

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 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 accounts. A portion of these funds are reimbursable and can be used by the installation to support forestry management.

The following procedures will be followed:

- Commercial timber sales will be restricted to the portion of JBER owned by the Air Force, with timber receipts going to the Air Force.
- Natural Resources is currently staffing a funding document that would allow Natural Resources to charge for personal-use firewood. Fees are proposed to be implemented in 2015.
- 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 fund forest management activities and regeneration costs.

## 7.11.5 Forest Management Factors and Strategies

### 7.11.5.1 Commercial Forest Lands

On JBER-Elmendorf commercial 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 from FRA have not been associated with age ranges. Determining stand age distribution for all of JBER is one goal of the forestry program.

Approximately 50 percent, or 37,054 acres of JBER (Figure 7.11.5.1), is commercial forest land; and only about 2,000 acres of the total forest acreage on JBER (39,053 acres) is not considered commercial. A breakdown of cover types is shown in Table 7.11.5.1. The white spruce-paper birch-aspen cover type comprises the largest portion of commercial 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 7.11.5.1.** JBER Cover Types and Acreages.

| **Commercial Forest** | **Acres** | | |
|---|---|---|---|
| ***Stand Type*** | ***EAFB*** | ***FRA*** | ***JBER*** |
| White Spruce | 323 | 884 | 1,207 |
| Paper Birch-White Spruce | 4,078 | - | 4,078 |
| White Spruce-Paper Birch-Aspen | - | 16,913 | 16,913 |
| Balsam Poplar | 770 | - | 770 |
| Paper Birch | 542 | - | 542 |

| Commercial Forest | Acres | | |
|---|---|---|---|
| ***Stand Type*** | ***EAFB*** | ***FRA*** | ***JBER*** |
| Paper Birch-Aspen | - | 11,170 | 11,170 |
| Quaking Aspen-White Spruce | 410 | - | 410 |
| Black and White Spruce-Paper Birch-Aspen | - | 1,432 | 1,432 |
| Black Cottonwood-White Spruce | 280 | - | 280 |
| Alder/Bluejoint Grass* | 1,532 | - | 1,532 |
| Other Coniferous* | - | 748 | 748 |
| **Total Commercial Forest Acreage on JBER** | **6,176** | **30,878** | **37,054** |
| Total Forest Acreage on JBER | 6,384 | 32,799 | 39,053 |
| Total Non-Forest Acreage on JBER | 7,070 | 26,983 | 34,053 |
| Military Support Facilities/Developed/Cantonment | - | - | 13,526 |
| Urban Forested Acreage on JBER | 2,084 | 2,558 | 4,642 |
| Total JBER Acreage | 13,324 | 59,782 | 73,106 |

* Not included in the total commercial forest acreage.

Most commercial sales will likely be conducted for the purpose of land conversion. Where possible, sales will be timed to coincide with improved market conditions. Much of the firewood sold/given away in recent years has been generated by numerous development projects that resulted in forest clearing.

Currently JBER is not collecting fees for any forest products, and thus, is not contributing to the Air Force reimbursable forestry account. Therefore, JBER is not eligible for reimbursable funds to support the program. In the event that JBER could resume charging fees, contributions would be made to the forestry account as required. JBER will initiate a timber harvest program whereby trees felled are sold and a portion of the revenues are returned to JBER. This may be accomplished through timber sales by contractual agreement, personal-use firewood permit sales, or Christmas tree permit sales. Fees will fund reforestation efforts, support staffing needs, maintain/procure equipment, and otherwise support the forestry program. A document is currently being staffed to the 673d Air Base Wing/CC that proposes to re-instate a fee for forest products.

> **Task 7.11.5.1:** Initiate a user fee based timber harvest program for personal use firewood and Christmas trees. Timeframe: 2015.

Since a personal-use sale of timber products is currently being pursued, woodlots would be made available for harvest as needed to promote wildlife or forest management initiatives. In most cases in the past, contracts required salvageable trees to be cut and stacked for firewood that was made available to the public. This model will still apply, with the added ability to charge for providing said services.

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.

Woodcutting permits on JBER are currently free. However, this INRMP update recommends consideration be given to raising the fee to $10 per cord. These funds would make up a good deal of the financial shortfall to be used for forest enhancement and regeneration.

In 2014, Natural Resources coordinated with ITAM to assist in management of trees in training areas, particularly around Bivouacs 408 and 409, at Firing Point 6, and in wood lots near Arctic Valley, on JBER, and in Trianing Area 418. Woodlot B, on the west end of the flightline on JBER-E, was used to stockpile trees cut from around the flightlines as well as brush cut from around buildings and fences. Woodlot I, in Training Area 418 was used to stockpile logs cut from areas of new development in the JBER-R Cantonment area. Both of these active woodlots were publicized as open for wood collection, with authorization from the Base Forester. Additionally, several roadside areas were opened in Training Areas 402, 403, 404, 405, 411, 412, and along Arctic Valley Road to encourage clearing of windthrown birch, which are considered hazards within active training areas. Fire department training was conducted to drop snagged birch near roadsides. As of 31 December, 2014, woodcutting is free of charge to those requesting authorization. Up to three authorizations are allowed per person, per year. One cord of wood is to allowed to be gathered per authorization. Authorizations are valid for 30 days.
Christmas trees were again offered in designated lots on JBER-E, north of the flight line and around Sixmile Lake as well as in Training Area 418, around woodlot I on JBER-R. Christmas tree cutting was allowed between Novermber 24th and December 25th. Only one tree was allowed per authorization, though multiple authorizations were allowed per household.

In 2014, A total of 609 woodcutting permits and 374 Christmas trees were authorized. Not all authorized woodcutters filled their quotas, however 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.

Alaska Statutes 44.37.200-220 has language for the state of Alaska commissioner of natural resources in coordination with the commissioner of environmental conservation, to prepare an assessment and report on the feasibility of carbon sequestration and carbon-trading systems in Alaska. In 2016, 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 the development of a strategic action plan to gain carbon credits or reduce the JBER footprint, if possible.

**Project 7.11.5.1:** Forest Carbon Credit Evaluation. Timeframe: 2016.

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.

#### 7.11.5.2 Forest Inventory

Section 7.11.2.2, *Historical Timber Surveys* discusses past forest surveys performed on JBER. Long-term vegetation monitoring plots will be inventoried annually, and data analyzed, to assess ecosystem health and trends. Similar plots in other vegetative communities have been established and will be inventoried as needed. 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. Assessments of hazard areas were conducted by both MWH and APU in 2014 (reports pending). Continued assessment of hazardous trees is needed throughout JBER, including on non-training lands, to ensure public safety. Assessments are included as part of the urban forestry plan discussed in Section 7.10.5, *Urban Forestry*. A wildfire hazard assessment (see Section 7.12, *Wildland Fire Management*) must also be performed regularly to determine where fuel reduction is most necessary and areas that are fire prone.

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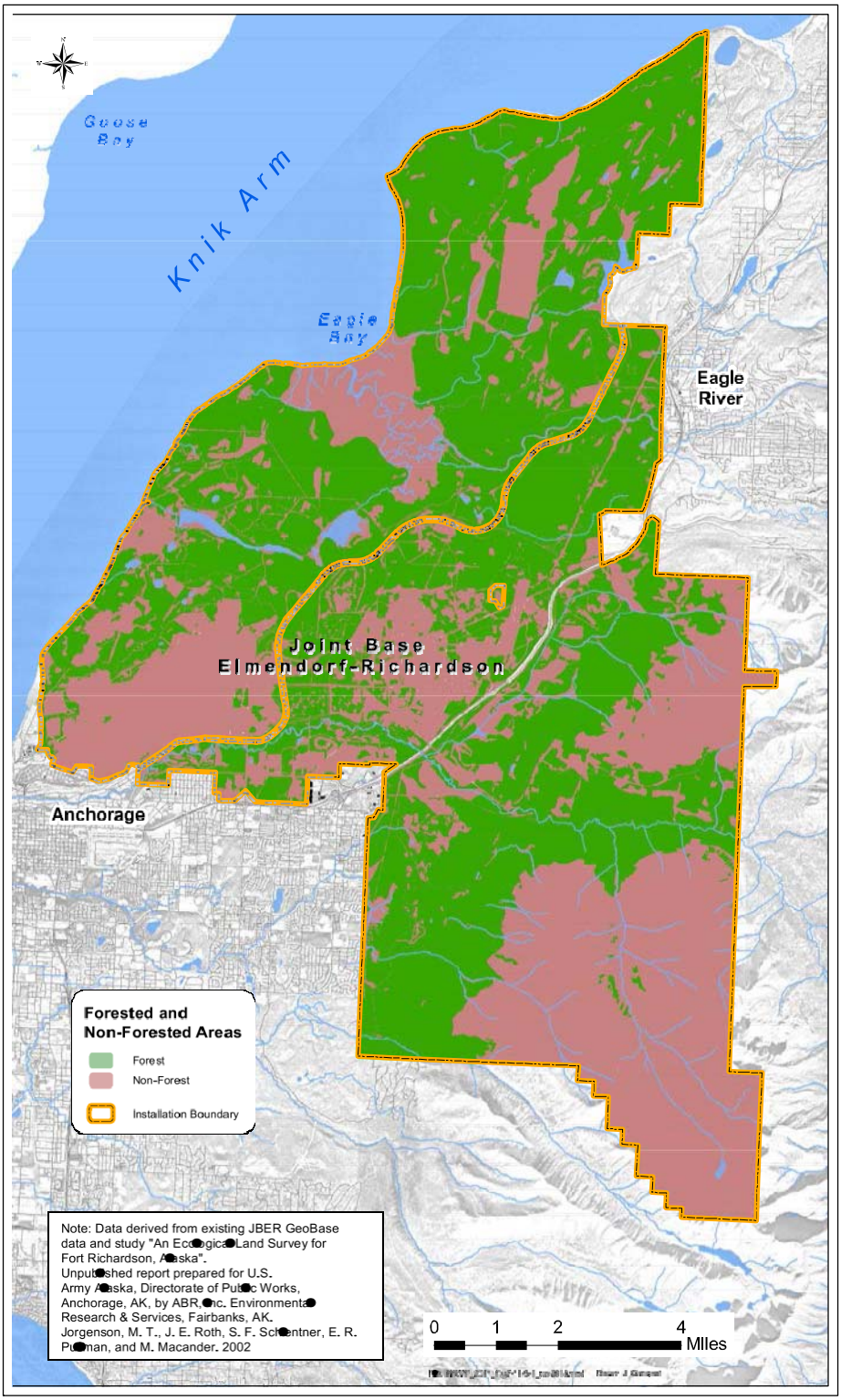
Goose Bay
Knik Arm
Eagle Bay
Eagle River
Joint Base Elmendorf-Richardson
Anchorage
Forested and Non-Forested Areas
Forest
Non-Forest
Installation Boundary
Note: Data derived from existing JBER GeoBase data and study "An Ecological Land Survey for Fort Richardson, Alaska". Unpublished report prepared for U.S. Army Alaska, Directorate of Public Works, Anchorage, AK, by ABR, Inc. Environmental Research & Services, Fairbanks, AK. Jorgenson, M. T., J. E. Roth, S. F. Schentner, E. R. Pullman, and M. Macander. 2002
0 1 2 4
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**Task (In-house) 7.11.5.2:** Perform hazard tree assessment surveys in cantonment and heavy traffic training areas, especially around firing points and landing zones. These surveys are typically informal. Timeframe: Annually

**Task 7.11.5.2.2:** Coordinate with ITAM to develop silvicultural prescriptions for each training area based on anticipated future military needs. Timeframe: Annually

### 7.11.5.3 Forest Management/Harvest Activities

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. Funding shortfalls in recent years have prevented site preparation, regeneration efforts, silvicultural management, and timber stand improvement/forest health projects. Management decisions and lack of manpower have restricted the scope of timber management on JBER. In addition, military training requirements limit some portions of JBER by what management options are available.

It is hoped that in the future, BLM and JBER managers can develop a stewardship agreement and MOU regarding timber management. Conceptually, a stewardship agreement would allow JBER to manage all forests on the installation and retain all funds generated by timber sales (contracted or permitted) on both Fee Simple and withdrawn (BLM owned) lands. In exchange, BLM will expect JBER to meet certain annual reporting requirements that relate to volume of production, timber inventory, and volume of timber sold among other data. This would benefit JBER by reducing overall costs to installation management and provide an offset to clearing land for development/mission requirements. Currently, JBER and BLM have a draft MOU that has been proposed. Natural Resources hopes to have a final resolution to this issue prior to the start of the 2015 field season.

**Task 7.11.5.3.1:** Finalize a MOU including a forestry stewardship agreement with BLM. Timeframe: by 2015.

**Potential Estimated Annual Harvest**

An estimate 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.

In Table 7.11.5.3, white spruce and hardwood harvest acreage represent saw, pole, and pole/saw timber types; the majority is in the pole/saw type.

**Table 7.11.5.3. JBER Estimated Annual Timber Harvest**

| Harvest Timber Type | Potential Harvest Land | Rotation Age | Regeneration Time | Total Rotation Length | Estimated Annual Harvest | 50% of 10-Year Estimated Annual Harvest |
|---|---|---|---|---|---|---|
| White Spruce | 24,320 acres | 120 years | 10 years | 130 years | 187 acres per year | 935 acres |
| Hardwoods | 12,482 acres | 80 years | 10 years | 90 years | 139 acres per year | 695 acres |

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**

Clearcuts, seed tree cuts, and selective cutting will 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).
- No logging should be done within 1/4 mile of known, occupied bear or wolf den sites or 300 feet of eagle or goshawk aeries.
- No logging should be done within 100 feet of anadromous streams and lakes, and only selective logging should be done within 100-300 feet of lakes, streams, recreation areas, or main roads.
- Logging in wetlands should be minimized, and if necessary, should be done in the winter.
- Summer logging in upland areas should utilize whole-tree-logging methods to provide some site scarification.
- Logging in sensitive areas should be restricted to rubber-tired or low-pressured track equipment.

Unless federal standards (including those within this document) are stricter, forest harvest activities will meet 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.

**Project 7.11.5.3.1:** Maintain old growth stands and unique forest types wherever possible. Timeframe: ongoing

**Task 7.11.5.3.2:** Manage and designate available parcels for moose browse/other wildlife habitat. Timeframe: ongoing.

**Task 7.11.5.3.3:** Harvest all areas having saleable forest products prior to conversion to non-forest. Timeframe: As needed

**Task 7.11.5.3.4:** Explore alternatives to hydro-axing. Timeframe: 2015-2016.

**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. Recent failures to draw bids on commercial timber sales will result in no more clear-cuts in the foreseeable future. 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.

**Project 7.11.5.3.2:** Conduct native seed stock collection and coordinate propagation by a cooperating nursery. Timeframe: 2017.

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.

In 2014, more than 1,000 seeds of mountain hemlock (*Tsuga mertensiana*) were collected near Geronimo Drop Zone. Seeds are being stratified at the Northern Latitude Plant Material Center in Palmer, Alaska. Seeds will be greenhouse grown through spring of 2016 and planted at JBER in designated reforestation areas (to be determined).

**Task 7.11.5.3.5:** Develop and implement long-term reforestation/reclamation plans. Timeframe: Annually

**Public Outreach**

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.

**Task 7.11.5.3.6:** Participate in Tree City, Arbor Day, and other urban forest initiatives. Timeframe: Annually.

## 7.12 Wildland Fire Management

### 7.12.1 Policy and Background

Wildland fire management can be an important 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. In some circumstances, wildland fire may both rejuvenate the system and support the military mission.

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.

A JBER Wildland Fire Management Plan (WFMP) is included as Appendix L. This plan outlines specific steps to reduce wildfire potential, effectively protect and enhance valuable natural and cultural resources, integrate applicable state and local coordination requirements, and implement ecosystem management goals and objectives on JBER. This plan will be updated along with INRMP updates. 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.

This was a cooperative effort involving USARAK Range Control (RTA), Natural Resources, and JBER Fire Emergency Services. The goal of this risk assessment was to evaluate how well protected the landscape is and provide management recommendations for the next 5 years. These recommendations will help target project funding to increase fire protection on the installation.

**Project 7.12.1:** MGT, Wildland Fire. Timeframe: annually.

The goal of this project for 2014 is to update the WFMP and evaluate fire protection basewide. Project components include evaluating landscape features and targeting mitigation actions to correct any deficiencies, such as fuel reduction harvests, firebreak installation/maintenance, or prescribed burning.

**Task 7.12.1.1:** Establish future fire management regimes as part of the WFMP and update annually. Timeframe: 2015 and annually.

**Task 7.12.1.2:** Perform wildland fire planning including coordination with Range Control, ITAM, JBER Fire Emergency, USFS, and DOF. Timeframe: annually.

### 7.12.2 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.

> **Task 7.12.2.1:** Initiate a fuel management program to include a fuel inventory to identify and reduce fuels in fire prone areas. Timeframe: 2015-2016; Deliverables from Project 7.12.1: *MGT, Wildland Fire* in 2014-15.

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 confirm to all state and local permitting requirements.

> **Task 7.12.2.2:** Establish a Memorandum of Agreement for execution of prescribed burns, annual wildfire training, and development of burn plans. Timeframe: COMPLETED 22 March 2015.

## 7.12.3 Wildfire Suppression

### 7.12.3.1 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.

#### 7.12.3.2 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 DOF has wildfire suppression responsibility for all areas in the southern part of the state regardless of land ownership. When necessary, the BLM reimburses the DOF to suppress wildfires in the southern half of the state, including JBER. The AFS also provides training for wildfire suppression to military zone firefighters.

JBER has a memorandum of agreement for fire prevention and wildland fire protection (Appendix G c). Presently FES is negotiating a prescribed burn support MOA with DOF. It is anticipated that DOF will provide the principal wildland fire suppression support for JBER starting in 2015.

JBER FES maintains 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.

## 7.13 Agricultural Outleasing

There are 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, agriculture outleasing shall be conducted in such a manner to support mission operations, support conservation compliance, execute natural resources stewardship, maintain healthy ecosystems, and sustain biodiversity.

## 7.14 Integrated Pest Management

### 7.14.1 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.

The EAFB Installation Pest Management Plan (3 Civil Engineer Squadron 2009) and the FRA Installation Pest Management Plan (U.S. Army Garrison, Alaska 2003b) comply with applicable requirements, particularly those of the federal Insecticide, Fungicide, and Rodenticide Act and DoD and individual military Department policies. A JBER Integrated Pest Management Plan (IPMP) was completed in 2012 (March 5, 2012). The Installation Pest Management Plan must be reviewed annually and updated at least once every five years.

> **Task (In-house) 7.14.1:** Coordinate with the Pest Management Section on pest plan updates to ensure that the Integrated Pest Management Plan and INRMP are mutually supportive. Timeframe: as needed.

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 7.15, *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. The 773 CES Pest Management Section also strives to provide a self-help pest management option; products for minor pests are available for JBER housing occupants. Major pest control work for housing units is sub-contracted to a local pest control company.

### 7.14.2 Management

Pest management requirements on JBER are:

- disease vectors and other health related pests, such as mosquitoes;
- general household and nuisance pests, such as silverfish and firebrats;
- structural pests, such as carpenter ants;
- BASH pests, such as grasshoppers;
- weeds, such as dandelions, clover, and other lawn weeds, and non-lawn invasive plants, such as bird vetch, white sweet clover, orange hawkweed, and choke cherry;
- vertebrate pests, such as mice, voles, bats, shrews, and squirrels; and
- Birds, such as violet green swallow, cliff swallow, European starling, and rock dove.

The 2012 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 (Section 7.10.7.2, *Chemical Control*) and forest diseases and insect control (Section 7.11.3.2 *Forest Disease/Insect Problems*). 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 2012 IPMP.

The Natural Resource office will coordinate with 773 CES 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*.

## 7.15 Bird/Wildlife Aircraft Strike Hazard Management (BASH)

### 7.15.1 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.

### 7.15.2 Management

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, maintained fencing, habitat maintenance, and proper gate management, wildlife can be kept from the airfield complex. It should be noted that Natural Resources manages JBER and tenants should coordinate with Natural Resources, but tenants are responsible for management of their properties and actions. Bryant Army Airfield is currently requesting support from 3d Wing SEF.

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 (1999 - present) contracted during the period 1 April - 31 October to keep the airfield and the surrounding Bird Exclusion Zone and Waterfowl Exclusion Zone (primarily LMU 7) clear of birds (Figure 7.15.2). 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.

The U.S. Department of Agriculture's National Wildlife Research Center conducted telemetry studies to help determine goose movement patterns in the Anchorage area. A joint-agency task force was formed to conduct goose management in the Anchorage area. In keeping with recommendations made by this task force (Crowley *et al*. 1997), some geese were translocated, and remaining geese near the airfield were hazed and, as a last resort, dispatched. These activities were conducted under a depredation permit issued to EAFB by the USFWS and ADF&G. The Anchorage goose population by 2003 was reduced to the objective maximum population of 2,000 birds during the fall count.

> **Task (In-house) 7.15.2.1:** Provide support in obtaining federal and state permits required for depredation, salvage, collection, and possession of all migratory or local species. Timeframe: annually.

Figure 7.15.2 Bird and Waterfowl Exclusion Zones on JBER 1:95,000

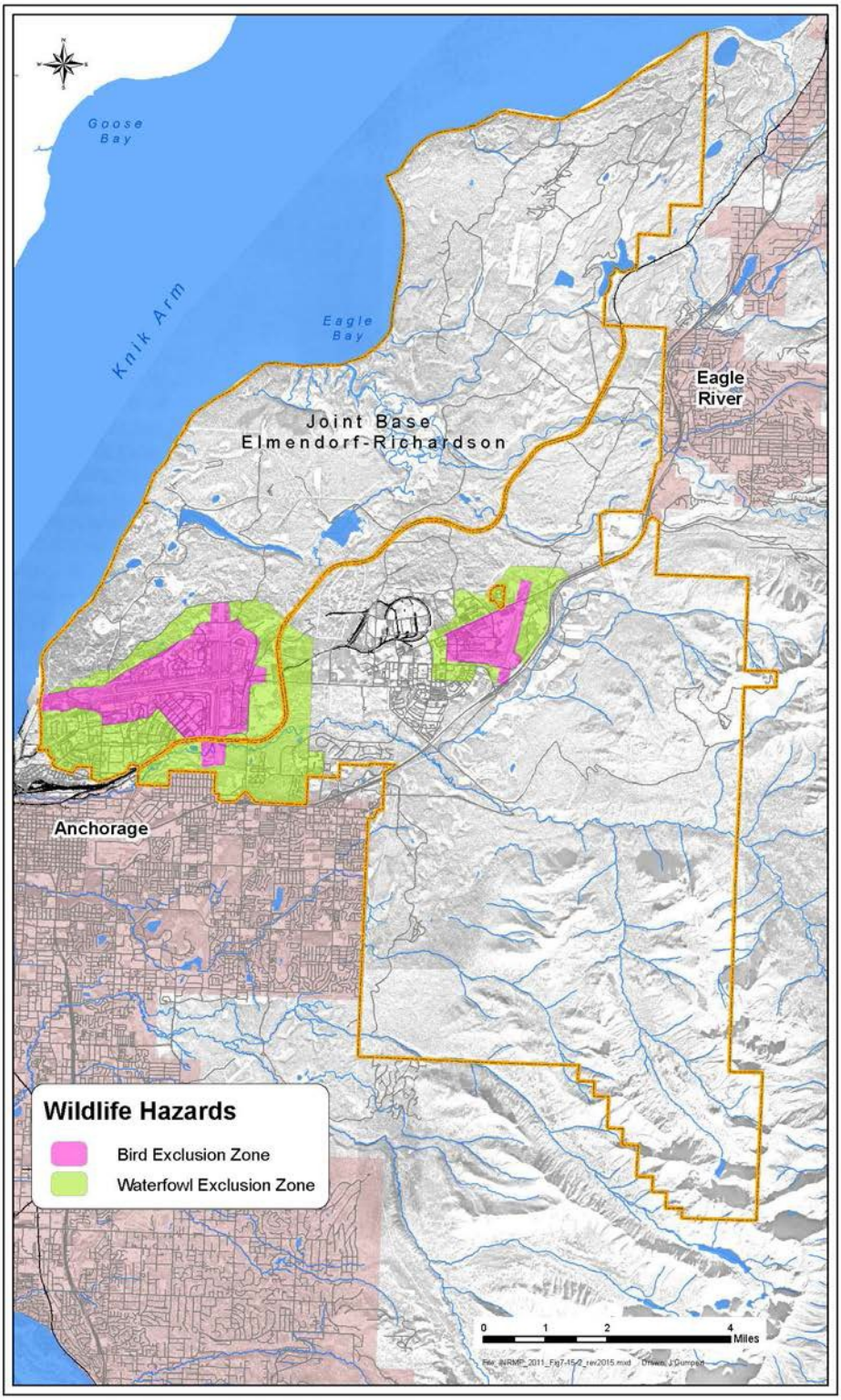


Figure 7.15.2 Bird and Waterfowl Exclusion Zones on JBER 1:95,000

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Improved and semi-improved lands within the Bird Exclusion Zone (most of LMU 7) 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 in included in Appendix E, *Flora*.

> **Task (In-house) 7.15.2.2:** Provide guidance and support for biological monitoring of wildlife populations, bird migration activity, wildlife conflict, and habitat management to improve technical advice for wildlife and vegetation management programs on all JBER airfields. Timeframe: ongoing.

> **Task (In-house) 7.15.2.3:** Coordinate with and provide natural resources representation to the Bird Hazard Working Group to monitor and advise the group of environmental modification and conditions that increase BASH potential. Timeframe: Twice annually.

The proposal to resume year-round firing of high explosive munitions into the ERF Impact Area created concerns for increasing risk to aircraft and crew by flushing more birds into the Elmendorf aerodrome. While the 3WGI 91-212 (*BASH Program*) established protocol to respond to birds entering the pattern, managerial procedures to minimize range an aerial operations need to be addressed to minimize BASH risk.

> **Project 7.15.2:** MGT, Species, BASH Risk. Timeframe: Annually.

## 7.16 Outdoor Recreation

### 7.16.1 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 woodcutting. A brief discussion of the history of outdoor recreation is in Appendix I.

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 necessary or appropriate for sustainable use of natural resources by the public to the extent that such use is consistent with the military mission and the needs of fish and wildlife resources, subject to requirements necessary to ensure safety and military security. Recreational activities are permitted in

undeveloped and training areas on JBER as long as there are no conflicts with the military mission or training activities. This is for public safety, the safety of the troops, and to maintain the integrity of the military training experience.

Hunting, fishing, and trapping may be permitted within current sustainable population levels and carrying capacity of specific wildlife habitats. The number of users of fish and wildlife resources may be limited on a daily or seasonal basis. 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. 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 Section 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.

> **Task 7.16.1:** Implement a nominal recreation user i-sportsman fee. Fees will offset recreation access administration and management costs as required by AFI 32-7064 and the Sikes Act. Timeframe: 2014-2016

### 7.16.2 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. However, if recreational or management activities conflict with military activities, the military mission comes first.

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. 673 ABWI 32-7001 outlines different levels of public access to JBER. The process for allowance and type of use differs on JBER-Richardson and JBER-Elmendorf because of differing access policies.

After 9/11, access to JBER-Elmendorf became more restrictive. Access to recreational facilities is divided into two groups; those with DoD identification cards and those without (general public). There is essentially no uncontrolled access to JBER-Elmendorf by the general public post-9/11/2001. Permittees to bow hunt for moose from the general public are permitted access daily only after a preliminary hunter orientation and security check. All other access by the general public requires a sponsor holding a DoD identification card.

DoD employees, military personnel, their dependents, DoD contractors, and their accompanied guests are allowed access to most outdoor recreation activities, such as hiking trails, snowmobiling, camping, picnicking, fishing, and other nature-related and gathering activities (including woodcutting).

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. Access to JBER-Richardson lands for recreation is authorized at specific entrances only, and all recreation activities must be conducted in accordance with applicable rules and regulations.

Civilians and military personnel requesting recreational access to JBER-Richardson lands and waters must obtain a Recreation Access Permit. This permit provides conditional authorization to enter the training lands and is good for one calendar year. All recreational users must log in 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 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-Richardson must log out of the training areas and physically vacate said training areas by 2300 hours on the day of use.

### 7.16.3 Management

#### 7.16.3.1 Hunting And Fishing

Hunting is an important natural resources-based form of outdoor recreation on JBER lands. Hunting on JBER is conducted under regulations promulgated by the ADF&G to ensure a sustainable harvest of game species. 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-Elmendorf is limited to an archery-only draw hunt for moose. 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 Natural Resources*. 673 ABWI 32-7001 conforms to state laws, but it outlines additional and more restrictive regulations for JBER-Elmendorf usage. Hunting on JBER-Richardson includes moose hunts, small game, and waterfowl in accordance with ADF&G regulations. As specified in ADF&G regulations hunting on JBER is open to all to participate in 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. There is no prioritization for hunting opportunities. Waterfowl hunting is restricted to areas north of Eagle River. Current harvest data are not available for any of these species, but historical records indicate an average annual harvest of 250 spruce grouse, 100-500 snowshoe hare, and 10 ptarmigan (U.S. Army Garrison, Alaska 2007a).

The ADF&G establishes hunting, trapping, and fishing regulations and harvest objectives for each game management unit. JBER is part of game management unit 14C. Base wildlife population management is coordinated with ADF&G and managed in accordance with the objectives set forth in this INRMP. JBER management of hunting involves allowing access for specific hunting activities, determining availability

of areas for hunting, military-specific safety requirements, reporting requirements, and other parameters to avoid conflicts with the military mission and to provide safe, high quality recreational experiences.

INRMP Objective 3.1 states the base will evaluate potential issues with allowing access for an ADFG-approved black bear hunt on JBER-Richardson lands.

Base hunting is conducted under ADF&G regulations vetted through the Alaska Game Board process to ensure public input and a sustainable yield. 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.

Section 4.5.5.3 of 673 Air Base Wing Instruction 32-7001 (25 July 2012) authorizes and discusses black bear hunting on JBER-Richardson. In March 2015, the Alaska Board of Game enlarged Game Management Unit 14c black bear hunting opportunities by including JBER. The method of take authorized was use of a shotgun with slugs.

Fishing is extremely popular year-round on JBER and is centered primarily on stocked lakes. Ice fishing is allowed on most JBER lakes from mid-November through late-March. Driving privately owned vehicles (gross weight 1,500 pounds or over) onto frozen lakes is prohibited for safety reasons. River fishing is pursued to a much lesser degree as it is limited from Bravo Bridge upstream to the southern property line. 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.

> **Task 7.16.3:** Compile hunting harvest data through the electronic recreational access permit system. Timeframe: 2016 and Annually.

### 7.16.3.2 Seasonal Activities

Summer activities include All-Terrain Vehicle use (approximately four miles of trail on JBER-Elmendorf), 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.

Swimming in any lake, stream, creek or reservoirs on JBER is prohibited. Falconry can be conducted on JBER-Richardson lands but is restricted to training areas that allow hunting and is in accordance with stipulations set forth by Natural Resources and the Range Control office.

JBER-Richardson rifle ranges are used by numerous law enforcement agencies. Public tours of the fish hatchery and other areas are offered. This type of open and cooperative interaction is essential for allowing diverse recreational pursuits on a continuing basis.

Horseback riding is not permitted on JBER. Recreational activities involving removal of minerals (including gold panning, dredging, and mining of any kind) and/or fossils from JBER-controlled land are not authorized.

Collection of plant seeds or other plant propogules for personal or commercial use is not authorized on JBER lands.

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, and occasionally Green lakes, 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, horseback riding, and cross-country skiing. JBER-Elmendorf has an extensive trail system, including Knik Bluff Trail, Upper Sixmile Trail, Spring Lake Trail, All Terrain Vehicle trail, and an extensive snowmachine trail system. Summer trails, with exception of the All Terrain Vehicle 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 I.

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 communter 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.

### 7.16.3.3 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, moose hunting is restricted to certain areas as shown on Figure 7.4.3.1. 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 (Figure 7.16.3.1).

**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.

#### 7.16.3.4 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*.

#### 7.16.3.5 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 7.20, *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.

Figure 7.16.3.1 Recreation Areas on Joint Base Elmendorf-Richardson 1:90,000

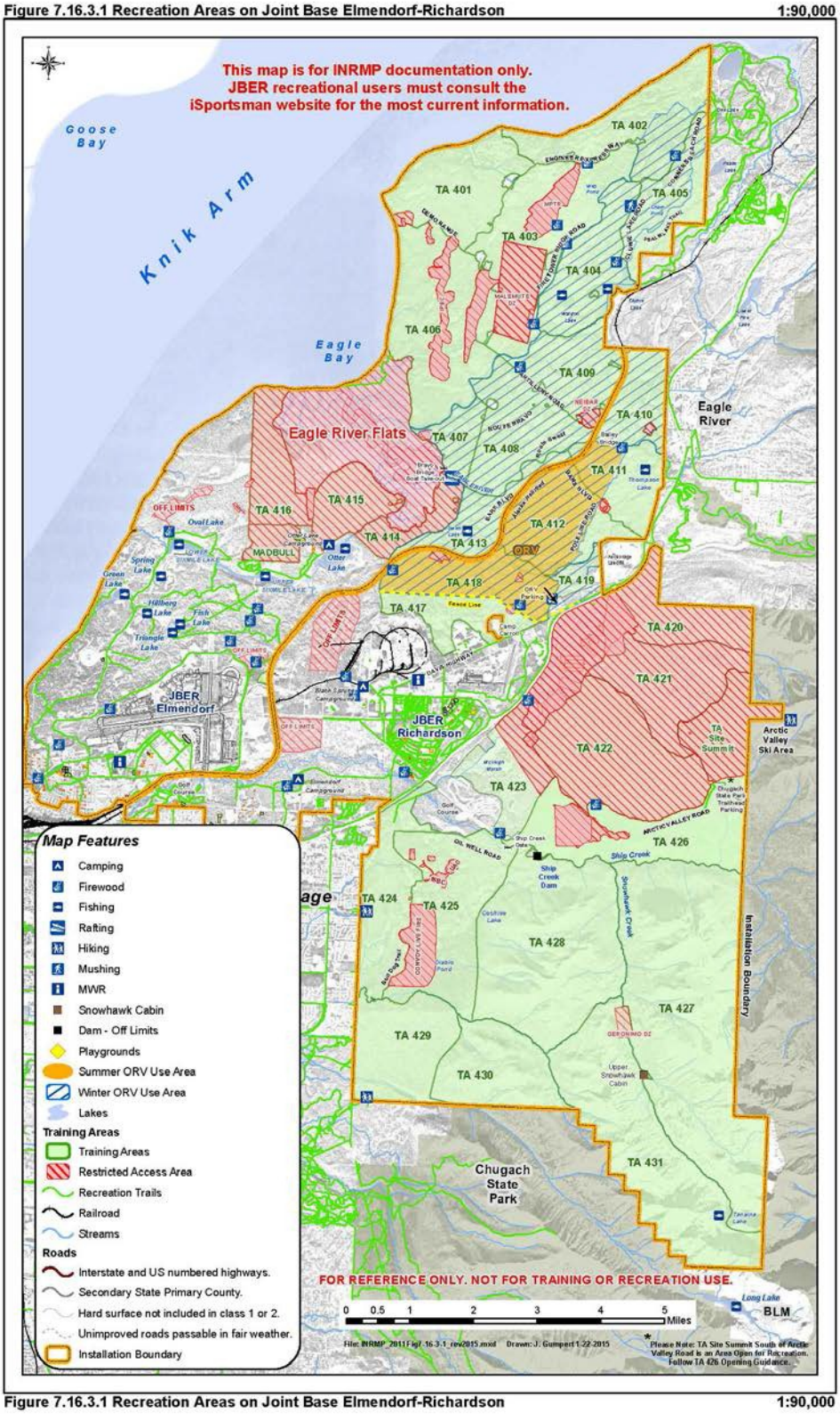


Figure 7.16.3.1 Recreation Areas on Joint Base Elmendorf-Richardson 1:90,000

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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 Watchable Wildlife site is located at the entrance to Lower Sixmile Lake, where visitors can see spawning and migrating salmon from July through September. A similar site is planned for Upper Sixmile Lake. Another possibility for a Watchable Wildlife site is a moose viewing area overlooking a browse improvement project.

#### 7.16.3.6 Water Sports Activities

Water resources on JBER include natural lakes and ponds, man-made impoundments, streams, and miles of 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.

Motorized boating is restricted to electric trolling motors, with exception that gas powered motors, not exceeding 10 HP, are allowed only on Clunie Lake. Only electric motors are authorized for all other lakes on JBER. When necessary for installation or removal of flight line floats on Sixmile Lake, outboard motors may be used with authorization from Natural Resources available at the Wildlife Education Center.

Testing outboard motors is only allowed on Lower Sixmile Lake and requires a special permit available at the Wildlife Education Center. Clearly defined restrictions for “engine-test permits” issued for Lower Sixmile Lake will be provided in the permit. 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.

Eagle River is heavily used during summer by rafters, canoers, and kayakers. Commercial rafting is permitted on JBER through Outdoor Recreation. Lower Eagle River is rated as Class II whitewater (Embrick 1994). At high water, some reaches of the river may be low Class III. The Army prepared environmental documentation and held public meetings on recreational boating use of Eagle River in 1995. The need for an improved permitting policy and a new boat take-out area were identified. The Army constructed a boat take-out in 1995, which included a gravel access road and parking area and signs. All recreational users (including boaters) must obtain a Recreational Access Permit and use the electronic recreational access permit system (see Section 7.16.3.6, *Management of Outdoor Recreation and Participants*).

The canyon portion of Ship Creek where it exits the Chugach Mountains is located on JBER. Ship Creek is a major public water supply for JBER and the city of Anchorage. For these reasons, boating on Ship Creek is not allowed.

#### 7.16.3.7 Camping/Special Group Activities

Primary concerns for tent camping on JBER include fire safety and conflicts with bears. Tent camping on JBER-Elmendorf has been restricted to special groups, such as Boy and Girl Scouts and church groups. 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 sites) campground near Green Lake, but they have not camped there recently. Green Lake campground is equipped with fire pits or 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.

Day use and picnicking are authorized on JBER-Richardson at Cottonwood Park and fishing lakes. Overnight camping is allowed only at two established camping areas: Black Spruce Travel Camp and Upper Otter Lake. The Black Spruce Travel Camp is a full service overnight camping facility.

### 7.16.3.8 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 7.16.3.10, *Outdoor Recreation Permits and Fee Structure*), and conducting recreational user surveys. The electronic recreational access permit 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. This database also provides the mailing addresses for recreational user surveys. User surveys are used to determine area use, number of recreational users, and types of recreational activities.

> **Project 7.16.3.8:** Recordkeeping, Other, Recreational Access Software Maintenance. Timeframe: 2012-2016.

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.

> **Task 7.16.3.8:** Initiate a program to identify, delineate, map, and prioritize areas impacted by recreational use for repair, and concentrate additional recreational use monitoring on assessing use in critical areas. Timeframe: 2015.

### 7.16.3.9 Outdoor Recreation Management

Moose hunting and fishing are by far the most important resource demands placed on JBER 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 normally 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, extension of snowmachine trails across JBER-Richardson) and are not permitted. Prior to authorizing such activities, environmental impact analysis must be conducted.

Outdoor recreational activities were identified by Richmond (1993). A JBER Outdoor Recreation Plan will be developed to provide sound management of outdoor recreation and use of natural resources on the installation. This plan will include a trails management plan, a lake access evaluation (prepared with consideration of the State of Alaska access program), and planned projects to improve outdoor recreational facilities, among other issues.

> **Task 7.16.3.9.1:** Prepare a well developed, researched, and NEPA-compliant JBER Outdoor Recreation Plan. Timeframe: 2015

Some efforts by Natural Resources and 673d Force Support Squadron, Community Services Flight outdoor recreation services may be repetitive or divergent. The same is true of the JBER-Richardson Morale Welfare and Recreation and the Community Services Flight on JBER-Elmendorf. Refinement and clarification of roles and responsibilities of these organizations related to outdoor recreation activities on JBER is necessary and will be part of the JBER Outdoor Recreation Plan. Other items of importance for the plan would include an evaluation of the fee structure and permit system, issues related to consumptive and non-consumptive uses, ADA requirements for facilities, etc.

Section 7.16.3, *Management* includes discussion of trails on JBER.

> **Project 7.16.3.9:** Maintenance of Existing Trails. Timeframe: as needed.

Trail maintenance, including signs, bridges, brush clearing, etc., should be accomplished when staffing and funds are available. ATV or hiking trail maintainance is the responsibility of natural resources staff. Outdoor recreational staff is responsible for grooming all cross-country ski trails.

Outdoor recreational opportunities could be improved by construction or maintenance of fishing docks, lake access, portage sites, and informational kiosks. Consideration should include making docks handicapped-accessible particularly at Hillberg and Lower and Upper Sixmile lakes.

> **Task 7.16.3.9.2:** Improve identified outdoor recreational opportunities. Timeframe: as needed.

Restrictive access points for the EOD Creek turnoff at Sixmile Munitions, the Oval Lake access road, All Terrain Vehicle trailheads, and hiking trailheads should be established. In many cases gates will prevent unauthorized access by four-wheelers, 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. Gates could be opened during winter snowmobiling season when damage is unlikely.

> **Task 7.16.3.9.3:** Establish and coordinate installation of controlled access points (gates or other barriers) at specific access points and in riparian areas to help alleviate illegal four-wheeling and resource damage. Timeframe: as needed.

Other opportunities for recreation facility improvements include the following:

- The Clunie Lake area could be improved by graveling the parking area, providing sanitation facilities, and installing barriers to keep vehicles out of wetlands.
- The Sixmile Creek Recreation Area parking area and beach access could be improved by graveling.
- Waldon Lake has a good parking area, but adjacent natural areas are being degraded by uncontrolled, unauthorized uses, such as camping. A boardwalk or portable pier for anglers could be installed to enhance fishing opportunities.
- Thompson Lake mainly requires the installation of barriers around common parking areas to stop damage to wetlands by vehicles.
- 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.

### 7.16.3.10 Outdoor Recreation Permits and Fee Structure

All hunting or fishing on JBER is in accordance with applicable federal and state laws and regulations. However, in some cases JBER regulations are more stringent due to mission requirements. Generally hunting and fishing are regulated by ADF&G, through hunting and trapping regulations. Army Regulation 200-3*, Natural Resources - Land Forest and Wildlife Management*, USARAK 190-13, *Enforcement of Hunting, Trapping and Fishing on Army Lands in Alaska*, and 3WI 32-7001, *Conservation of Natural Resources* have been consolidated into the JBER Natural Resources regulation 673 ABWI 32-7001.

**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 thier 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, off-road vehicle use on JBER-Elmendorf (both four-wheeler and snowmachine), special group camping, dog-mushing, and boat engine testing. Information on how to obtain permits is on the JBER iSportsman website.

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-Elmendorf 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 hunt permit must:

(1) complete a State of Alaska approved bowhunter or muzzleloader education course,
(2) purchase all appropriate state licenses and tags (*i.e.*, non-resident moose tags),
(3) successfully draw a State of Alaska moose hunting permit,
(4) complete a State of Alaska-approved basic hunter education course (may be from any state but must meet Alaskan standards),

(5) pass a proficiency test administered by JBER,
(6) attend a hunt orientation presented by JBER,
(7) obtain a iSportsman permit, and
(8) remit $125 conservation fee to JBER.

JBER moose 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 may be checked at the kill site by either natural resources personnel or by Conservation Law Enforcement personnel. Mandatory 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 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." 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. In coordination with ADF&G both EAFB and FRA began charging moose hunters an access fee. Moose hunting fees generate roughly $15K a year approximately 50% of the annual electronic recreation access program cost and a much smaller fraction of the total recreation management cost.

Section 7.11.4, *Legal Factors* 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.

Woodcutting permits on JBER are currently free. However, consideration should be given to instituting a fee not to exceed $50 per cord, particularly for wood that is limbed and cut into manageable length and hauled to easily accessible locations. Tight funding for natural resource projects is expected into the foreseeable future and user fee income would make up some of the financial shortfall for forest enhancement and regeneration. JBER sales of timber, firewood, and Christmas trees are required to comply with DoDI 4715.03 and AFI-32-7064.

**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. Hunting and fishing fees are entered into an installation level account. Activities of the account for EAFB from FY01 through FY10 are included in Appendix I. EAFB firewood and Christmas tree permits during this period totaled almost $49,000 and moose permits totaled just over $19,000. During this same period FRA moose hunting permits generated just under $121,000. Estimated annual proceeds if a recreational user fees and forestry permits were reinstated is approximately $80-100K annually. This amount would offset annual recreation access administration and management costs as required by AFI 32-7064 and the Sikes Act.

## 7.17 Coastal Zone Management

### 7.17.1 Policy and Background

The Air Force has a Memorandum of Understanding with Coastal America (Coastal America 1992) to perform the following:

- protect, preserve, and restore the nation's coastal ecosystems through existing federal capabilities and authorities;
- collaborate and cooperate in the stewardship of coastal living resources by working together and in partnership with other federal programs; and
- provide a framework for action that effectively focuses expertise and resources on jointly identified problems to produce demonstrable environmental and programmatic results that may serve as models for effective management of coastal living resources.

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 Anchorage in Port Expansion projects.

### 7.17.2 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.

> **Task 7.17.2:** Utilize 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 to protect, preserve, and restore coastal ecosystems. Timeframe: as needed.

### 7.17.3 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. However, JBER will continue to perform tasks specified in the Air Force Memorandum of Understanding with Coastal America (Coastal America 1992).

## 7.18 Cultural Resources Protection

### 7.18.1 Policy and Background

Cultural resources management at JBER is provided in accordance with Section 106 and Section 110 of the National Historic Preservation Act (16 USC Section 470, as amended), the Archeological Resources

Protection Act (16 USC Section 470aa-47011), the American Indian Religious Freedom Act (42 USC), the Native American Graves Protection and Repatriation Act (25 USC Section 3001 *et seq*.), EO 11593 (*Protection and Enhancement of Cultural Environment*), and Air Force Instruction 32-7065. Means to achieve compliance with these laws and policies are outlined in the *Integrated Cultural Resources Management Plan, 2008-2012, Elmendorf Air Force Base, Alaska* (Verhaaren and Kullen 2008) and the *Integrated Cultural Resources Management Plan, 2002-2006, Fort Richardson, Alaska, United States Army, Alaska* (Center for Environmental Management of Military Lands and Gene Stout and Associates 2001). A JBER Integrated Cultural Resources Management Plan was completed in late 2012 and is relevant for 2012-2017.

JBER cultural resources include archeological sites, historic sites, cultural landscapes and Traditional Cultural Properties of importance to Native Alaskans, and historic landscapes. Cultural resource management efforts at JBER-Elmendorf have accomplished or documented the completion of archeological surveys in areas of highest probability, including areas along the beach and bluff and areas of high relief inland. Most sites identified in the survey are cabin ruins and associated features from the homesteading era. Three sites were considered potentially eligible for National Register of Historic Places inclusion for their part in the history of Anchorage. No formal determinations of eligibility have been made. Known cultural resources on JBER-Elmendorf include 27 archeological sites, mostly homesteader or military sites; 45 World War II-era historic properties grouped into four historic districts; and 11 significant Cold War-era buildings and structures. Large areas of JBER remain unsurveyed. Of the 72,539 acres considered surveyable, 23,749 acres have been surveyed. Projects are programmed in upcoming years to increase the amount of surveyed land.

Previous archeological investigations indicate that JBER-Richardson has a low site density and may be considered to have low potential to contain archeological resources of significance to prehistory. Known cultural resources on JBER-Richardson include five archeological sites consisting of cabins and structures; 46 buildings and structures; two portions of the Iditarod National Historic Trail, the only congressionally designated National Historic Trail in Alaska; Nike Site Summit Historic District; and the Fort Richardson National Cemetery. The latter two cultural resources 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.

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 3 buildings and continuing on 3 more scheduled for FY14-15. 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 programmed for FY14-16 to restore the radar clamshells at the upper 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. For instance, JBER has a Memorandum of Agreement with the University of Alaska Fairbanks Museum for artifact storage.

### 7.18.2 Cultural Resources Implications for Natural Resources Management

Natural resources management generally complements the preservation of archeological 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 (36 CFR Part 800) 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 cancelled in FY13 due to contractual deficiencies with Knik Village. This project will be programmed in FY17.

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. Section 106 of the National Historic Preservation Act requires consultation with the State Historic Preservation Office, affected Indian Tribes, and other interested parties regarding "undertakings" that may affect historic properties. The Cultural Resources Manager will assist with Section 106 consultation, as necessary. If cultural resources may be impacted, steps must be taken to avoid or mitigate damage.

> **Task 7.18.2:** Coordinate with the Cultural Resources Manager to ensure that adverse effects to archeological sites and other cultural resources are avoided during natural resource management activities. Timeframe: ongoing.
>
> **Project 7.18.2:** Eagle River Flats Programmatic Agreement. Timeframe: Project execution is dependent on finalization of Resumption of Year-Round Firing Opportunities Eagle River Flats EIS

Of all practices associated with natural resources management on JBER, timber cutting, vegetation restoration, and erosion control projects have perhaps the greatest potential to disturb archeological sites. Natural resources projects that involve excavation, earth moving, and/or fill deposition can damage or bury archeological sites.

## 7.19 Natural Resources Law Enforcement

### 7.19.1 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, 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. Game laws must be implemented in accordance with applicable state and federal laws. Whenever hunting, fishing, or trapping is allowed on military installations, enforcement of natural resources laws and regulations will be in accordance with the INRMP.

Conservation law enforcement has a long history of providing service to EAFB and FRA. The MCA program has a 22-year history at EAFB and the surrounding community. Military Police game wardens provided similar service to FRA with the exception of 1999-2005 when FRA implemented a contract to provide civilian conservation enforcement. Military Police game wardens were reinstated in 2005. 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.

### 7.19.2 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 or serve as MCAs. These personnel work under supervision of CLEOs, as outlined in AFI 32-7064, ABWI 32-7001, and OI 32-700.

Enforcement authority stems from 10 USC 2671, Military Reservations and Facilities: Hunting, Fishing and Trapping, 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 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*. Enforcement of federal and state fish and game laws, cultural/historic laws, and outdoor recreation regulations is per requirements listed in 673 ABWI 32-7001.

Conservation enforcement is also required by Public Law 86-797 (Sikes Act). The 1997 Sikes Act Improvement Act includes two specific professional natural resources enforcement items:

- required enforcement of applicable natural resource laws (including regulations) and
- an 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*.

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. Outside agencies involved in natural and cultural resources enforcement on JBER include USFWS, Alaska Department of Public Safety/Alaska Bureau of Wildlife Enforcement, ADF&G, 673 ABW Judge Advocate's Office, 673 CES Natural Resources, NMFS, and BLM.

> **Task 7.19.2.2:** Coordinate enforcement activities with other agencies, particularly ADF&G, NMFS and USFWS. Timeframe: ongoing.
>
> **Task 7.19.2.2:** Update or revise 673d ABWI 32-7001. Timeframe: as needed

### 7.19.3 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.

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, which are handled through the Federal Magistrate's Office via 673d Security Forces Squadron, may be issued to both military and civilian personnel for violations of state/federal fish and game laws in accordance with 10 USC 2671 and 16 USC 670 (Sikes Act). In addition, military personnel may be charged under the Uniform Code of Military Justice.

Unlike CLEOs, MCAs have a limited scope of authority. 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.

### 7.19.4 Conservation Law Enforcement Investigators/Park Rangers

Natural Resources currently has two full-time 1801 Conservation Law Enforcement investigators and one 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. They also oversee work schedules, train, direct priorities, and provide field training of four Military Police personnel. 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.

> **Task 7.19.4:** Evaluate the need for additional full-time manning to provide adequate conservation enforcement on JBER as Military Police support is reduced or eliminated. Timeframe: as needed.

### 7.19.5 Training

#### 7.19.5.1 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. These agents are recognized as state Peace Officers for Fish and Wildlife Protection with jurisdiction on military lands only.

Training is conducted by Alaska Wildlife Troopers, Fish and Game enforcement, NMFS Enforcement, USFWS Special Agents, US Park Service, and Office of Special Investigations representatives from the Staff Judge Advocate's Office. Training topics include legal authority and jurisdiction, search and seizure, state and federal fish and wildlife laws, cultural resources, officer safety, use of force, and weapons qualification. For Level 2 agents to acquire Level 3 status an additional 32 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 and bear response procedures. All qualified MCAs must successfully complete an annual quality control practical to maintain qualifications.

#### 7.19.5.2 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.

### 7.19.6 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.

### 7.19.7 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, snowmobiling, and safety issues. Problem areas include cutting firewood without a permit, selling firewood, and extensive illegal and unsafe snowmachine 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.

> **Task 7.19.7.1:** Conduct public education as a key element in preventative law enforcement. Timeframe: ongoing.
>
> **Task 7.19.7.2:** Conduct enforcement activities to complement other natural resources management activities and programs. Timeframe: ongoing.

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-Richardson has been common, averaging one case every other month. On JBER-Elmendorf the average is two cases 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, FRA, and EAFB (See Section 6.5.4, *Living with Wildlife Memorandum of Understanding*). 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 7.4.3.2, *Wildlife Conflict Management*.

**Task 7.19.7.3:** Strategize, develop, implement, and articulate means of addressing law enforcement priorities. Timeframe: ongoing.

**Task 7.19.7.4:** Use procedures established by Natural Resources in conjunction with ADF&G to handle nuisance wildlife complaints on JBER and provide for public safety in the event that dangerous wildlife is present in the cantonment area or areas where military personnel are training. Timeframe: as needed.

## 7.19.8 Enforcement Problem Areas

### 7.19.8.1 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 associated with premeditated trespassing.

The southern border of JBER-Elmendorf is mostly fenced but trespassing, frequently for the purposes of poaching salmon, is common. Areas between the state fish hatchery and Eagleglen Golf Course are the most common locations for trespass activity. Trespassers encountered by enforcement personnel are usually in the act of salmon poaching and are cited and released. At times individuals are detained and turned over to 673d Security Forces Squadron or the Anchorage Police Department.

Numerous trails and waterways create easy access for an individual to enter JBER. A recreation pass system is available on JBER-Richardson for users to sign into those training areas that Range Control considers safe for recreation activities. However, electronic survey counters indicate that many 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. See the table below for trespass warnings/citations issued from 2008-2015.

| JBER Tresspass Warnings/Citations 2008-2015 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **2008** | 48 | **2010** | 193 | **2012** | 182 | **2014** | 125 |
| **2009** | 304 | **2011** | 338 | **2013** | 167 | **2015** | 255 |

### 7.19.8.2 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 action under the Uniform Code of Military Justice. This activity is enforced by the use of trail cameras, routine patrol, Range Control, or witness reporting.

#### 7.19.8.3 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 Golf Course. Patrols by Conservation Enforcement personnel are increased during the salmon season.

In the past, several moose carcasses have been found under suspicious circumstances. Incidents involving illegally harvested moose 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, and bird feed during summer, dirty barbecue grills, etc. This is a difficult area to enforce, but state law requires a $310.00 fine for those in violation of negligent feeding laws ($325.00 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 Brief and responses to nuisance calls in housing areas, which include determination of the cause of the animal's presence.

### 7.19.9 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 Bureau of Wildlife Enforcement officers, 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 duty belts, bulletproof vests, and pepper spray is also provided. MCA hats and badges are provided by Natural Resources, but the duty uniform is the Airman Battle Uniform. MCAs almost always purchase their own duty belt and attachments and badge (Level 3 Agents). Given the increasing prominence of this program and the degree to which Natural Resources have come to rely upon this section, reliable options for funding must be explored.

## 7.20 Public Outreach

### 7.20.1 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.

> **Task (in-house) 7.20.1.1:** Perform outreach programs. Timeframe: ongoing.

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-Elmendorf's on-going BASH program, the bear study, Arbor Day activities, and others.

> **Task 7.20.1.2:** Coordinate with the Public Affairs Office, particularly for special programs, interviews, or potentially contentious issues. Timeframe: as needed.

### 7.20.2 Environmental Education and Interpretive Programs

The Wildlife Education Center/Natural Resources Office has been the centerpiece of interpretative efforts for many years. Located in one of the JBER-Elmendorf's oldest historic buildings, the Wildlife Education Center offers wildlife 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 are also located there. Tours are 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 2002-2005 the annual average Wildlife Education Center visitation dropped to less than 2,000. The Wildlife Education Center is a key resource not only for the JBER community, but also for Anchorage public schools, whose K-6th grade classes take tours on a regular basis. The Wildlife Education Center is open daily, Monday through Friday, for a total of 19.25 hours per week.

> **Task 7.20.2.1:** Maintain and improve the Wildlife Education Center/Natural Resources Office as the centerpiece of interpretative efforts for the environmental education program. Timeframe: ongoing.

Because the Wildlife Education Center is co-located with Natural Resources, some personnel from Natural Resources are often on hand to answer questions, issue natural resources permits, and provide

informational literature. Additionally, volunteer tour guides conduct scheduled tours. Dignitaries frequent this building when visiting JBER and the Wildlife Education Center is involved in PR campaigns such as photography sessions for units, and holiday greetings for families and their deployed members.

Other environmental education efforts include articles on natural resources topics in the JBER newspaper, occasional interviews with local media, and special events, such as Arbor Day tree planting; guided nature hikes for schools, Scouts, and church groups; and other activities. Natural Resources staff and MCA s also conduct monthly Newcomer's Briefings and wildlife safety briefings.

In 2014, the Wildife Education Center (WEC) hosted two events, one in September and one in November, where spouses of the Commanders of Pacific Air Forces toured the WEC. In October, 26 Cub Scouts from the local JBER troop attended presentations by the JBER Forester, Wildlife Biologist, Marine Mammal Technician, and Wildlife Conservation Officers. They also conducted activities at the WEC to complete objectives toward earning Forestry and Wildlife Conservation Badges. Each scout prepared a small spruce seedling that they will nurture over the winter and then bring back to participate in an Arbor Day planting event in 2015. Four Holiday Greeting events were held at the WEC for military families to video record greetings to their hometowns. Additionally, children were invited to the WEC to explore the exhibits and trick or treat with Brutus, the bear, while learning why feeding wildlife on base is prohibited.

> **Task 7.20.2.2:** Provide scheduled tours, issue natural resources permits, provide informational literature, wetland conservation education and conduct monthly Newcomer's Briefings, and wildlife safety briefings at the Wildlife Education Center. Timeframe: ongoing.

> **Task 7.20.2.3:** Provide newspaper articles on natural resources topics, interviews with local media as needed, and support special events and other activities related to natural resources. Timeframe: as needed.

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.

> **Project 7.20.2:** Kiosks, JBER. A kiosk describing the salmon life cycle and the importance of salmon to native culture was cancelled in FY13 due to contractual deficiencies with Knik Village. Timeframe: 2017.

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.

> **Project 7.20.2.4:** Design a Watchable Wildlife site at Upper Sixmile Lake. Timeframe: 2017

Professional staffing is another area of the program that could use improvement. A dedicated part- or full-time Wildlife Education Center attendant would allow the Wildlife Education Center to be open for longer periods. The attendant could double as interpreter and customer service technician, issuing permits and collecting fees. A mature, informed volunteer or seasonal technician could successfully fill this position.

> **Task 7.20.2.5:** Maintain natural resources volunteer programs as part of an overall effort to promote appreciation of nature and natural resources on JBER. Timeframe: ongoing.

## 7.21 Natural Resources Training

### 7.21.1 Policy and Background

DoDI 4715.03 (February 14, 2011) specifies that necessary supplemental training to ensure the proper and efficient management of natural resources should be provided in a timely manner. Training allocation is authorized for all personnel in accordance with Air Force funding matrix requirements. Typically, a training course or professional development event is authorized annually. Minimum training requirements are specified in AFI 32-7064.

### 7.21.2 Management

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.

> **Task 7.21.2.1:** Send newly hired natural resources managers to the *DoD Natural Resources Compliance* course. Timeframe: as needed.

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 Environmental Forum, 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.

> **Task 7.21.2.2:** Provide supplemental training to natural resources managers in accordance with AFI32-7064, Chapter 17 *Natural Resource Management Training*. Timeframe: annually.

Conservation Law Enforcement personnel training is discussed in Section 7.19.5, *Training*. Natural resources volunteers receive initial orientation and safety training and are then trained on their job-specific tasks.

> **Task 7.21.2.3:** Provide initial orientation, safety, and job-specific training for volunteers. Timeframe: as needed.

# 8.0 Management Goals, Objectives, and Projects

Natural resources goals and objectives are presented in Section 2.4.3, *Joint Base Elmendorf-Richardson Natural Resources Mission, Goals, and Objectives* and below in Section 8.1, *JBER Natural Resources Goals and Objectives*. The goals and objectives are intended to provide overall direction for management of JBER natural resources in accordance with DoD, Air Force, and 673 ABW policies and directives.

Individual JBER natural resources program projects and tasks, as well as the strategies to implement them, are discussed in various management sections in Chapter 7 and included in Section 8.2, *INRMP Implementation and Project Summary*.

## 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.*

**Goal 1: Manage JBER natural resources under the guidelines and principles of adaptive ecosystem management, which aim to maintain functional ecosystems and natural diversity including viable populations, native species, and ecological communities.**

Objective 1.1: Inventory JBER's natural resources, including soils, 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.

Objective 1.2: Establish statistically valid monitoring programs and protocols for ecosystem integrity and function by 2016.

Objective 1.3: Maintain or improve native vegetation patterns, successional stages, and biodiversity for ecosystem integrity and function.

Objective 1.4: Prevent the introduction and spread of invasive species, provide for their control, and minimize the mission, ecological, and economic impacts.

Objective 1.5: Contribute to the health, quantity and quality of the primary constituent elements for Cook Inlet beluga whale increasing the JBER salmon smolt production by 2016.

Objective 1.6: Identify on JBER essential/critical habitats of species at risk and species of special concern most probable to become candidate species.

Objective 1.7: Identify risks to biodiversity and ecosystem health from habitat fragmentation and reduced connectivity by 2016.

Objective 1.8: Contribute to scientific knowledge by publishing results from studies, when appropriate, in peer reviewed journals.

Objective 1.9: Seek and establish functional partnerships with land management agencies and non-governmental organizations to fulfill JBER natural resource objectives.

**Goal 2: Minimize conflicts between military mission, wildlife, natural resources, and land use.**

Objective 2.1: Achieve no-net loss of military training through coordination and management of federally listed species or their habitats and state listed protected species when practicable.

Objective 2.2: Advise the JBER BASH program and evaluate management activities required by 3 WGI 91-212 and make recommendations for modifications annually.

Objective 2.3: Provide environmental education and outreach to minimize dangerous conflict with wildlife and conduct an evaluation of program effectiveness annually.

Objective 2.4: Utilizing the principles of adaptive management, work with ITAM and Range Control to integrate land management efforts and monitor results of management and military activities.

**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 of natural resources on JBER.**

Objective 3.1: Evaluate JBER forest, wildlife and fisheries resources and develop recommendations for sustained yield.

Objective 3.2: Develop and implement Wildland Fire Management Plan, coordinate with other entities responsible for fire prevention and natural resource management, and identify the appropriate sources of funding for wildland fire activities.

Objective 3.3: Monitor and evaluate outdoor recreation activities and develop recommendations for providing quality outdoor recreation opportunities.

Objective 3.4: Provide environmental education and outreach to promote safe and appropriate use through the development and implementation of an educational plan.

Objective 3.5: Provide effective enforcement of all federal, state, and local natural resources laws and regulations.

## 8.2 INRMP Implementation and Project Summary

INRMP projects and tasks are listed under general topics (section headings) in the order they appear in Chapter 7. Appendix A is a work plan summary describing projects and tasks, work accomplished, goal(s) and objective(s) achieved, programmed projects and the year of execution.

## 8.3 Project Timeline

**2015**
**Funded as of 04/06/2015**
Project 7.2.4.2.4: MGT, Habitat, Winter Moose Browse Utilization Inventory.

Project 7.2.4.2.5: MGT, Species, Eagle and Breeding Bird Surveys.

Project 7.2.4.2.9: Contractor Support, CN, (Fisheries).

Project 7.2.4.2.10: Contractor Support, CN, (Forestry).

Project 7.2.4.2.11: Contractor Support, CN, (Land MGT).

Project 7.2.4.2.12: Contractor Support, CN (REC / Outreach / Volunteer MGT).

Project 7.2.4.2.13: Contractor Support, CN, (T&E).

Project 7.2.4.2.14: Contractor Support, CN, (Wildlife).

Project 7.4.2.2.1: MGT, Species, Beluga Prey. Enumerate salmon species near the entrance to Lower Sixmile Lake and monitor adult and smolt out-migration from Sixmile Lake.

Project 7.4.2.2.2: MGT, Species, Beluga Whale Prey. Enumerate salmon species in Eagle River.

Project 7.4.2.7.2: JBER Stream, Lake and Habitat Survey.

Project 7.4.3.2.1: Equipment Maint, CN Support.

Project 7.4.3.2.2: Equipment, CN Activities.

Project 7.4.3.2.3: Supplies, CN.

Project 7.8.2: Monitor, Wetlands.

Project 7.9.3.1: MGT, Invasive Species.

Project 7.11.3.1: MGT, Habitat, Silviculture. Improve forest stands and wildlife habitat through silvicultural practices.

Project 7.15.2: MGT, Species, BASH Risk.

Project 7.20.2.2: Kiosks, JBER.A kiosk describing the salmon life cycle and the importance of salmon to native culture was Canceled in FY13 due to contractual deficiencies with Knik Village.

**Not Funded as of 04/06/2015**
Project 7.2.4.2.2: MGT, Inventory and Monitoring Statistical Oversight.

Project 7.2.4.2.3: MGT, Species, Moose.

Project 7.5.2.2.6: Vehicle Leasing, Excess TOA, CN.

Project 7.5.3: P&F, CN.

Project 7.5.4.2: JBER Rare Plant Inventory.

Project 7.8.4: MGT, Wetland/Floodplain

Project 7.9.3.2: MGT, Habitat, Vegetative Plot.

Project 7.10.5: MGT Habitat, Urban Forest.

Project 7.16.3.9: Maintenance of Existing Trails.

**2016**
Project 7.2.4.2.6: MGT, Species, Wood Frog Baseline Survey.

Project 7.2.4.2.7: Invasive Pike Survey.

Project 7.4.2.4: Rainbow Predation Rates, Sixmile Salmon Smolt.

Project 7.4.2.7.1: Fish Habitat Restoration/Enhancement.

Project 7.4.2.7.2: JBER Stream, Lake and Habitat Survey.

Project 7.5.2.2.5: MGT, Species, Tissue Sampling Eagle River Flats Prey Species.

Project 7.5.2.2.6: Vehicle Leasing, Excess TOA, CN.

Project 7.5.3: P&F, CN.

Project 7.5.4.1: Boreal Wetlands Birds at Risk--Abundance, Nesting, & Migration

Project 7.11.5.1: Forest Carbon Credit Evaluation.

Project 7.12.1: MGT, Wildland Fire.

Project 7.16.3.8: Recordkeeping, Other, Recreational Access Software Maintenance.

**2017**
Project 7.2.5: Plan Revision, INRMP.

Project 7.4.2.7.1: Fish Habitat Restoration/Enhancement.

Project 7.5.2.2.1: Investigate feasibility of use of Unmanned Aerial Vehicle for monitoring of belugas in Knik Arm.

Project 7.5.2.2.4: MGT, Species, Beluga Acoustical Monitoring.

Project 7.5.4.1: Boreal Wetlands Birds at Risk--Abundance, Nesting, & Migration

Project 7.10.8.4: Develop the JBER Gravel Reclamation Priority Plan.

Project 7.11.5.3.2: Conduct native seed stock collection and coordinate propagation by a cooperating nursery.

**Annually**
Project 7.2.4.2.2: MGT, Inventory and Monitoring Statistical Oversight.

Project 7.2.4.2.3: MGT, Species, Moose.

Project 7.2.4.2.4: MGT, Habitat, Winter Moose Browse Utilization Inventory.

Project 7.2.4.2.5: MGT, Species, Eagle and Breeding Bird Surveys.

Project 7.2.4.2.9: Contractor Support, CN, (Fisheries).

Project 7.2.4.2.10: Contractor Support, CN, (Forestry).

Project 7.2.4.2.11: Contractor Support, CN, (Land MGT).

Project 7.2.4.2.12: Contractor Support, CN (REC / Outreach / Volunteer MGT).

Project 7.2.4.2.13: Contractor Support, CN, (T&E).

Project 7.2.4.2.14: Contractor Support, CN, (Wildlife).

Project 7.4.2.2.1: MGT, Species, Beluga Prey. Enumerate salmon species near the entrance to Lower Sixmile Lake and monitor adult and smolt out-migration from Sixmile Lake.

Project 7.4.2.2.2: MGT, Species, Beluga Whale Prey. Enumerate salmon species in Eagle River.

Project 7.4.3.2.1: Equipment Maint, CN Support.

Project 7.4.3.2.2: Equipment, CN Activities.

Project 7.4.3.2.3: Supplies, CN.

Project 7.8.2: Monitor, Wetlands.

Project 7.8.4: MGT, Wetland/Floodplain

Project 7.9.3.1: MGT, Invasive Species.

Project 7.9.3.2: MGT, Habitat, Vegetative Plot.

Project 7.10.5: MGT Habitat, Urban Forest.

Project 7.11.3.1: MGT, Habitat, Silviculture. Improve forest stands and wildlife habitat through silvicultural practices.

Project 7.12.1: MGT, Wildland Fire.

Project 7.15.2: MGT, Species, BASH Risk.

# 9.0 INRMP Implementation

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 second 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 Work Plans

Work plans and projects are integral to successful implementation of this INRMP. Annual requirements for funding through the Environmental Compliance Program have been identified through FY 2017. 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. Annual work plans will be reviewed and approved per AFI 32-7064.

## 9.2 Natural Resources Management Staffing

JBER personnel requirements for the planning period 2012-2017 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 primary constituent element necessary for the CIBW recovery. Anticipated personnel requirements for the JBER conservation program through 2014 are delineated below. In 2013, full-time program personnel losses exceeded 40%. Anticipate filing a full-time outside expert support position through a competitively awarded USACE cooperative agreement. 673 CES is committed to replacing the one lost federal biologist position when a position becomes available.

2016 Staffing:

| Title | Type | Series/Grade |
|---|---|---|
| Chief, Conservation Section | DoD Civilian | 0401/GS-13 |
| General Biologist | DoD Civilian | 0401/GS-12 |
| Cultural Resources Manager | DoD Civilian | 0028/GS-12 |
| General Biologist | DoD Civilian | 0401/GS-12 |
| Conservation Enforcement Officer | DoD Civilian | 1801/GS-12 |
| Conservation Enforcement Officer | DoD Civilian | 1801/GS-11 |
| Conservation Enforcement Officer | DoD Civilian | 0025/GS-7 |
| General Biologist | OES | |
| Fisheries Biologist | OES | |
| Forester/Ecologist | OES | |
| Seasonal Technicians | OES | |

Note - Bird dispersal within the Bird Exclusion Zone/Waterfowl Exclusion Zone and dispersing other wildlife within the airfield security fence is contracted to the local office of the U.S. Department of Agriculture-Animal Plant Health Inspection Service, Wildlife Services.

### 9.2.1 Training

Training of natural resources personnel is discussed in Section 7.21, *Natural Resources Training*. Conservation Law Enforcement personnel training is discussed in Section 7.19.5, *Training*.

### 9.2.2 Volunteer Program

Natural Resources have 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. In return, they volunteer a minimum of 48 hours per year to 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;
- forest inventory;
- tree planting or cutting;
- wildlife habitat surveys and improvement projects;
- construction, upgrades, and repairs of recreational facilities;
- trail maintenance and construction;
- museum display construction/repair; and
- museum tour guide.

### 9.2.3 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 7.19.3, *Military Conservation Agent Program* further discusses this program.

### 9.2.4 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.

## 9.3 Annual Coordination Requirements

As required by DoDI 4715.03, AFI 32-7064, and the Sikes Act, the INRMP is reviewed annually in cooperation with the USFWS and ADF&G. Reviews will also include key partnership agencies, the BLM and NMFS. Annual reviews facilitate adaptive management by providing an opportunity for parties to review INRMP goals and objectives and establish realistic schedules for completing proposed actions. JBER and its statutory partners conduct an annual INRMP review to verify that:

- current information on all conservation metrics is available;
- all "must fund" projects and activities have been budgeted for and implementation is on schedule;
- all required trained natural resources positions are filled or are in the process of being filled;
- projects and activities for the upcoming year have been identified and included in the INRMP;
- all required coordination with the USFWS, ADF&G and NMFS has occurred;
- all significant changes to JBER's mission requirements or its natural resources have been identified; and
- JBER is effectively ensuring that there is no "net loss" in the capability of its lands to support the military mission.

In addition to the annual review, a formal review and revision, if necessary, occurs on a regular basis but no less often than five years in cooperation with the USFWS, ADF&G and NMFS. 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 many cases, the annual INRMP review and update will keep the plan current and negate the requirement for a costly major revision. This INRMP will be reviewed "as to operation and effect" to determine whether it is being implemented to meet Sikes Act requirements and contributes to the conservation and rehabilitation of natural resources on JBER. Interim reviews and revisions at an interval less than five years may be warranted if the following occurs:

- significant changes to JBER's military mission or its natural resources,
- new environmental compliance requirements, or
- other information significantly affecting the ability of JBER to implement this INRMP.

## 9.4 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 2012-2017, 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 and have been completed.

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.

## 9.5 Implementation Funding Options

JBER receives funding based upon the projects and requirements it has entered and validated in the Automated Civil Engineering System, Project Management system. The Automated Civil Engineering System (ACES), Project Management is used for programming compliance, pollution prevention, and conservation requirements. If a requirement is not entered into and validated in the ACES, Project Management by the Major Command, the installation will not receive any funding to carry out that requirement.

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.

### 9.5.1 Funding Categories of Priority

Conservation projects are usually funded through the Environmental Planning, Programming, and Budgeting System process using ACES. Projects are identified, prioritized, cost-estimated and submitted through the ACES environmental budget process to the parent command and, ultimately, Headquarters Air Force.

Projects have three priority categories. Level 1 projects are required to comply with federal laws or regulations in the fiscal year they are programmed. An example might be funding for an endangered species-related project. Level 2 funding includes requirements that are not currently out of compliance, but will be at a future date. Level 3 projects support enhancement projects that are not driven by compliance with laws.

In recent years, most funded projects have been Level 1 (must fund). Air Force natural resource funding is programmed through 2020 and reviewed annually. An Air Force budgetary integrated priority list is created at the Air Force level from installation project submittals for two subsequent fiscal years beyond the operating year. The integrated priority list prioritizes all Air Force projects based on environmental risk.

### 9.5.2 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. These requirements are submitted through the Automated Civil Engineer System as Compliance Class O&S (Level 0), which means they *must be funded*. Per AFI 32-7011 O&S funds are *necessary to maintain environmental compliance, meet EO goals/objectives, and prevent natural resource degradation that may affect military readiness*.

### 9.5.3 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 7.11.4, *Legal Factors* and Section 7.16.3.8, *Outdoor Recreation Permits and Fee Structure* further discuss reimbursable conservation program funds.

#### 9.5.3.1 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 commercial and non-commercial timber sales have varied from year to year, but have generally averaged about $10,000 per year on EAFB. In 2005 these receipts were used to purchase a forestry truck for activities related to forest management and inventory on EAFB. Sections 7.11.4, *Legal Factors* and 7.11.5.3, *Forest Management/Harvest Activities* discuss the status of timber management receipts during this INRMPs planning period.

#### 9.5.3.2 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.

#### 9.5.3.3 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 improvement and related activities. Fish and wildlife funds are "no-year" funds (*i.e*., revenues generated in a particular year remain available for obligation indefinitely). Section 7.16.3.8, *Outdoor Recreation Permits and Fee Structure* further discusses fish and wildlife fees.

Between 100 to 150 moose permits have been issued annually on JBER. JBER moose hunting permits generated about $13,000 in 2014. Revenues from these permits have been used to purchase Military Conservation Agent equipment in the past. If available permit levels remain consistent, JBER should expect $12,500-$18,750 annually from this source of funding.

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." 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. In coordination with ADF&G, both EAFB and FRA began charging moose hunters an access fee. Moose hunting fees generate roughly $17K a year approximately 50% of the annual electronic recreation access program cost and a much smaller fraction of the total recreation management cost. JBER intend on implementing a nominal recreation user fees beginning in 2015. Fees will offset recreation access administration and management costs as required by AFI 32-7064 and the Sikes Act

### 9.5.4 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.

#### 9.5.4.1 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).

#### 9.5.4.2 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.

#### 9.5.4.4 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.

#### 9.5.4.5 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.

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# Agencies and Persons Presently or Previously Contacted

## Joint Base Elmendorf-Richardson

**JBER & 673d Air Base Wing Public Affairs**
Bob Hall – Deputy Director of Public Affairs (former)
1st Lt. Michael Harrington – Public Affairs Officer

**673d Civil Engineer Squadron (CES/CC)**
Lt Col J. David Norton – Commander (former)

**673 CES/CEIAP**
Brinda Hazard – Realty Specialist
Stephanie Kendrick – Realty Specialist

**673 CES/CEI Civil Engineering Installation Management**
Dave Battle – Wildlife Biologist (former)
Tim Berg – Asset Optimization Chief
Rosanna Dickens – Water Quality Program Manager
Mary Dougan – Program Analyst, Comprehensive Planning
David Elliott – Wildlife Biologist
Christopher Garner – Wildlife Biologist (Belugas)
Rich Graham – Research Assistant, (former)
Herman Griese – Wildlife Biologist, (former)
John D. Gumpert, Jr. – GeoBase
Don Hass – Water Quality Program Manager
Kirk Huff - Community Planning and Liaison Support
Charlene Johnson – Forester/Wetlands Ecologist
Jessica Johnson – Fisheries Biologist
Sara Jones – Wildlife Education Center Coordinator, (former)
Brent Koenen – Chief, Natural Resources
Chuck Monie – Chief, Asset Management Flight, (former)
Valerie Payne – Chief, Installation Management
Mark Prieksat – Chief, Environmental Quality
Talmadge Robinson – Forester (former)
Cassandra Schoofs – Natural Resources Biologist
Jon K. Scudder – Cultural Resources Manager
Mark Sledge – Conservation Enforcement Officer
Nicole Troyer – Ecologist, (former)
James Wendland – Conservation Enforcement Officer

**673 CES/CENME**
Becci D. Anderson – GeoBase (former)
John Gumpert - GeoBase Program Manager

**773 CES/CEO**
SSgt. Robert Lopez Jr. – Pest Management

**3d Wing Safety**
3 WG Flight Safety Office

**176th Wing (Army National Guard)**
Andrew Mamrol – Environmental Manager (former)

**U.S. Army Alaska G3**
Brandon Berta – ITAM Coordinator
Mike Bryers – Range Manager
Dave Patterson - USARAK Range Safety
David Fitz-Enz - RTLP Coordinator

## Agencies

**Alaska Department of Fish and Game**
Cora Campbell – Commissioner
David Battle – Assistant Area Wildlife Biologist
Jessica Coltrane – Wildlife Biologist
Dan Bosch – Fisheries Biologist
Mike Thalhauser – Fisheries Biologist

**U.S. Bureau of Land Management**
Bud Cribley – State Director
Cara Staab – Wildlife Program Lead
Eric Geisler – Forester
Robert King – Archaeologist
Jenny Blanchard – Archaeologist
Bruce Seppi – Wildlife Biologist
David Mushovic – Realty Specialist
Molly Cobbs – Planning and Environmental Coordinator

**U.S. Fish and Wildlife Service**
Socheata Lor– Field Supervisor
Phil Brna – Fish and Wildlife Biologist
Jennifer Spegon – Ecological Services

**National Marine Fisheries Service**
Barbara Mahoney – Wildlife Biologist (Beluga Whale)
James Balsiger – Regional Administrator

**Native Village of Eklutna**
Marc Lamoreaux – Land and Environment Director
Lee Stephan – President

# Appendix A. Annual Work Plan

**FY 2015 Annual Work Plan**

| **Projects Currently Above the Funding Line (as of 04/06/15)** | **Funding Source** |
|---|---|
| Project 7.2.4: Long-Term Ecological Monitoring | FXSB61692815 |
| Project 7.2.4.2.4: MGT, Habitat, Winter Moose Browse Utilization Inventory. | FXSBOS599115 |
| Project 7.2.4.2.5: MGT, Species, Eagle and Breeding Bird Surveys. | FXSBOS591115 |
| Project 7.2.4.2.9: Contractor Support, CN, (Fisheries). | FXSBOS8115 |
| Project 7.2.4.2.10: Contractor Support, CN, (Forestry). | FXSBOS84115 |
| Project 7.2.4.2.11: Contractor Support, CN, (Land MGT). | FXSBOS0115 |
| Project 7.2.4.2.12: Contractor Support, CN (REC / Outreach / Volunteer MGT). | FXSBOS01115 |
| Project 7.2.4.2.13: Contractor Support, CN, (T&E). | FXSBOS00115 |
| Project 7.2.4.2.14: Contractor Support, CN, (Wildlife). | FXSBOS99115 |
| Project 7.4.2.2.1: MGT, Species, Beluga Prey. Enumerate salmon species near the entrance to Lower Sixmile Lake and monitor adult and smolt out-migration from Sixmile Lake. | FXSBOS627115 |
| Project 7.4.2.2.2: MGT, Species, Beluga Whale Prey. Enumerate salmon species in Eagle River. | FXSBOS623115 |
| Project 7.4.2.7.2: JBER Stream, Lake and Habitat Survey. | FXSB61433915 |
| Project 7.4.3.2.1: Equipment Maint, CN Support. | FXSBOS580115 |
| Project 7.4.3.2.2: Equipment, CN Activities. | FXSBOS530815 |
| Project 7.4.3.2.3: Supplies, CN. | FXSBOS50015A |
| Project 7.8.2: Monitor, Wetlands. | FXSBOS217115 |
| Project 7.9.3.1: MGT, Invasive Species. | FXSBOS047115 |
| Project 7.11.3.1: MGT, Habitat, Silviculture. Improve forest stands and wildlife habitat through silvicultural practices. | FXSBOS14115 |
| Project 7.15.2: MGT, Species, BASH Risk. | FXSBOS640115 |
| **Projects Currently Below the Funding Line** | **Funding Source** |
| Project 7.2.4.2.2: MGT, Inventory and Monitoring Statistical Oversight. | FSXBOS614015 |
| Project 7.2.4.2.3: MGT, Species, Moose. | FXSBOS111115 |
| Project 7.5.2.2.6: Vehicle Leasing, Excess TOA, CN. | FXSBOS117115 |
| Project 7.5.3: P&F, CN. Bald Eagle Permit | FXSBOS56115 |
| Project 7.5.4.2: JBER Rare Plant Inventory. | FXSB61516615 |
| Project 7.8.4: MGT, Wetland/Floodplain | FXSBOS462115 |
| Project 7.9.3.2: MGT, Habitat, Vegetative Plot. | FXSBOS447115 |
| Project 7.10.5: MGT Habitat, Urban Forest. | FXSBOS74115 |
| Project 7.12.1: MGT, Wildland Fire. | HJZHOS186115 |
| Project 7.16.3.9: Maintenance of Existing Trails. | FXSB60163415 |
| **In House Tasks** | |
| Task 7.2.4.2.2: Monitoring vegetation, birds, and small mammals according to long-term protocols. | In house |
| Task 7.2.4.1: Perform on-the-ground vegetation/wildlife surveys to | In house |

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| provide resolution to questions of diversity, abundance, and occupancy of the habitats identified through remote sensing or other appropriate techniques. | |
| Task 7.2.4.2.1: Incorporate priority species monitoring data into ecotype (habitat) classes and develop a map with key habitats highlighted to be used for management and land use recommendations. | In house |
| Task 7.2.4.2.5: Conduct visual monitoring of common and Pacific loons, and red-throated and horned grebes using Alaska Loon Watch volunteers. | In house |
| Task 7.2.5.1: Delegate authority for annual INRMP update to projects and budgets to the 673d Civil Engineer Group Commander. | In house |
| Task 7.2.5: Plan Update, INRMP. | In house |
| Task 7.2.5.2: Conduct annual external reviews for operation and effect and prepare INRMP updates and revisions as necessary based on results of these reviews. | In house |
| Task 7.3.2: Analyze GIS data to support natural resources management by evaluating development and use impacts on natural resources and documenting and tracking resource management actions. | In house |
| Project 7.3.3: Use out-sourcing or secure contract to acquire the necessary INRMP data layers. | In house |
| Task 7.3.3: Require that contracts that go to outside agencies or contractors include a clause that any spatial data developed from the study is incorporated into a compatible GIS format, and that Natural Resources will get digital and hard copies of data. | In house |
| Task 7.4.2.1.2: Continue the project to rotenone Otter Lake/Creek waters to remove all pike, remove obstructions to salmon passage, enhance spawning habitat, and reintroduce salmon into the system; and complete collection of baseline data. | In house |
| Task 7.4.2.3: Monitor the fishery through creel checks and expand checks to include the mouth of Sixmile Creek, other popular fishing areas, and saltwater fishery through the electronic recreational access permit system. | In house |
| Task 7.4.2.5: Review and comment on ADF&G annual stocking plan | In house |
| Task 7.4.2.8: Removal of the JBER-R Dam to prevent hazards from ice damming and flooding in the vicinity of the dam. | In house |
| Task 7.4.3.1.1: Establish a long-term management plan for wildlife populations and habitat, accomplished through annual meetings with our INRMP collaborators and yearly INRMP updates. | In house |
| Task 7.4.3.1.2: Establish individual population and habitat objectives that are measurable and monitor them. | In house |
| Task 7.4.3.1.3: Identify and monitor essential habitats that provide for nesting/denning, travel corridors, and other seasonally important habitats, and minimize fragmentation by promoting natural landscapes and connectivity of habitats. | In house |
| Task 7.4.3.1.4: Integrate wildlife/habitat issues into land-use planning and decision-making processes | In house |
| Task 7.4.3.1.5: Assimilate JBER monitoring data into this document and tabulate data that is currently in raw form. | In house |
| Task 7.4.3.1.8: Manage moose and its winter habitat with the objective of no more than 80% utilization of preferred winter browse (Salix, | In house |

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| Betula, and Populus) and work with the ADF&G to maintain minimums of 25-50 calves per 100 cows and 35 bulls per 100 cows. | |
| Task 7.4.3.1.9: Continue to manage JBER moose hunts. | In house |
| Task 7.4.3.1.11: Develop a beaver management plan to include best management practices, such as protecting large trees and beaver proof culverts for damage prevention, and population control practices as a means of preventing damage to facilities. | In house |
| Task 7.4.3.1.12: Document and digitally illustrate nesting habitats of passerines of conservation concern during the 2015 INRMP review. | In house |
| Task 7.4.3.2.1: Reduce human-wildlife conflicts with large, potentially dangerous animals such as bears and moose through an aggressive program of public education, garbage management, and enforcement. | In house |
| Task 7.4.3.2.2: Create a geo-based map annually depicting all solid waste dumpster locations and designating the ones that are considered "bear-proof" and illustrating all wildlife conflict responses annually. Update this map annually in the INRMP and share this map with user groups in early spring. | In house |
| Task 7.5.2.2.1: Ensure conservation measures are implemented for the protection of the CIBW as well as other marine mammals in Cook Inlet. | In house |
| Task 7.5.2.2.3: Investigate amount of ice cover on Eagle River and Otter Creek throughout the winter. | In house |
| Task 7.5.3.1: Continue eagle nest protections implemented in response to proposed continuation of year-round firing into the ERF Impact area | In house |
| Task 7.5.4.2: Monitor migratory bird populations, particularly birds of conservation concern accomplished through Alaska Landbird Monitoring Surveys or other DOD Partners in Flight strategies. | In house |
| Task 7.6.2.1: Provide natural and cultural resources technical guidance and expertise to support the ITAM program. | In house |
| Task 7.6.2.2: Coordinate with ITAM personnel to ensure Natural Resources and ITAM programs manage JBER lands to support JBER military missions. | In house |
| Task 7.6.2.3: Regularly schedule coordination meetings. | In house |
| Task 7.6.4: Support prevention activities and restoration of disturbed areas performed through the ITAM program. | In house |
| Task 7.8.3.1: Conduct a feasibility analysis of wetland mitigation options for JBER mission dependent projects. | In house |
| Task 7.9.1: JBER will strive to coordinate our vegetative clearing activities annually with our tenants and produce a map of cleared areas. | In house |
| Task 7.9.2.1: Continue sampling a minimum of 10% of the LTVM plots annually (as staffing allows). | In house |
| Task 7.9.2.2: Initiate and implement a program to monitor climatic indicator species to track climate influenced changes to vegetative communities. | In house |
| Task 7.9.3: Map JBER invasive vegetation and control efforts. | In house |
| Task 7.10.2.2.1: Perform a comprehensive inventory of landscaped areas on JBER | In house |
| Task 7.10.2.2.2: Propose locations for land conversion from improved or semi-improved land to unimproved by reforestation efforts. Vacant | In house |

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| or abandoned woodlots may be reasonable candidates for reforestation. | |
| Task 7.10.4.1: Evaluate the ecological change and potential for human/wildlife conflict due to less intensive habitat modification at Eagleglen Fiteness Park | In house |
| Task 7.10.5: Complete Urban Forest inventory on JBER-Richardson. | In house |
| Task 7.11.3.2: Coordinate with the BLM and US Forest Service on insect infestation monitoring on JBER. | In house |
| Task 7.11.5.1: Initiate a user fee based timber harvest program for personal use firewood and Christmas trees. | In house |
| Task 7.11.5.2: Perform hazard tree assessment surveys in cantonment and heavy traffic training areas, especially around firing points and landing zones. | In house |
| Task 7.11.5.3.1: Finalize a MOU including a forestry stewardship agreement with BLM | In house |
| Task 7.11.5.3.2: Manage and designate available parcels for moose browse/other wildlife habitat. | In house |
| Task 7.11.5.3.4: Explore alternatives to hydro-axing. | In house |
| Task 7.11.5.3.5: Develop and implement long-term reforestation/reclamation plans. | In house |
| Task 7.11.5.3.6: Participate in Tree City, Arbor Day, and other urban forest initiatives. | In house |
| Task 7.12.1.1: Establish future fire management regimes as part of the WFMP and update annually. | In house |
| Task 7.12.1.2: Perform wildland fire planning including coordination with Range Control, ITAM, JBER Fire Emergency, USFS, and DOF. | In house |
| Task 7.12.2.1: Initiate a fuel management program to include a fuel inventory to identify and reduce fuels in fire prone areas. | In house |
| Task 7.12.2.2: Establish a Memorandum of Agreement for execution of prescribed burns, annual wildfire training, and development of burn plans. | In house |
| Task 7.15.2.1: Provide support in obtaining federal and state permits required for depredation, salvage, collection, and possession of all migratory or local species. | In house |
| Task 7.15.2.2: Provide guidance and support for biological monitoring of wildlife populations, bird migration activity, wildlife conflict, and habitat management to improve technical advice for wildlife and vegetation management programs on all JBER airfields. | In house |
| Task 7.15.2.3: Coordinate with and provide natural resources representation to the Bird Hazard Working Group to monitor and advise the group of environmental modification and conditions that increase BASH potential. | In house |
| Task 7.16.1: Implement a nominal recreation user i-sportsman fee. Fees will offset recreation access administration and management costs as required by AFI 32-7064 and the Sikes Act. | In house |
| Task 7.16.3.8: Initiate a program to identify, delineate, map, and prioritize areas impacted by recreational use for repair, and concentrate additional recreational use monitoring on assessing use in critical areas. | In house |
| Task 7.16.3.9.1: Prepare a well developed, researched, and NEPA-compliant JBER Outdoor Recreation Plan. | In house |
| Task 7.18.2: Coordinate with the Cultural Resources Manager to ensure that adverse effects to archeological sites and other cultural resources are avoided during natural resource management activities. | In house |

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| Task 7.19.2.2: Coordinate enforcement activities with other agencies, particularly ADF&G, NMFS and USFWS. | In house |
| Task 7.19.7.1: Conduct public education as a key element in preventative law enforcement. | In house |
| Task 7.19.7.2: Conduct enforcement activities to complement other natural resources management activities and programs. | In house |
| Task 7.19.7.3: Strategize, develop, implement, and articulate means of addressing law enforcement priorities. | In house |
| Task 7.20.1.1: Perform outreach programs | In house |
| Task 7.20.2.1: Maintain and improve the Wildlife Education Center/Natural Resources Office as the centerpiece of interpretative efforts for the environmental education program. | In house |
| Task 7.20.2.2: Provide scheduled tours, issue natural resources permits, provide informational literature, wetland conservation education and conduct monthly Newcomer's Briefings, and wildlife safety briefings at the Wildlife Education Center. | In house |
| Task 7.20.2.5: Maintain natural resources volunteer programs as part of an overall effort to promote appreciation of nature and natural resources on JBER. | In house |
| Task 7.21.2.2: Provide supplemental training to natural resources managers in accordance with AFI32-7064, Chapter 17 Natural Resource Management Training. | In house |

**FY 2016 Annual Work Plan**

| Projects Slated for Funding | Funding Source |
|---|---|
| Project 7.2.4.2.2: MGT, Inventory and Monitoring Statistical Oversight. | FSXBOS614016 |
| Project 7.2.4.2.3: MGT, Species, Moose. | FXSBOS111116 |
| Project 7.2.4.2.4: MGT, Habitat, Winter Moose Browse Utilization Inventory. | FXSBOS599116 |
| Project 7.2.4.2.5: MGT, Species, Eagle and Breeding Bird Surveys. | FXSBOS599016 |
| Project 7.2.4.2.6: MGT, Species, Wood Frog Baseline Survey. | FXSB61444016 |
| Project 7.2.4.2.9: Contractor Support, CN, (Fisheries). | FXSBOS8116 |
| Project 7.2.4.2.10: Contractor Support, CN, (Forestry). | FXSBOS84116 |
| Project 7.2.4.2.11: Contractor Support, CN, (Land MGT). | FXSBOS0116 |
| Project 7.2.4.2.12: Contractor Support, CN (REC / Outreach / Volunteer MGT). | FXSBOS01116 |
| Project 7.2.4.2.13: Contractor Support, CN, (T&E). | FXSBOS00116 |
| Project 7.2.4.2.14: Contractor Support, CN, (Wildlife). | FXSBOS99116 |
| Project 7.4.2.2.1: MGT, Species, Beluga Prey. Enumerate salmon species near the entrance to Lower Sixmile Lake and monitor adult and smolt out-migration from Sixmile Lake. | FXSBOS627116 |
| Project 7.4.2.2.2: MGT, Species, Beluga Whale Prey. Enumerate salmon species in Eagle River. | FXSBOS623116 |
| Project 7.4.2.4: Rainbow Predation Rates, Sixmile Salmon Smolt. | FXSB61640616 |

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| Project 7.4.2.7.1: MGT Habitat Otter Creek/Lake, Salmon Reclamation. | FXSB61622816 |
| Project 7.4.2.7.2: JBER Stream, Lake and Habitat Survey. | FXSB6133916 |
| Project 7.4.2.8: Invasive Pike Survey. | FXSBOS641716 |
| Project 7.4.3.2.1: Equipment Maint, CN Support. | FXSBOS580916 |
| Project 7.4.3.2.2: Equipment, CN Activities. | FXSBOS580116 |
| Project 7.4.3.2.3: Supplies, CN. | FXSBOS530616 |
| Project 7.5.2.2.5: MGT, Species, Tissue Sampling Eagle River Flats Prey Species. | HJZHOS634115 |
| Project 7.5.2.2.6: Vehicle Leasing, Excess TOA, CN. | FXSBOS117116 |
| Project 7.5.3: P&F, CN. | FXSBOS56116 |
| Project 7.5.4.1: Boreal Wetlands Birds at Risk--Abundance, Nesting, & Migration | FXSB460582 |
| Project 7.8.2: Monitor, Wetlands. | FXSBOS217116 |
| Project 7.8.4: MGT, Wetland/Floodplain | FXSBOS462116 |
| Project 7.9.3.1: MGT, Invasive Species. | FXSBOS047116 |
| Project 7.9.3.2: MGT, Habitat, Vegetative Plot. | FXSBOS447116 |
| Project 7.10.5: MGT Habitat, Urban Forest. | FXSBOS74116 |
| Project 7.11.3.1: MGT, Habitat, Silviculture. Improve forest stands and wildlife habitat through silvicultural practices. | FXSBOS14116 |
| Project 7.11.5.1: Forest Carbon Credit Evaluation. | FXSB61518216 |
| Project 7.12.1: MGT, Wildland Fire. | HJZHOS186116 |
| Project 7.15.2: MGT, Species, BASH Risk. | FXSBOS640116 |
| Project 7.16.3.8: Recordkeeping, Other, Recreational Access Software Maintenance. | FXSBOS87116 |
| **In House Tasks** | |
| Task 7.2.4.1: Perform on-the-ground vegetation/wildlife surveys to provide resolution to questions of diversity, abundance, and occupancy of the habitats identified through remote sensing or other appropriate techniques. | In house |
| Task 7.2.4.2.1: Incorporate priority species monitoring data into ecotype (habitat) classes and develop a map with key habitats highlighted to be used for management and land use recommendations. | In house |
| Task 7.2.4.2.2: Monitoring vegetation, birds, and small mammals according to long-term protocols. | In house |
| Task 7.2.4.2.3: Conduct a collared pika survey in alpine areas on JBER. | In house |
| Task 7.2.4.2.5: Conduct visual monitoring of common and Pacific loons, and red-throated and horned grebes using Alaska Loon Watch volunteers. | In house |
| Task 7.2.5.1: Delegate authority for annual INRMP update to projects and budgets to the 673d Civil Engineer Group Commander. | In house |
| Task 7.2.5: Plan Update, INRMP. | In house |
| Task 7.2.5.2: Conduct annual external reviews for operation and effect and prepare INRMP updates and revisions as necessary based on results of these reviews. | In house |

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| Task 7.3.2: Analyze GIS data to support natural resources management by evaluating development and use impacts on natural resources and documenting and tracking resource management actions. | In house |
| Task 7.3.3: Require that contracts that go to outside agencies or contractors include a clause that any spatial data developed from the study is incorporated into a compatible GIS format, and that Natural Resources will get digital and hard copies of data. | In house |
| Task 7.4.2.1.2: Continue the project to rotenone Otter Lake/Creek waters to remove all pike, remove obstructions to salmon passage, enhance spawning habitat, and reintroduce salmon into the system; and complete collection of baseline data. | In house |
| Task 7.4.2.3: Monitor the fishery through creel checks and expand checks to include the mouth of Sixmile Creek, other popular fishing areas, and saltwater fishery through the electronic recreational access permit system. | In house |
| Task 7.4.2.5: Review and comment on ADF&G annual stocking plan | In house |
| Task 7.4.3.1.1: Establish a long-term management plan for wildlife populations and habitat, accomplished through annual meetings with our INRMP collaborators and yearly INRMP updates. | In house |
| Task 7.4.3.1.2: Establish individual population and habitat objectives that are measurable and monitor them. | In house |
| Task 7.4.3.1.3: Identify and monitor essential habitats that provide for nesting/denning, travel corridors, and other seasonally important habitats, and minimize fragmentation by promoting natural landscapes and connectivity of habitats. | In house |
| Task 7.4.3.1.4: Integrate wildlife/habitat issues into land-use planning and decision-making processes | In house |
| Task 7.4.3.1.5: Assimilate JBER monitoring data into this document and tabulate data that is currently in raw form. | In house |
| Task 7.4.3.1.8: Manage moose and its winter habitat with the objective of no more than 80% utilization of preferred winter browse (Salix, Betula, and Populus) and work with the ADF&G to maintain minimums of 25-50 calves per 100 cows and 35 bulls per 100 cows. | In house |
| Task 7.4.3.1.9: Continue to manage JBER moose hunts. | In house |
| Task 7.4.3.1.13: Incorporate wetland-dependent migratory bird and wood frog habitat into Wetland Functional Assessment. | In house |
| Task 7.4.3.2.1: Reduce human-wildlife conflicts with large, potentially dangerous animals such as bears and moose through an aggressive program of public education, garbage management, and enforcement. | In house |
| Task 7.4.3.2.2: Create a geo-based map annually depicting all solid waste dumpster locations and designating the ones that are considered "bear-proof" and illustrating all wildlife conflict responses annually. Update this map annually in the INRMP and share this map with user groups in early spring. | In house |
| Task 7.5.2.2.1: Ensure conservation measures are implemented for the protection of the CIBW as well as other marine mammals in Cook Inlet. | In house |
| Task 7.5.2.2.3: Investigate amount of ice cover on Eagle River and Otter Creek throughout the winter. | In house |
| Task 7.5.3.1: Continue eagle nest protections implemented in response | In house |

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| to proposed continuation of year-round firing into the ERF Impact area | |
| Task 7.5.4.2: Monitor migratory bird populations, particularly birds of conservation concern accomplished through Alaska Landbird Monitoring Surveys or other DOD Partners in Flight strategies. | In house |
| Task 7.6.2.1: Provide natural and cultural resources technical guidance and expertise to support the ITAM program. | In house |
| Task 7.6.2.2: Coordinate with ITAM personnel to ensure Natural Resources and ITAM programs manage JBER lands to support JBER military missions. | In house |
| Task 7.6.2.3: Regularly schedule coordination meetings. | In house |
| Task 7.6.4: Support prevention activities and restoration of disturbed areas performed through the ITAM program. | In house |
| Task 7.8.1: Update and adapt the Wetland Functional Assessment Methodology and Credit-Debit Method to suit the more natural setting on JBER. This task will require collaboration with the Corps of Engineers. | In house |
| Task 7.9.1: JBER will strive to coordinate our vegetative clearing activities annually with our tenants and produce a map of cleared areas. | In house |
| Task 7.9.2.1: Continue sampling a minimum of 10% of the LTVM plots annually (as staffing allows). | In house |
| Task 7.9.2.2: Initiate and implement a program to monitor climatic indicator species to track climate influenced changes to vegetative communities. | In house |
| Task 7.9.3: Map JBER invasive vegetation and control efforts. | In house |
| Task 7.10.2.2.1: Perform a comprehensive inventory of landscaped areas on JBER | In house |
| Task 7.10.2.2.2: Propose locations for land conversion from improved or semi-improved land to unimproved by reforestation efforts. Vacant or abandoned woodlots may be reasonable candidates for reforestation. | In house |
| Task 7.10.5: Complete Urban Forest inventory on JBER-Richardson. | In house |
| Task 7.11.3.1 Develop a JBER Forest Management Plan. Plan should include establishing a stand level GIS layer to facilitate forestry management, collect mapping data from ITAM, and establish baseline maps. | In house |
| Task 7.11.3.2: Coordinate with the BLM and US Forest Service on insect infestation monitoring on JBER. | In house |
| Task 7.11.5.2: Perform hazard tree assessment surveys in cantonment and heavy traffic training areas, especially around firing points and landing zones. | In house |
| Task 7.11.5.3.2: Manage and designate available parcels for moose browse/other wildlife habitat. | In house |
| Task 7.11.5.3.4: Explore alternatives to hydro-axing. | In house |
| Task 7.11.5.3.5: Develop and implement long-term reforestation/reclamation plans. | In house |
| Task 7.11.5.3.6: Participate in Tree City, Arbor Day, and other urban forest initiatives. | In house |
| Task 7.12.1.1: Establish future fire management regimes as part of the WFMP and update annually. | In house |
| Task 7.12.1.2: Perform wildland fire planning including coordination | In house |

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| with Range Control, ITAM, JBER Fire Emergency, USFS, and DOF. | |
| Task 7.15.2.1: Provide support in obtaining federal and state permits required for depredation, salvage, collection, and possession of all migratory or local species. | In house |
| Task 7.15.2.2: Provide guidance and support for biological monitoring of wildlife populations, bird migration activity, wildlife conflict, and habitat management to improve technical advice for wildlife and vegetation management programs on all JBER airfields. | In house |
| Task 7.15.2.3: Coordinate with and provide natural resources representation to the Bird Hazard Working Group to monitor and advise the group of environmental modification and conditions that increase BASH potential. | In house |
| Task 7.16.3: Compile hunting harvest data through the electronic recreational access permit system. | In house |
| Task 7.18.2: Coordinate with the Cultural Resources Manager to ensure that adverse effects to archeological sites and other cultural resources are avoided during natural resource management activities. | In house |
| Task 7.19.2.2: Coordinate enforcement activities with other agencies, particularly ADF&G, NMFS and USFWS. | In house |
| Task 7.19.7.1: Conduct public education as a key element in preventative law enforcement. | In house |
| Task 7.19.7.2: Conduct enforcement activities to complement other natural resources management activities and programs. | In house |
| Task 7.19.7.3: Strategize, develop, implement, and articulate means of addressing law enforcement priorities. | In house |
| Task 7.20.1.1: Perform outreach programs | In house |
| Task 7.20.2.1: Maintain and improve the Wildlife Education Center/Natural Resources Office as the centerpiece of interpretative efforts for the environmental education program. | In house |
| Task 7.20.2.2: Provide scheduled tours, issue natural resources permits, provide informational literature, wetland conservation education and conduct monthly Newcomer's Briefings, and wildlife safety briefings at the Wildlife Education Center. | In house |
| Task 7.20.2.5: Maintain natural resources volunteer programs as part of an overall effort to promote appreciation of nature and natural resources on JBER. | In house |
| Task 7.21.2.2: Provide supplemental training to natural resources managers in accordance with AFI32-7064, Chapter 17 Natural Resource Management Training. | In house |

**FY 2017 Annual Work Plan**

| Projects Slated for Funding | Funding Source |
|---|---|
| Project 7.2.4.2.2: MGT, Inventory and Monitoring Statistical Oversight. | FXSBOS614017 |
| Project 7.2.4.2.3: MGT, Species, Moose. | FXSBOS545417 |
| Project 7.2.4.2.4: MGT, Habitat, Winter Moose Browse Utilization Inventory. | FXSBOS599117 |
| Project 7.2.4.2.5: MGT, Species, Eagle and Breeding Bird Surveys. | FXSBOS599017 |

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| Project 7.2.4.2.9: Contractor Support, CN, (Fisheries). | FXSBOS8117 |
| Project 7.2.4.2.10: Contractor Support, CN, (Forestry). | FXSBOS84117 |
| Project 7.2.4.2.11: Contractor Support, CN, (Land MGT). | FXSBOS0117 |
| Project 7.2.4.2.12: Contractor Support, CN (REC / Outreach / Volunteer MGT). | FXSBOS01117 |
| Project 7.2.4.2.13: Contractor Support, CN, (T&E). | FXSBOS00017 |
| Project 7.2.4.2.14: Contractor Support, CN, (Wildlife). | FXSBOS99117 |
| Project 7.2.5: Plan Revision, INRMP. | FXSBOS461817 |
| Project 7.4.2.2.1: MGT, Species, Beluga Prey. Enumerate salmon species near the entrance to Lower Sixmile Lake and monitor adult and smolt out-migration from Sixmile Lake. | FXSBOS627117 |
| Project 7.4.2.2.2: MGT, Species, Beluga Whale Prey. Enumerate salmon species in Eagle River. | FXSBOS623017 |
| Project 7.4.2.7.1: MGT Habitat Otter Creek/Lake, Salmon Reclamation. | FXSB61622817 |
| Project 7.4.3.2.1: Equipment Maint, CN Support. | FXSBOS530917 |
| Project 7.4.3.2.2: Equipment, CN Activities. | FXSBOS530817 |
| Project 7.4.3.2.3: Supplies, CN. | FXSBOS530617 |
| Project 7.5.2: Fly aerial imagery every three years to satisfy a conservation recommendation cited in the NMFS biological opinion. | FXSBOS423617 |
| Project 7.5.2.2.1: Investigate feasibility of use of Unmanned Aerial Vehicle for monitoring of belugas in Knik Arm. | FXSBOS14117 |
| Project 7.5.2.2.2: Investigate beluga usage of Eagle River during late fall and winter, support beluga acoustical monitoring. | FXSBOS403617 |
| Project 7.5.2.2.4: MGT, Species, Beluga Acoustical Monitoring. | HJZHOS453617 |
| Project 7.5.4.1: Boreal Wetlands Birds at Risk--Abundance, Nesting, & Migration | FXSB46058217 |
| Project 7.8.2: Monitor, Wetlands. | FXSBOS217117 |
| Project 7.8.4: MGT, Wetland/Floodplain | FXSBOS462017 |
| Project 7.9.3.1: MGT, Invasive Species. | FXSBOS087917 |
| Project 7.9.3.2: MGT, Habitat, Vegetative Plot. | FXSBOS447317 |
| Project 7.10.5: MGT Habitat, Urban Forest. | FXSBOS74117 |
| Project 7.10.8.4: Develop the JBER Gravel Reclamation Priority Plan. | FXSB74494317 |
| Project 7.11.3.1: MGT, Habitat, Silviculture. Improve forest stands and wildlife habitat through silvicultural practices. | FXSBOS14117 |
| Project 7.11.5.3.2: Conduct native seed stock collection and coordinate propagation by a cooperating nursery. | FXSB74494917 |
| Project 7.12.1: MGT, Wildland Fire. | HJZHOS186117 |
| Project 7.15.2: MGT, Species, BASH Risk. | FXSBOS640817 |
| Project 7.20.2.2: Kiosks, JBER. A kiosk describing the salmon life cycle and the importance of salmon to native culture | FXSBOS112317 |
| Project 7.20.2.4: Design a Watchable Wildlife site at Upper Sixmile Lake | In house |
| **In House Tasks** | |
| Task 7.2.4.1: Perform on-the-ground vegetation/wildlife surveys to provide resolution to questions of diversity, abundance, and occupancy of the habitats identified through remote sensing or other appropriate techniques. | In house |
| Task 7.2.4.2.1: Incorporate priority species monitoring data into | In house |

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| ecotype (habitat) classes and develop a map with key habitats highlighted to be used for management and land use recommendations. | |
| Task 7.2.4.2.2: Monitoring vegetation, birds, and small mammals according to long-term protocols. | In house |
| Task 7.2.4.2.5: Conduct visual monitoring of common and Pacific loons, and red-throated and horned grebes using Alaska Loon Watch volunteers. | In house |
| Task 7.2.5.1: Delegate authority for annual INRMP update to projects and budgets to the 673d Civil Engineer Group Commander. | In house |
| Task 7.2.5: Plan Update, INRMP. | In house |
| Task 7.2.5.2: Conduct annual external reviews for operation and effect and prepare INRMP updates and revisions as necessary based on results of these reviews. | In house |
| Task 7.3.2: Analyze GIS data to support natural resources management by evaluating development and use impacts on natural resources and documenting and tracking resource management actions. | In house |
| Task 7.3.3: Require that contracts that go to outside agencies or contractors include a clause that any spatial data developed from the study is incorporated into a compatible GIS format, and that Natural Resources will get digital and hard copies of data. | In house |
| Task 7.4.2.2: Consider the feasibility of restoring the anadromy to or creating a terminus run in the Green Lake or another system. | In house |
| Task 7.4.2.3: Monitor the fishery through creel checks and expand checks to include the mouth of Sixmile Creek, other popular fishing areas, and saltwater fishery through the electronic recreational access permit system. | In house |
| Task 7.4.2.5: Review and comment on ADF&G annual stocking plan | In house |
| Task 7.4.3.1.1: Establish a long-term management plan for wildlife populations and habitat, accomplished through annual meetings with our INRMP collaborators and yearly INRMP updates. | In house |
| Task 7.4.3.1.2: Establish individual population and habitat objectives that are measurable and monitor them. | In house |
| Task 7.4.3.1.3: Identify and monitor essential habitats that provide for nesting/denning, travel corridors, and other seasonally important habitats, and minimize fragmentation by promoting natural landscapes and connectivity of habitats. | In house |
| Task 7.4.3.1.4: Integrate wildlife/habitat issues into land-use planning and decision-making processes | In house |
| Task 7.4.3.1.5: Assimilate JBER monitoring data into this document and tabulate data that is currently in raw form. | In house |
| Task 7.4.3.1.8: Manage moose and its winter habitat with the objective of no more than 80% utilization of preferred winter browse (Salix, Betula, and Populus) and work with the ADF&G to maintain minimums of 25-50 calves per 100 cows and 35 bulls per 100 cows. | In house |
| Task 7.4.3.1.9: Continue to manage JBER moose hunts. | In house |
| Task 7.4.3.2.1: Reduce human-wildlife conflicts with large, potentially dangerous animals such as bears and moose through an aggressive program of public education, garbage management, and enforcement. | In house |
| Task 7.4.3.2.2: Create a geo-based map annually depicting all solid waste dumpster locations and designating the ones that are considered | In house |

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| "bear-proof" and illustrating all wildlife conflict responses annually. Update this map annually in the INRMP and share this map with user groups in early spring. | |
| Task 7.5.2.2.1: Ensure conservation measures are implemented for the protection of the CIBW as well as other marine mammals in Cook Inlet. | In house |
| Task 7.5.3.1: Continue eagle nest protections implemented in response to proposed continuation of year-round firing into the ERF Impact area | In house |
| Task 7.5.4.1: Develop polygons around nesting sites for species of concern; discourage use that will have a detrimental effect on these areas. | In house |
| Task 7.5.4.2: Monitor migratory bird populations, particularly birds of conservation concern accomplished through Alaska Landbird Monitoring Surveys or other DOD Partners in Flight strategies. | In house |
| Task 7.6.2.1: Provide natural and cultural resources technical guidance and expertise to support the ITAM program. | In house |
| Task 7.6.2.2: Coordinate with ITAM personnel to ensure Natural Resources and ITAM programs manage JBER lands to support JBER military missions. | In house |
| Task 7.6.2.3: Regularly schedule coordination meetings. | In house |
| Task 7.6.4: Support prevention activities and restoration of disturbed areas performed through the ITAM program. | In house |
| Task 7.9.1: JBER will strive to coordinate our vegetative clearing activities annually with our tenants and produce a map of cleared areas. | In house |
| Task 7.9.2.1: Continue sampling a minimum of 10% of the LTVM plots annually (as staffing allows). | In house |
| Task 7.9.2.2: Initiate and implement a program to monitor climatic indicator species to track climate influenced changes to vegetative communities. | In house |
| Task 7.9.3: Map JBER invasive vegetation and control efforts. | In house |
| Task 7.10.2.2.1: Perform a comprehensive inventory of landscaped areas on JBER | In house |
| Task 7.10.2.2.2: Propose locations for land conversion from improved or semi-improved land to unimproved by reforestation efforts. Vacant or abandoned woodlots may be reasonable candidates for reforestation. | In house |
| Task 7.10.5: Complete Urban Forest inventory on JBER-Richardson. | In house |
| Task 7.11.5.2: Perform hazard tree assessment surveys in cantonment and heavy traffic training areas, especially around firing points and landing zones. | In house |
| Task 7.11.5.3.2: Manage and designate available parcels for moose browse/other wildlife habitat. | In house |
| Task 7.11.5.3.5: Develop and implement long-term reforestation/reclamation plans. | In house |
| Task 7.11.5.3.6: Participate in Tree City, Arbor Day, and other urban forest initiatives. | In house |
| Task 7.12.1.1: Establish future fire management regimes as part of the WFMP and update annually. | In house |
| Task 7.12.1.2: Perform wildland fire planning including coordination with Range Control, ITAM, JBER Fire Emergency, USFS, and DOF. | In house |

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| Task 7.15.2.1: Provide support in obtaining federal and state permits required for depredation, salvage, collection, and possession of all migratory or local species. | In house |
| Task 7.15.2.2: Provide guidance and support for biological monitoring of wildlife populations, bird migration activity, wildlife conflict, and habitat management to improve technical advice for wildlife and vegetation management programs on all JBER airfields. | In house |
| Task 7.15.2.3: Coordinate with and provide natural resources representation to the Bird Hazard Working Group to monitor and advise the group of environmental modification and conditions that increase BASH potential. | In house |
| Task 7.16.3: Compile hunting harvest data through the electronic recreational access permit system. | In house |
| Task 7.18.2: Coordinate with the Cultural Resources Manager to ensure that adverse effects to archeological sites and other cultural resources are avoided during natural resource management activities. | In house |
| Task 7.19.2.2: Coordinate enforcement activities with other agencies, particularly ADF&G, NMFS and USFWS. | In house |
| Task 7.19.7.1: Conduct public education as a key element in preventative law enforcement. | In house |
| Task 7.19.7.2: Conduct enforcement activities to complement other natural resources management activities and programs. | In house |
| Task 7.19.7.3: Strategize, develop, implement, and articulate means of addressing law enforcement priorities. | In house |
| Task 7.20.1.1: Perform outreach programs | In house |
| Task 7.20.2.1: Maintain and improve the Wildlife Education Center/Natural Resources Office as the centerpiece of interpretative efforts for the environmental education program. | In house |
| Task 7.20.2.2: Provide scheduled tours, issue natural resources permits, provide informational literature, wetland conservation education and conduct monthly Newcomer's Briefings, and wildlife safety briefings at the Wildlife Education Center. | In house |
| Task 7.20.2.5: Maintain natural resources volunteer programs as part of an overall effort to promote appreciation of nature and natural resources on JBER. | In house |
| Task 7.21.2.2: Provide supplemental training to natural resources managers in accordance with AFI32-7064, Chapter 17 Natural Resource Management Training. | In house |

# Appendix B. Laws and Regulatory Instruments that May Affect JBER Natural Resources Management

Below is a list of the most significant federal laws and regulations and other regulatory instruments that may govern implementation of this INRMP.

**Federal Laws**

32 CFR. Part 190, *Appendix-Integrated Natural Resources Management*
32 CFR. Part 989, *Environmental Impact Analysis Process (EIAP)*
American Indian Religious Freedom Act (42 United States Code (USC))
Americans with Disabilities Act of 1990 (PL 101-336; 42 USC 12101)
Animal Damage Control Act (7 USC 426-426b)
Archaeological and Historic Preservation Act of 1974 (PL 93-291; 16 USC 469 *et seq*.)
Archaeological Resources Protection Act of 1979 (PL 96-95:16 USC 470aa-11)
Bald and Golden Eagle Protection Act (PL 95-616; 16 USC 688 *et seq*.)
Clean Air Act (as amended through 1990)
Clean Water Act (PL 95-217; 33 USC 1251 *et seq*.)
Coastal Barrier Resources Act of 1982 (16 USC 3509)
Coastal Zone Management Act (16 USC 145 *et seq*.)
Conservation Programs on Military Reservations (see Sikes Act below)
Defense Appropriations Act of 1991 - Legacy Program
Emergency Wetlands Resources Act of 1986 (16 USC 3901-3932)
Endangered Species Act of 1973 (PL 95-632, 16 USC 1531 *et seq*.)
Estuarine Areas Act (16 USC 1221-1226)
Farmland Protection Policy Act (7 USC 4201 *et. seq.*)
Federal Facilities Compliance Act of 1992 (PL 102-386; amending 42 USC 6961)
Federal Insecticide, Fungicide and Rodenticide Act (7 USC 136 *et seq*.)
Federal Land Policy and Management Act of 1976 (43 USC 1701)
Federal Noxious Weed Act of 1976 (7 USC 2801)
Federal Water Pollution Control Act of 1977 (Clean Water Act), as amended (33 USC 1251 *et seq*.)
Fish and Wildlife Conservation Act (FWCA) of 1980 (16 USC 2901 *et seq*.)
Fish and Wildlife Conservation and Natural Resource Management Programs on Military Reservation (Amends Public Law 86-797 (Sikes Act) (PL 96-561)
Fish and Wildlife Coordination Act, as amended (16 USC 661 *et seq.*)
Forest and Rangeland Renewable Resources Planning Act of 1974 (16 USC. 1601 *et seq.*)
Hunting, Fishing and Trapping on Military Lands (an update to the Military Construction Authorization Act 10 USC 2665)
Lacey Act of 1900 (16 USC 701, 702)
Leases: Non-Excess Property of Military Departments (10 USC 2667)
Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (PL 109-479)
Marine Mammal Protection Act (MMPA) of 1972, as amended (16 USC 1361 *et seq*.)
Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972, as amended (33 USC 1401 *et seq*. and 16 USC 1431 *et seq*.)
Migratory Bird Conservation Act (Chapter 257; 45 Stat 1222; 16 USC 715 *et seq*.)
Migratory Bird Treaty Act (PL 65-186; 16 USC 703 *et seq*.)
Military Reservation and Facilities: Hunting, Fishing and Trapping Act of 1958 (Public Law 85-337, 10 USC 2671)

National Defense Authorization Act for Fiscal Year 2003 (PL 107-314)
National Defense Authorization Act for Fiscal Year 2004 (PL 108-136)
National Environmental Policy Act of 1969 (as amended, PL 91-190; 42 USC 4321 *et seq*.)
National Historic Preservation Act of 1966 (as amended, PL 89-665; 16 USC 470 *et seq*.)
National Trails Systems Act of 1986 (16 USC 1241-1249)
Native American Graves Protection and Repatriation Act (25 USC, Section 3001 *et seq*.)
NonIndigenous Aquatic Nuisance Prevention and Control Act of 1990
North American Wetlands Conservation Act (16 USC 4401 *et seq*.)
Noxious Plant Control Act (PL 90-583)
Outdoor Recreation on Federal Lands (16 USC 4601{1} *et seq*.)
Outleasing for Grazing and Agriculture on Military Lands (10 USC 2667(d)(4))
Plant Protection Act of 2000 (7 USC 7701 *et seq*.) (replaces Federal Noxious Weed Act of 1973 (PL 93-629))
Plant Quarantine Act (7 USC 151-167)
Protection of Fossils on Federal Lands (43 USC 1701 et seq., 18 USC 641, and 18 USC 1361).
Readiness and Environmental Protection Initiative (within Section 2811, FY 2003 National Defense Authorization Act) (10 USC 2684a)
Rivers and Harbors Act (33 USC 401 *et seq*.)
Sale of Certain Interests in Lands; Logs (10 USC 2665)
Sikes Act (PL 105-85, as amended through 2004 including PL 108-136; 16 USC 670 *et seq*.)
Soil and Water Conservation Act (16 USC 2001)
Soil Conservation Act of 1938 (16 USC 5901 *et seq*.)
Soil Conservation and Domestic Allotment Act (7 USC 128)
Timber Sales on Military Lands [An update of the Military Construction Authorization Act] (10 USC 2665)
Watershed Protection and Flood Prevention Act (PL 84-566; 16 USC 1001-1009)
Wild and Scenic Rivers Act of 1968 (16 USC1271-1287)

**Executive Orders and Presidential Memoranda**

Executive Order 11593, *Protection and Enhancement of the Cultural Environment*
Executive Order 11644, *Use of Off-Road Vehicles on the Public Lands*
Executive Order 11987, *Exotic Organisms*
Executive Order 11988, *Floodplain Management*, May 24, 1977 Executive
Order 11989, *Off-Road Vehicles on Public Lands*, May 24, 1977 Executive
Order 11990, *Protection of Wetlands*, May 24, 1977
Executive Order 11991, *Protection and Enhancement of Environmental Quality*: Amends Executive Order 11514
Executive Order 12608, *Protection of Wetlands*: Amends Executive Order 11990
Executive Order 12898, *Environmental Justice*
Executive Order 12962, *Recreational Fisheries*, June 6, 1995
Executive Order 13007, *Indian Sacred Sites*
Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*
Executive Order 13112, *Invasive Species*, February 3, 1999
Executive Order 13148, *Greening the Government through Leadership in Environmental Management*, April 22, 2000
Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*
Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, January 10, 2001
Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*
Executive Order 13443, *Facilitation of Hunting Heritage and Wildlife Conservation*

Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance,* October 8, 2009
Presidential Memorandum, *Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds* (April 26, 1994)
Presidential Memorandum, *Government-to-Government Relations with Native American Tribal Governments*

**Department of Defense (DoD) Directives/Instructions**
DoD Directive 4150.7, *DoD Pest Management Program*
DoD Directive 4700.4, *Natural Resources Management Program*
DoD Directive 4710.1, *Archaeological and Historic Resources Management*
DoD Instruction 4715.03, *Natural Resources Conservation Program* (February 14, 2011)
DoD Manual 4715.03, *Integrated Natural Resources Management Plan Implementation Manual*, (November 25, 2013)
DoD Instruction 4715.1, *Environmental Security*
DoD Directive 4715.1E, *Environment, Safety, and Occupational Health*
DoD Instruction 4715.9, *Environmental Planning and Analysis*
DoD Instruction 5000.13, *Natural Resources*
DoD Regulation 5400.7-R, *DoD Freedom of Information Act Program,* May 22, 1997
DoD Directive 6050.1, *Environmental Effects in the United States of DoD Actions*
DoD Directive 6050.2, *Use of Off-Road Vehicles on DoD Lands*
DoD Directive 6055.6-M, *Department of Defense Fire and Emergency Services Certification Program,* October 10, 2000
Department of Defense, *American Indian and Alaska Native Policy*
*DoD Commander's Guide to Biodiversity*, 1996, Keystone Center, Keystone, CO
DoD Financial Management Regulation Volume 11A, Chapter 16, *Accounting for Production and Sale of Forest Products,* August 2002.

**U.S. Air Force**
AFI 13-212, Volume 1, *Range Planning and Operations*
AFI 32-1021, *Planning and Programming of Military Construction (MILCON) Projects*
AFI 32-1053, *Pest Management Program*
AFI 32-2001, *The Fire Protection Operations and Fire Prevention Program*
AFI 32-7001, *Environmental Budgeting*
AFI 32-7006, *Environmental Program in Foreign Countries*
AFI 32-7020, *The Environmental Restoration Program*
AFI 32-7045, *Environmental Compliance Assessment and Management Program (ECAMP)*
AFI 32-7062, *Air Force Comprehensive Planning*
AFI 32-7064, *Integrated Natural Resources Management*
AFI 32-9003, *Granting Temporary Use of Air Force Real Property*
AFI 32-10112, *Installation Geospatial Information and Services*
AFI 36-2817, *Civil Engineer Awards Program*
AFI 65-601, *Budget Guidance and Procedures*, Volume 1
AFI 90-2002, *Air Force Interactions with Federally-Recognized Tribes*
AFI 91-202, *The US Air Force Mishap Prevention Program*
AFI 91-204, *Safety Investigations and Reports*
AFI 91-223, *Aviation Safety Investigations and Reports*
AFMAN 23-110, Volume II, Part Two, Chap 22, Section K, *USAF Supply Manual*
AFMAN 37-123, *Management of Records*
AFPAM 91-212*, Bird/Wildlife Aircraft Strike Hazard (BASH) Management Techniques*

AFPD 32-70, *Environmental Quality*
AFPD 37-1, *Air Force Information Management*
AFPD 91-2, *Safety Programs*
3WGI 91-212, *Bird and Wildlife Aircraft Strike Hazard (BASH) Program*
673 ABWI 32-7001, *Conservation and Management of Natural Resources*
673 ABWI 32-2001 *Fire Prevention Program*

**Other Related Guidance**
National Fire Equipment System (NFES) 1279 - *Prescribed Fire Smoke Management Guide*
NFES 1414 - *Wildland Fire Qualification Subsystem Guide*
NFES 1596 - *Fitness and Work Capacity*
NFES 2071 - *Fit to Work, Fatigue and the Firefighter*
National Fire Protection Association (NFPA) 295 - *Standard for Wildfire Control*
NFPA 299 - *Protection of Life and Property from Wildfire*
NFPA 1002 - *Standard for Fire Apparatus Driver/Operator Professional Qualifications*
NFPA 1051 - *Standard for Wildland Fire Fighter Professional Qualifications*
NFPA 1500 - *Standard on Fire Department Occupational Safety and Health Program*
NFPA 1582 - *Standard on Medical Requirements for Fire Fighters*
NFPA 1977 - *Protective Clothing and Equipment for Wildland Fire Fighting*
Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design*

**State of Alaska**

**Alaska Forest Practices Act.** The Alaska Forest Practices Act applies to all state and private lands in Alaska. It specifies harvesting procedures, best management practices, and provides penalties for non-compliance. Although not regulatory on federal lands, most federal land management agencies accept these standards as a minimum.

**State Fish and Game Regulations.** State fish and game laws apply to federal lands within the State of Alaska, and are enforced on JBER. Alaska Statutes Title 16 and Alaska Department of Fish and Game (ADFG) Regulations Title 5 detail state laws relating to use of fish and wildlife resources and habitat protection. Those statues and regulations that pertain to use of resources on JBER are enforced jointly by ADFG, Alaska Department of Public Safety, Bureau of Wildlife Enforcement and CEANC military conservation agents.

**Other Related Authorities**

**Migratory Bird Treaty Act as Affected by the 2003 National Defense Authorization Act**
The 2003 National Defense Authorization Act had the effect of amending the Migratory Bird Treaty Act placing a greater emphasis on conserving birds on JBER. USFWS published regulation changes in 8946 Federal Register effective March 30, 2007 and summarized the action. *…The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, or possessing of migratory birds unless permitted by regulations promulgated by the Secretary of the Interior. Section 315 of the 2003 National Defense Authorization Act (Authorization Act) provides that, … the Secretary of the Interior (Secretary) shall exercise his/ her authority under Section 704(a) of the MBTA to prescribe regulations to exempt the Armed Forces for the incidental taking of migratory birds during military readiness activities authorized by the Secretary of Defense or the Secretary of the military department concerned. As directed by Section 315 of the Authorization Act, this rule authorizes such take, with limitations, that result from military readiness activities of the Armed Forces. If any of the Armed Forces determine that a proposed or an ongoing*

*military readiness activity may result in a significant adverse effect on a population of a migratory bird species, then they must confer and cooperate with the Service to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects. The Secretary of the Interior, or his/her designee, will retain the power to withdraw or suspend the authorization for particular activities in appropriate circumstances* (8946 Federal Register / Vol. 72, No. 39 / Wednesday, February 28, 2007 / Rules and Regulations).

In summary the regulations require JBER to:
(1) Engage in close coordination with USFWS for migratory bird conservation.
(2) Maintain current information on migratory bird populations and trends.
(3) Document migratory bird conservation in the INRMP.
(4) Incorporate migratory bird population goals and habitat objectives into INRMPs.
(5) Conduct annual INRMP reviews with USFWS and ADFG to:
  (a) solicit their input concerning INRMP effectiveness of bird conservations and
  (b) analyze effectiveness of INRMP measures to avoid, minimize, or mitigate take.
(6) Analyze project effects, especially any new military readiness activity, via NEPA documentation.
(7) If impacts may significantly affect a population of migratory bird species, confer early with USFWS.

**DoD Partners In Flight**
The DoD Partners in Flight program sustains and enhances the military testing, training, and safety mission through proactive, habitat-based management strategies that maintain healthy landscapes and training lands. The DoD Partners in Flight Strategic Plan identifies actions that support and enhance the military mission while also working to secure bird populations. Partners in Flight migratory bird conservation strategies adopted into JBER management are below.

***Inventory & Monitoring***
- Use national standardized protocols and assess the status and trends of bird populations and habitats, including migrating, breeding, and wintering birds.
  - Monitoring data will be maintained in secure and accessible systems.
  - Identify habitat conditions needed by applicable species of special concern and understand interrelationships of co-existing species.
  - Evaluate the effects of management activities on habitats and populations of migratory birds through National Environmental Protection Act processes, Air Force Forms 813 and 332, and Air Base Wing Form 3.
  - Identify bird movement/migration patterns and habitat selection within JBER.

***Habitat Conservation (protection, restoration, and enhancement)***
- Manage habitat within bird and wildlife exclusion zones around airfields to reduce the bird-aircraft strike hazard and minimize unnecessary destruction of birds and nests, which will include:
  - managing vegetation, as outlined in 3WGI 91-212 BASH Prevention program;
  - coordinating with facility managers and building designers to minimize bird nesting sites on structures, and coordinate pre-egg laying nest destruction but establish alternative nesting sites outside the wildlife exclusion zone;
  - minimizing standing water and open water ponds that attract waterbirds; and
  - restricting bird feeding and emphasizing proper garbage management.
- Provide for cavity-nesting species through old growth forest and snag tree protection and provide artificial nesting opportunities.

- Improve waterfowl nesting habitat on Sixmile, Green, Hillberg, and Spring lakes through the installation of nest platforms.
- Provide signage for protection of important habitat of species of special concern.

***Collaboration***

- Collaborate with other federal and state agencies to develop reasonable and effective conservation measures for actions that affect migratory birds and their natural habitats, and share inventory, monitoring, research, and study data through e-Bird, Avian Knowledge Network, and BBIRD.

***Cooperation***

- Allow the USFWS and other partners reasonable access to military lands to conduct sampling or survey programs.
- Encourage the use of qualified volunteers from local bird clubs to assist in survey and monitoring programs.
- Use existing partnerships and explore opportunities for expanding and creating new partnerships to facilitate combined funding for inventory, monitoring, management studies, and research.

***Outreach & Public Access***

- Provide outdoor recreation and wildlife viewing opportunities, where appropriate.
- Coordinate birding outings in-house or through local birding clubs.
- Promote and distribute outreach and educational materials.
- Update and reprint *Bird Checklist, Anchorage Area Military Reservations: Elmendorf Air Force Base/Fort Richardson* as a JBER ckecklist.
- Consider creating interpretive displays along trails describing habitats, wildlife, and the management actions needed to sustain them.

***Integrate the above strategies*** with initiative partners, the North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, North American Waterbird Conservation Plan, Alaska Wildlife Action Plans, and DoD Partners in Flight Strategic Plan.

***Regulations***

- Obtain state and federal permits for depredation activities, scientific collection, and live/dead eagle exhibit.
- Follow DoD Migratory Bird Guidance to ensure compliance with obligations in the National Environmental Protection Act, the Migratory Bird Treaty Act, and the Final Rule on Take of Migratory Birds by the Armed Forces (50 CFR Part 21).

**Wetlands**

Executive Order 11900, *Protection of Wetlands* stipulates that *federal agencies shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities.* Additionally, DoD Instruction 4715.03 states, *DoD operations and activities shall avoid the net loss of size, function, or value of wetlands. Additionally, the DoD will preserve the natural and beneficial values of wetlands in carrying out its activities. The development of mitigation 'banks' is encouraged as sound conservation planning.* Other regulations regarding protection of wetlands include Section 10 of the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act, and U.S. Army Corps of Engineers

regulations 33 CRF Parts 320-336. Actions affecting wetlands require an environmental analysis in accordance with AFI 32-7064, 32 CFR 560, and applicable federal and state laws and regulations.

U.S. Army Corps of Engineers permits are required under Section 10 of the Rivers and Harbors Act of 1899 prior to commencing any work or structures (*e.g.*, dredging, bulkheads, piers and docks, bank protection) built in a navigable water of the United States. U.S. Army Corps of Engineers permits are required under Section 404 of the Clean Water Act for the discharge or dredged of fill material into a water of the United States, including wetlands. Corps of Engineers regulations in 33 CFR Parts 320-330 prescribe statutory authorities and general and special policies and procedures applicable to the review of applications for Corps of Engineers permits. Before commencing any work in a water of the United States, a district engineer must be contacted and a permit obtained, as appropriate.

State regulations include 18 AAC 70 Alaska Water Quality Standards permits issued by the State of Alaska Department of Environmental Conservation. The State of Alaska Department of Natural Resources, Division of Land requires a land use permit when any activity occurs near or on state lands or stream beds under AS 38.05.850.

**Grounds Maintenance and Landscaping**

Laws, orders, directives, policies, and regulations that affect grounds maintenance and landscaping on JBER include:

- EO 13112, *Invasive Species*, which requires preventing the introduction of and controlling invasive species;
- National Invasive Species Management Plan (2001), which includes DoD goals to prevent and control invasive species as well as restore lands with native species;
- DoD directives 4715.1 and 4715.03, which require military services to protect, preserve, and restore the natural environment using regionally native plants for landscaping;
- AFI32-7064, which includes grounds maintenance standards for improved and semi-improved grounds.

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# Appendix C. INRMP Correspondence and Comments Received

**Joint Base Elmendorf-Richardson Integrated Natural Resources Management Plan**
**Agency Coordination Meeting**
**Meeting Minutes**
April 14, 2015
0900

**Attendees**:

Doug Ballou – BLM (on phone)
Barbara Mahoney – NMFS
Jennifer Spegon – USFWS
David Saalfeld – ADF&G (on phone)
Laurie Thorpe – BLM (on phone)
Brent Koenen – JBER
Chris Garner – JBER
Kristy Craig – JBER
Jess Johnson – JBER
David Elliott – JBER
Charlene Johnson – JBER
Cassie Schoofs – JBER

Handouts: INRMP Annual Report, Annual Work Plan, and 2014 Review Summary of Changes

0910 – Introductions
Brent Koenen (BK) began the meeting by highlighting focus areas for each agency
BLM: JBER/BLM Memorandum of Agreement
USFWS: Bird projects on JBER
ADF&G: Bear hunt
NMFS: Belugas

The Air Force requires an annual INRMP review in collaboration with other agencies. This INRMP review meeting is an important part of the review process.

**BK**- Overview of the INRMP Annual Report
***Topic 1: Sufficient numbers of qualified natural resources management personnel and resources are available to oversee implementation of projects and activities identified in the INRMP Work Plan.***
– Overall, JBER believes it is Sikes Act compliant because the Conservation section has adequate staffing to complete the tasks and projects outlined in the INRMP. JBER received adequate 2014-2015 funding for projects (see Annual Work Plan).

***Topic 2: Significant changes to the installation's mission requirements or its natural resources have not occurred. The INRMP, with the enclosed 2014 Summary of Changes, is current and consistent with Sikes Act requirements.***
- There were no significant mission or natural resource changes that occurred on JBER this past year. The only noteworthy change was implementation of a recreational access fee. This outdoor recreational access fee is electronic system administered by

iSportsman. The recreation fee is $10 annually or $5 for a disabled veteran or senior citizen.

***Topic 3: Projects identified in the INRMP have been budgeted for and implementation is on schedule as summarized in the attached Work Plan Implementation Table.***
- JBER's conservation program was fully funded in FY14. Project execution is proceeding.

**Topic 4:** ***USFWS, ADF&G, NMFS and the BLM coordination has occurred.***
- JBER did not get a 2013 INRMP review concurrence signature from ADF&G. The believed principle reason ADF&G did not sign the 2013 INRMP was the disagreement over the need to complete NEPA documentation for the proposed JBER black bear hunt. This topic could have received a yellow rating since ADF&G did not endorse the 2013 INRMP review. JBER rates this topic as a green because of the strong working relationship JBER has with ADF&G and the other three federal agencies throughout the year.

***Topic 5: Progress towards meeting the agreed upon goals and objectives for natural resources management was completed in 2014.***
- JBER is meeting the INRMP goals and objectives by developing and implementing statistically sound vegetation, fish, bald eagle, wetlands, and belugas baselines. JBER will be monitoring and conducting trend analysis going forward.

DoD is encouraging cooperating agencies be given the opportunity to execute conservation projects. JBER will look for opportunities to identify and fund appropriate projects with our collaborative agencies.

Agency specific topics:
**ADF&G-** Two main areas of support: fisheries and moose surveys
**BK-** It is JBER's intent to continue funding the annual aerial moose surveys over JBER land with ADF&G executing this task.
**David Saalfeld (DS) -** concurred that the state wants to continue doing the aerial moose surveys
**BK -** As for the bear hunt, we were waiting on the Game Board/State in order to move forward.
**DS –** There was a Game Board meeting in March, at which the black bear hunt on JBER was authorized. Method of take will be a shotgun with slugs. A coordination meeting with JBER biologists in the near future is needed to determine 2016 hunt specifics.

**BK –** JBER will likely require the hunters pass a proficiency test before they are allowed to hunt
**DS –** ADF&G was counting on that
**BK-** As for fisheries, JBER would prefer to continue running the fisheries program internally, in close coordination with the state.

The INRMP endorsement correspondence to ADF&G will request written concurrence to the INRMP's sufficiency, ADF&G commitment to continue doing the aerial moose surveys on JBER lands, and that ADF&G does not object to JBER internally executing the fisheries monitoring program in close consultation with ADF&G fisheries personnel.

No concerns from ADF&G with the 2014 review of the INRMP were noted at this time.

**BLM –** The MOA (Memorandum of Agreement) has been written, it is held up on the JBER end. JBER is anticipating a staffed MOA in 4 months to the BLM
**Laurie Thorpe (LT) –** for reference, the BLM commercial fee for wood is $10 per cord and personal use is free
**BK-** We are estimating a $30-50 per cord fee for wood on JBER depending on if the wood is pre-cut, limbed and stacked as compared to requiring the wood cutter to drop, limb and section the firewood.
**LT -** indicated the conceptual forestry fees envisioned by JBER are quite reasonable.
**BK -** Invasive species are another focus for future collaboration with BLM

No concerns from BLM with the 2014 review of the INRMP were noted at this time.

**USFWS –**
**BK -** 2 bird related projects are funded. JBER would like the USFWS to take the lead on the majority future avian projects. Issue on JBER: The landfill is close to Bryant Army Airfield, raptors are the one of the biggest BASH (Bird Aircraft Strike Hazard) risks.

JBER conducts an annual Bald Eagle survey to ensure Eagle Act compliance and to minimize BASH risk. These Bald Eagle surveys were accomplished by USFWS or contractors in the past. JBER plans on conducting the eagle surveys internally, starting in 2016. JBER is hyper-sensitive to adhering to Eagle Act guidance. In spite of our diligence, JBER has still delivered 4 dead Bald Eagles to USFWS in the past couple years. This winter JBER obtained Bald Eagle Nest Take permits, 2 to remove eagle nesting trees and one disturbance permit near an active range.

The boreal water-birds project is a consortium of agencies and University of Alaska, Anchorage staff; including ADF&G, USFWS, DoD and UAA. For FY15 funding, JBER would like to offer USFWS the lead on this consortium. Kristy Craig (JBER) and Jim Johnson (USFWS) are collaborating on a statement of work for this project FY15 project. A bit of history: JBER has been working with Steve Matsuoka (USFWS) since 2007 and will be continuing the same work with Jim Johnson. This includes working with Rusty Blackbirds and Olive-sided Flycatchers and deploying a number of pinpoint geo-locators. Under the Sikes Act, funding provided to an agency has a period of performance (POP) of 18 months. We (USFWS and JBER) need to ensure the funding provided to USFWS does indeed have an 18-month POP.
If JBER were to hand off management of this project to USFWS, JBER would still host the project location, provide funding and facilitate meetings. The USFWS and UAA would drive the science, the consortium and JBER will ensure study plans and results are applicable to military operations.

Future projects of interest include eDNA, unmanned aircraft, and Otter Lake redesign with Bill Rice (USFWS)
**Jennifer Spegon (JS) –** noted the future wood frog project, Dr. Mary Reeves with the USFWS is a great resource for wood frog deformities, contaminants, time of year, what works best, etc.

The INRMP correspondence with USFWS will request written concurrence to the INRMP's and USFWS commitment to act as the principal project lead for FY15 avian projects, with the exception of the annual eagle aerial surveys. In-house staff plan on completing eagle surveys in the future, USFWS is welcome to participate in all future JBER annual eagle surveys.

**NMFS-**
- Cook Inlet beluga whale (CIBW) critical habitat (CH) in Eagle River is currently excluded due to INRMP's protections and conservation measures. If those protections change, NMFS would have to re-evaluate the CH exclusion.
**Chris Garner (CG) -** CPODs are placed up Eagle River to investigate the extent, timing and duration of beluga usage of Eagle River. JBER also operates a fish wheel and weir just upstream of the uppermost CPOD.
- Working on a correlation between fish species and numbers with beluga presence in Eagle River.
- Manolo Castellote of NMML is working on an acoustic proxy for identification of feeding behavior using terminal buzzes. We hope to apply this paradigm to our data Cook Inlet-wide, including Eagle River.

**Barb Mahoney (BM) -** mentioned the possibility of additional funding from NMFS for mutually supportive data; JBER/NMFS have joint interest in the unmanned aerial vehicles (UAV) to enhance future CIBW study efforts. NMFS is interested in coordinating with future UAV projects.

The INRMP correspondence with NMFS will request written concurrence that the INRMP remains sufficient and monitoring efforts are protective to the CIBW.

**BK-** Another potential project of interest is using eDNA to look for eulachon presence in Eagle River.

SIDEBAR –
A follow up meeting occurred on 4/16/2015 at 0830 with ADF&G Fisheries (Mike Thalhauser and Jay Baumer) as they were unable to attend the 4/14 meeting. The JBER fisheries projects were discussed and ADF&G agreed that JBER should continue running the fisheries projects internally as ADF&G is satisfied with the fisheries work being done on JBER and does not have the staff or funding to take on additional projects.

- ADF&G inquired into why recreational access is stricter on Elmendorf than Richardson. Security Forces requires stricter access requirements on Elmendorf.
- ADF&G are interested in seeing scale samples collected on Sixmile returning adult salmon. JBER expressed a willingness to collect scales from returning salmon.
- ADF&G are willing to help develop a confidence interval for salmon apportionment for the Eagle River project. JBER welcomes ADF&G assistance to more accurately apportion the Eagle River salmon returns.
- ADF&G would like to see the current questions being asked on the iSportsman exit survey for fishing and would like to possibly add additional questions. Examples of iSportsman exit survey questions were provided to ADF&G.

# Meeting with ADFG Wildlife

Meeting Minutes
Monday, October 28, 2013
9:00am

JBER has set aside a budget for monitoring wildlife on base. Discussed at this meeting was the role that ADFG would be taking in monitoring this population of wildlife.

**Predator Management** was a line item in the future budget. It was determined that there was not a present need for these monies. The wolf population is too small to provide an adequate sample size for a meaningful study. The line item will be removed from the budget.

**Black bear hunt**
Discussed:

- Would likely receive adequate support from ADFG leadership on this matter
- In process of writing an EA
- Will the hunt be brought before the Board? Depends on EA timing…
- We will meet again with ADFG to discuss logistics of this hunt; manpower, numbers, etc.

**Aerial Moose Survey**
Allocated $52,000 in current budget for moose surveys.
Discussed:

- Estimated cost for aerial moose survey is $5,000 - $10,000
- Will try to do moose surveys in mid to late November
- Need snow to perform the surveys,
- Survey on JBER may not happen this year due to weather conditions…

**Moose Browse Enhancement Project**
Determined to be the priority project for JBER wildlife money
Discussed:

- there has been lots of habitat loss and fragmentation on base due to various projects
- the remaining habitat needs to be enhanced

- **We will produce a GIS map of the areas we have hydro-axed and ask for recommendations from ADFG on where the best places to improve habitat for moose browse**

**Moose Gates**
Moose gates along the highway are in disrepair as a result of no or very little maintenance being done since installation.
Discussed:
- Replacing the gates with a new, improved design
- Possibility of a wildlife overpass
    - 1-5 overpasses in this length of road
    - Moving troops between training areas
    - Genetics isolation between the north and south sides of the highway

Other discussion:
- Is it a possibility of give money to ADFG to hire a grad student, technician, etc to focus on JBER?
- We will be sending the JBER INRMP to ADFG for review by the end of this year.

Meeting ended at 10:15

# Meeting with ADFG Fisheries

Meeting Minutes
Monday, October 28, 2013
10:20am

JBER sets aside $179,000 each year for fisheries projects on base with the two ongoing projects being 6-mile and Eagle River.

6-mile: Smolt outmigration counts; spawning adult surveys;
Discussed:

- The transition to removing the fish ladder and replacing it with a rough bottomed stream for FY 15 via a contractor.
- The predation of smolt coming out of lower 6-Mile. Dan suggested the possibility of stocking both Upper and Lower 6-mile and increasing the bag limits for both to decrease the numbers of trout in the lakes if they are having a significant impact on smolt numbers

Eagle River: Salmon enumeration via Didson sonar and Fish Wheel
Discussed:

- possible ways of installing a safer and more effective sonar system

Otter Lake: The Rotenone project scheduled for Fall 2014
Discussed:

- the need to use Krissy (sp?) as the named licensed pesticide applicator on the permit application
- how to move money around to be able to pay ADFG for their services as we not able to directly pay them

Chester and Campbell Creeks:
Discussed:

- Need feedback from ADFG about what role or projects need to be done on these streams

Also discussed:

- Would ADFG be willing to use some of our money to hire a grad student, technician or entry-level biologist to support JBER fisheries operations?

- Should we be conducting dissolved oxygen surveys on JBER lakes in mid-March?

- We will be sending the JBER INRMP to ADFG for review by the end of this year.

**DEPARTMENT OF THE AIR FORCE**
**HEADQUARTERS, 673D AIR BASE WING**
**JOINT BASE ELMENDORF-RICHARDSON, ALASKA**

673 CES/CEIEC
724 Postal Service Loop # 4500
Joint Base Elmendorf – Richardson AK 99505-4500

Ms. Ann Rappoport
U.S. Fish & Wildlife Service
605 West 4th Avenue, R, G-61
Anchorage, AK 99501

Dear Ms. Rappoport,

This letter is to notify the U.S. Fish & Wildlife Service that we intend to revise the Integrated Natural Resources Management Plan (INRMP) for Joint Base Elmendorf-Richardson (JBER). This new INRMP for 2013-2017 will be a revision and update of the INRMP for 2012-2016 to reflect current natural resources management.

We plan to have a draft available for your review by the end of December 2013. Your participation in this effort, through review of this document, is crucial to the success of integrated natural resources management on JBER.

We thank you for your ongoing support to the installation.

Sincerely,

VALERIE PAYNE
Chief, Installation Management

Signed by Valerie Payne on November 5th, 2013

**DEPARTMENT OF THE AIR FORCE**
**HEADQUARTERS, 673D AIR BASE WING**
**JOINT BASE ELMENDORF-RICHARDSON, ALASKA**

673 CES/CEIEC
724 Postal Service Loop # 4500
Joint Base Elmendorf - Richardson AK 99505-4500

Ms. Cora Campbell, Commissioner
Alaska Department of Fish and Game
333 Raspberry Road
Anchorage, AK 99518

Dear Ms. Campbell,

This letter is to notify the Alaska Department of Fish and Game that we intend to revise the Integrated Natural Resources Management Plan (INRMP) for Joint Base Elmendorf-Richardson (JBER). This new INRMP for 2013-2017 will be a revision and update of the INRMP for 2012-2016 to reflect current natural resources management.

We plan to have a draft available for your review by the end of December 2013. Your participation in this effort, through review of this document, is crucial to the success of integrated natural resources management on JBER.

We thank you for your ongoing support to the installation.

Sincerely,

VALERIE PAYNE
Chief, Installation Management

Signed by Valerie Payne on November 5th, 2013

**DEPARTMENT OF THE AIR FORCE**
**HEADQUARTERS, 673D AIR BASE WING**
**JOINT BASE ELMENDORF-RICHARDSON, ALASKA**

673 CES/CEIEC
724 Postal Service Loop # 4500
Joint Base Elmendorf - Richardson AK 99505-4500

Dr. James W. Balsiger
National Marine Fisheries Service
P.O. Box 21668
Juneau AK 99801

Dear Dr. Balsiger,

This letter is to notify the National Marine Fisheries Service that we intend to revise the Integrated Natural Resources Management Plan (INRMP) for Joint Base Elmendorf-Richardson (JBER). This new INRMP for 2013-2017 will be a revision and update of the INRMP for 2012-2016 to reflect current natural resources management.

We plan to have a draft available for your review by the end of December 2013. Your participation in this effort, through review of this document, is crucial to the success of integrated natural resources management on JBER.

We thank you for your ongoing support to the installation.

Sincerely,

VALERIE PAYNE
Chief, Installation Management

Signed by Valerie Payne on November 5th, 2013

**DEPARTMENT OF THE AIR FORCE**
**HEADQUARTERS, 673D AIR BASE WING**
**JOINT BASE ELMENDORF-RICHARDSON, ALASKA**

8 November 2013

Jane Mallory
Legacy Resource Management Program
Department of Defense, ODUSD-I&E/EM
E-mail: Jane.Mallory.ctr@osd.mil

Lt Col John B. Lantz
Commander, 673d Civil Engineer Squadron
730 Postal Service Loop # 4500
Joint Base Elmendorf – Richardson AK 99505-4500

Ms. Mallory,

Please accept this letter as my support and approval for the U.S. Fish and Wildlife Service proposal to document the benefits of military lands to declining boreal wetland birds on Joint Base Elmendorf-Richardson (JBER). We have informed our service headquarters of our support of this proposal. If funded, Brent Koenen will act as the POC.

We agree with the proponent's summary of benefits to the military. The proposed project is integral to the goal of our Integrated Natural Resource Management Plan to adaptively manage ecosystems through monitoring of ecological communities, as opposed to monitoring and management of individual species. The project results are expected to provide essential habitat selection models for several of JBER's species of conservation concern. The project would also provide direction for decision makers by providing relative habitat values and potential risks to habitat continuity. Understanding the wintering and migration habitats of JBER bird subpopulations will also provide insight into causes for future trends in breeding numbers. If you have questions please contact Mr. Brent Koenen at 907-384-6224, who will also be our POC for coordination between installation personnel and the project proponents, in the event the project is funded.

Sincerely,

JOHN B. LANTZ, Lt Col, USAF
Commander

# Meeting with ITAM/INRMP

Meeting Minutes
Thursday November 7, 2013
1000 to 1215

Present: Brandon Berta, Dave Fitz-enz, Chris Garner, Vince Jones, Brent Koenen, Mark Prieksat, Tal Robinson, Cassandra Schoofs

This meeting was arranged to discuss the JBER Integrated Natural Resource Management Plan (INRMP) and how ITAM could be integrated into it. Other items discussed include: MOA 250, the Palmer Soil and Water Conservation District contract, the revised BA for Resumption of Year Round Firing Opportunities, and USARAK 350-2

**MOA 250:**
Discussed:
- Which parts of MOA 250 should be incorporated into the INRMP
    -Military readiness and public law give the military a right to clear land
- These main points will be included into the body of the INRMP rather than the whole document in an appendix
- Many concerns/issues about this MOA
- General agreeance that MOA 250 should be terminated/rescinded

<u>Action Items:</u>
Brent – Email Vince about steps to take to terminate/rescind MOA 250

**Palmer Soil and Water Conservation District Contract**
Discussed:
- ITAM has a contract with the Palmer Soil and Water Conservation District. JBER Conservation (CEIEC *) would like access to use the contract– can MIPR funding directly without official agreement language or contract via Ft. Wainwright
- The reason they have the MOA is so ITAM was able to create this contract
- There is no need for CEIEC to have a separate contract or get in the middle of this one because they will be able to use the current contract (unless required to get involved from a landowner perspective).

*Note Recently, Conservation has changed from CEANC to CEIEC

**INRMP**

Discussed:

After the subsequent meeting on 11/13, we have resolved to include a map in the INRMP showing future MilCon Projects

- CEIEC would also like to illustrate the annual forestry clearing in the INRMP on a geo-base map.
- Army ranges not getting the environmental support funding they are accustomed to. Joint basing issues, funding clarification needed, there is inconsistency between the two branches

1, Wetland compensatory mitigation

- Under the Army funding matrix wetland compensation is an environmental cost
- The Air Force requires the project proponent to cover the wetland mitigation cost.

2. Cultural cost
- Under the Army funding matrix archeological pre-construction surveys is an as well mitigation e.g., building demolition is an environmental cost
- The Air Force requires the project proponent to cover the cultural cost.

- Include the following in the INRMP:
- identify wetlands/AFCAC issue
- identify Joint Base issue
- discuss the project incorporation into the INRMP and forestry clearing w/ITAM during next week's INRMP review meeting

Timeline
- Nov 12-14 final updates
- Week of Nov 18th – send out for internal review
- Before Christmas – send out for external agency review

<u>Action Items:</u>
Brent – send Section 7, wetlands and forestry sections to ITAM
Brandon – Requested that you are present in the update session next week to review the ITAM sections in the INRMP

**BA for ERF**
Discussed:
- Currently, the EIS indicates that there are practice rounds available for the 105 mm Howitzer. Dave corrected that there are not practice rounds in the 105mm.
- Otter Creek currently has a seasonal buffer
    - Recommendation: changing to a year-round buffer, does Range concur?

Action Items:
ITAM – Feedback on a year-round buffer to Otter Creek
CEIEC: Investigate if Otter Creek freezes this winter

**USARAK 350-2**
Discussed:
- How to meet the requirements of USARAK 350-2 specified in chapter 9 paragraph 9.3
- Using 813(s) for this process
- Have the 813 be location-based not event-based
-CEIEC noted the current limits for demo activities on Demo III per informal consultation with NMFS (Letter of Concurrence signed 28 May 2013):

- 40 lb NEW max on surface
- 150 lb NEW buried
- All charges over 40 lb NEW must be buried
- Charges over 75 lb NEW including buried charges require MMO's to ensure that no Cook Inlet belugas are present within 1500m radius of the detonation point.

Action Items
- Zack – Can an 813 extend for multiple years?

**Other Discussion items:**
- Funding of SRM for range maintenance
- Reinitiating more lines of communication between conservation and ITAM
    - possible attendance of staff meetings
- Discussion of the NEPA coverage for prescribed burning – will need input from Zack
- Discussion of MOA between JBER and BLM/AFS – CEIEC will draft a new MOA that provides for fire protection and prevention activities.
    - need to understand the ability/desire of AFS to cover RTA or secondarily, present the state with the opportunity to provide this service
    - CEIEC will likely call a meeting after the INRMP review has been finalized

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# Appendix D. Joint Base Elmendorf-Richardson Jurisdictional History

| Document | Year | Mo/Day | Acres | Purpose | Stipulations/Notes |
|---|---|---|---|---|---|
| EO 8102 | 1939 | 1-May | 36,570 | Withdrawn from appropriation for military use | Later amended by EO 9526 |
| EO 8343 | 1940 | 10-Feb | 4,935 | Withdrawn from appropriation for military use | Later amended by EO 9526 |
| EO 8755 | 1941 | 16-May | 18,600 | Withdrawn from appropriation for military use | |
| EO 8788 | 1941 | 14-Jun | 160 | Withdrawn from appropriation for military use | |
| PLO 95 | 1943 | 12-Mar | 6,360 | Withdrawn from appropriation for military use | Will revert to Department of Interior 6 months after termination of national emergency. |
| PLO 253 | 1944 | 7-Dec | 84,555 | Withdrawn from appropriation for military use | Will revert to Department of Interior 6 months after termination of national emergency. |
| EO 9526 | 1945 | 28-Feb | 41,505 | EO 8102 and EO 8343 are amended | Will revert to Department of Interior 6 months after termination of national emergency. |
| PLO 549 | 1949 | 31-Jan | 40 | Lands returned to the Department of Interior | |
| PLO 576 | 1949 | 29-Mar | 84,555 | PLO #253 is revoked and all lands are returned to Department of Interior | |
| PLO 582 | 1949 | 11-Apr | 1,399 | Withdrawal of lands for Alaska Railroad | |
| GO 33 EFF | 1950 | 15-Oct | 9,042 | Jurisdiction of lands is given to the Air Force | |
| Letter, Secretary of Interior | 1952 | 27-Oct | 66,465 | Lands remain in Army use after the national emergency is over | E.O. 8102, 8343,8755, and PLO 95 are all affected and will be returned to Department of Interior when no longer needed for the military mission. |

| Document | Year | Mo/Day | Acres | Purpose | Stipulations/Notes |
|---|---|---|---|---|---|
| PLO 891 | 1953 | 15-Apr | 560 | Lands returned to BLM or other appointed agencies | |
| PLO 1673 | 1958 | 2-Jul | 1,401 | Withdrawal of lands for Army use | |
| PLO 1780 | 1959 | 3-Feb | 1,897 | Lands returned to BLM or other appointed agencies | |
| PLO 1840 | 1959 | 29-Apr | 1,271 | Correction of acreages on PLO 1673 | PLO 1673 stated 1,401 acres while PLO 1840 corrects to 1,271 acres. |
| PLO 2134 | 1959 | 29-Apr | 1,856 | EO 8102 is revoked and lands are given to the State of Alaska | |
| PLO 2029 | 1959 | 15-Dec | 4,706 | Withdrawn from appropriation for military use | |
| PLO 2698 | 1962 | 11-Jun | 90 | Withdrawn for Army use to protect Nike Site Facilities | |
| PLO 2962 | 1963 | 5-Mar | 6,249 | Jurisdiction given to Air Force | Certain areas described under EO 810, and EO 8343 are corrected so that Air Force has jurisdiction rather than the Army. |
| Special use permit | 1965 | 17-Feb | | Military use as part of firing fan | |
| A-063442 | 1965 | 3-Sep | | Releases land back to the Department of Interior | BLM file shows military requesting land to be given back into BLM jurisdiction and BLM took responsibility for only part of the acres that the military requested. (see BLM sup. A-053882) |
| A-053881 | 1968 | 8-Feb | | Right of way easements for the Department of Army. | |
| PLO 5239 | 1972 | 14-Jul | 4,720 | Land acquired for use of the Fort Richardson-Davis range. | No EIS was required by this action. |
| Cooperative Agreement | 1974 | | | Army given access to BLM land | |

| Document | Year | Mo/Day | Acres | Purpose | Stipulations/Notes |
|---|---|---|---|---|---|
| DACA85-4-76-92 | 1976 | | | Air Force drop zone use | Agreement with Air Force to build and maintain a drop zone area; EIS prepared and included in the military file |
| PLO 6244 | 1982 | 6-May | 3,340 | Lands acquired for use of the Fort Richardson-Davis range | Army shall manage off-road vehicle usage, not allow further unexploded ordnance contamination, and has authority to manage all surface activities. |
| A-053882 | 1982 | 6-May | | Land transferred from Department of Interior to Department of Army | BLM file shows military requesting land to be given back into BLM jurisdiction and the BLM refusing to take responsibility of part of the acreages due to unexploded ordinances. (see BLM sup. A-063442) |
| PLO 2029 | 2013 | | 1,283 | PLO 2029 was issued as a buffer/safety area and possible UXO but under the jurisdiction of the Sec of the Interior.<br><br>After careful mapping and meeting with BLM the current land boundaries were redrawn and reported to HQ AF and BLM. | SLUP 063442 (1967) gave the Army a use permit to lands in this area but was replaced with PLO 6244 (1982, which has been extended with PLO 7514 (2002). PLO7514 expires in 2022. |

*Table taken from U.S. Army Alaska (1998) and amended (2013)

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# Appendix E. Flora of Joint Base Elmendorf-Richardson

**Ecotypes of Joint Base Elmendorf-Richardson**

| Type No | Parcel Count | Ecotype | Vegetation Description | Percent Cover | Area (Acres) |
|---|---|---|---|---|---|
| 1 | 1 | Alpine Lake | Water | 0.02 | 18.35 |
| 2 | 107 | Alpine Rocky Dry Barrens | Barrens (<5% veg) | 2.78 | 2,047.21 |
| 3 | 238 | Alpine Rocky Dry Dwarf Scrub | Dryas-Lichen Tundra | 6.23 | 4,585.32 |
| 4 | 302 | Alpine Rocky Moist Dwarf Scrub | Cassiope Tundra | 4.32 | 3,176.42 |
| 5 | 20 | Alpine Rocky Moist Low Scrub | Closed Low Willow | 0.11 | 80.44 |
| 6 | 44 | Coastal Lake and Sedge Marsh | Brackish Water | 0.57 | 421.24 |
| 7 | 93 | Coastal Loamy Wet Barrens | Barrens (<5% veg) | 0.94 | 692.71 |
| 8 | 9 | Coastal Loamy Wet Low Scrub | Open Low Sweetgale-Graminoid Shrub Meadow, slightly brackish | 0.21 | 152.56 |
| 9 | 44 | Coastal Loamy Wet Meadow, brackish | Halophytic Grass Wet Meadow | 0.74 | 542.44 |
| 10 | 11 | Coastal Loamy Wet Meadow, slightly brackish | Halophytic Sedge Wet Meadow, slightly brackish | 0.49 | 358.98 |
| 11 | 13 | Coastal Sandy Moist Meadow | Elymus | 0.02 | 15.84 |
| 12 | 71 | Gravel Roads and Pads | Barrens (<5% veg) | 0.50 | 369.06 |
| 13 | 54 | Human Modified Barrens | Barrens (<5% veg) | 0.40 | 294.58 |
| 14 | 1 | Human Modified Barrens Berms, Spoil Piles | Partially Vegetated (5-30%) | 0.00 | 1.71 |
| 15 | 7 | Human Modified Barrens Clearing, no soil removal | Barrens (<5% veg) | 0.02 | 17.25 |
| 16 | 92 | Human Modified Barrens Clearing, soil removal | Barrens (<5% veg) | 0.56 | 414.58 |
| 17 | 2 | Human Modified Barrens Ditch | Partially Vegetated (5-30%) | 0.00 | 1.64 |
| 18 | 17 | Human Modified Barrens Excavation/Pits (undif) | Barrens (<5% veg) | 0.15 | 108.42 |
| 19 | 1 | Human Modified Barrens Gravel Airstrip | Barrens (<5% veg) | 0.02 | 13.85 |
| 20 | 8 | Human Modified Barrens Gravel Fill | Barrens (<5% veg) | 0.07 | 55.04 |
| 21 | 6 | Human Modified Barrens Gravel Pad | Barrens (<5% veg) | 0.06 | 40.48 |
| 22 | 46 | Human Modified Barrens Gravel Road | Barrens (<5% veg) | 0.71 | 523.16 |

| Type No | Parcel Count | Ecotype | Vegetation Description | Percent Cover | Area (Acres) |
|---|---|---|---|---|---|
| 23 | 1 | Human Modified Barrens Paved Airstrip | Barrens (<5% veg) | 0.02 | 16.91 |
| 24 | 9 | Human Modified Barrens Paved Road | Barrens (<5% veg) | 0.23 | 167.98 |
| 25 | 15 | Human Modified Barrens Undifferentiated Trail | Barrens (<5% veg) | 0.02 | 17.13 |
| 26 | 305 | Human Modified Complex | Disturbance Complex | 2.38 | 1,751.71 |
| 27 | 157 | Human Modified Complex Disturbance Complex | Disturbance Complex | 1.70 | 1,251.58 |
| 28 | 2 | Human Modified Disturbance Complex | Barrens (<5% Veg) | 0.06 | 43.10 |
| 29 | 35 | Human Modified Forest | Closed Paper Birch | 0.31 | 224.77 |
| 30 | 25 | Human Modified Forest Clearing, habitat enhancement | Open Black Cottonwood | 0.46 | 336.95 |
| 31 | 99 | Human Modified Forest Clearing, no soil removal | Open Black Cottonwood | 0.96 | 703.19 |
| 32 | 9 | Human Modified Forest Clearing, soil removal | Open Black Cottonwood | 0.10 | 70.93 |
| 33 | 465 | Human Modified Meadow | Moist Graminoid, post burn or disturbance | 2.38 | 1,751.52 |
| 34 | 6 | Human Modified Meadow Clearing, habitat enhancement | Moist Graminoid, post burn or disturbance | 0.05 | 38.45 |
| 35 | 37 | Human Modified Meadow Clearing, no soil removal | Moist Graminoid, post burn or disturbance | 0.22 | 159.18 |
| 36 | 60 | Human Modified Meadow Clearing, soil removal | Barrens (<5% veg) | 0.57 | 419.99 |
| 37 | 2 | Human Modified Meadow Excavation/Pits (undif) | Moist Graminoid, post burn or disturbance | 0.04 | 26.11 |
| 38 | 2 | Human Modified Meadow Undifferentiated Fill | Moist Graminoid, post burn or disturbance | 0.03 | 22.30 |
| 39 | 149 | Human Modified Scrub | Closed Tall Scrub, post burn or disturbance | 0.94 | 688.13 |
| 40 | 84 | Human Modified Scrub Clearing, habitat enhancement | Closed Tall Alder | 1.47 | 1,082.10 |
| 41 | 327 | Human Modified Scrub Clearing, no soil removal | Closed Tall Alder | 2.05 | 1,508.74 |
| 42 | 137 | Human Modified Scrub Clearing, soil removal | Closed Tall Alder | 1.04 | 763.31 |
| 43 | 6 | Human Modified Scrub Excavation/Pits (undif) | Closed Tall Alder | 0.04 | 31.10 |
| 44 | 7 | Human Modified Scrub Undifferentiated Fill | Open Low Scrub, post burn or disturbance | 0.01 | 6.42 |
| 45 | 9 | Human Modified Scrub Undifferentiated Trail | Open Low Scrub, post burn or disturbance | 0.01 | 4.77 |
| 46 | 5 | Human Modified Waterbodies | Water | 0.03 | 20.89 |

| Type No | Parcel Count | Ecotype | Vegetation Description | Percent Cover | Area (Acres) |
|---|---|---|---|---|---|
| 47 | 1 | Human Modified Waterbodies Ditch | Water | 0.00 | 0.77 |
| 48 | 3 | Human Modified Waterbodies Water-filled excavation | Water | 0.01 | 7.87 |
| 49 | 39 | Lowland Bog Meadow | Subarctic Lowland Sedge-Moss Bog Meadow | 0.30 | 221.80 |
| 50 | 151 | Lowland Gravelly Moist Broadleaf Forest | Closed Paper Birch | 1.73 | 1,270.17 |
| 51 | 378 | Lowland Gravelly Moist Mixed Forest | Closed Quaking Aspen-Spruce | 6.72 | 4,945.86 |
| 52 | 231 | Lowland Gravelly Moist Needleleaf Forest | Open Black Spruce | 3.82 | 2,808.84 |
| 53 | 13 | Lowland Gravelly Moist Tall Scrub | Closed Tall Alder | 0.10 | 73.77 |
| 54 | 34 | Lowland Lake and Aquatic Forb | Aquatic Herb | 0.76 | 560.07 |
| 55 | 42 | Lowland Loamy Moist Meadow | Bluejoint Meadow | 0.12 | 91.35 |
| 56 | 56 | Lowland Needleleaf Forest Bog | Open Black Spruce | 0.64 | 467.57 |
| 57 | 193 | Lowland Scrub Bog | Closed Tall Willow | 1.86 | 1,370.23 |
| 58 | 9 | Nearshore Water | Marine Water | 0.04 | 27.56 |
| 59 | 24 | Paved Surfaces | Barrens (<5% veg) | 1.21 | 888.77 |
| 60 | 22 | Riverine Gravelly Moist Barrens | Barrens (<5% veg) | 0.04 | 29.99 |
| 61 | 54 | Riverine Gravelly Moist Broadleaf Forest | Open Black Cottonwood | 0.52 | 385.86 |
| 62 | 51 | Riverine Gravelly Moist Mixed Forest | Open Black Cottonwood-White Spruce | 0.91 | 667.80 |
| 63 | 25 | Riverine Gravelly Moist Needleleaf Forest | Closed Paper Birch-Aspen | 0.26 | 188.69 |
| 64 | 22 | Riverine Gravelly Moist Tall Scrub | Closed Tall Alder | 0.19 | 140.96 |
| 65 | 1 | Riverine Lake | Water | 0.00 | 1.69 |
| 66 | 22 | Riverine Loamy Wet Tall Scrub | Closed Tall Alder | 0.12 | 90.66 |
| 67 | 18 | Rivers and Streams | Brackish Water | 0.27 | 199.45 |
| 68 | 28 | Subalpine Rocky Moist Broadleaf Forest | Open Balsam Poplar | 0.74 | 543.17 |
| 69 | 94 | Subalpine Rocky Moist Low Scrub | Closed Low Willow | 2.14 | 1,576.68 |
| 70 | 54 | Subalpine Rocky Moist Meadow | Mixed Herbs | 0.26 | 189.97 |
| 71 | 27 | Subalpine Rocky Moist Needleleaf Forest | Closed Dwarf Mountain Hemlock | 0.24 | 175.35 |

| Type No | Parcel Count | Ecotype | Vegetation Description | Percent Cover | Area (Acres) |
|---|---|---|---|---|---|
| 72 | 140 | Subalpine Rocky Moist Tall Scrub | Closed Tall Alder | 3.80 | 2,792.65 |
| 73 | 11 | Upland Rocky Dry Barrens | Barrens (<5% veg) | 0.05 | 39.22 |
| 74 | 28 | Upland Rocky Dry Broadleaf Forest | Closed Quaking Aspen | 0.31 | 229.93 |
| 75 | 6 | Upland Rocky Dry Mixed Forest | Open Quaking Aspen-Spruce | 0.14 | 102.28 |
| 76 | 479 | Upland Rocky Moist Broadleaf Forest | Closed Paper Birch | 14.08 | 10,354.33 |
| 77 | 462 | Upland Rocky Moist Mixed Forest | Closed Quaking Aspen-Spruce | 22.69 | 16,688.30 |
| 78 | 89 | Upland Rocky Moist Needleleaf Forest | Open Black Spruce | 1.44 | 1,062.25 |
| 79 | 38 | Upland Rocky Moist Tall Scrub | Closed Tall Alder | 0.45 | 327.68 |
| | | | | | |
| | | | **Totals** | 100.00 | 73,560.08 |

GeoBase GIS 2013

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Achillea | borealis | | | boral yarrow | | |
| Achillea | millefolium | borealis | | northern yarrow | | |
| Achillea | millefolium | | | common yarrow | | ? |
| Achillea | ptarmica | | | sneezeweed; false sneezewort | | E |
| Achillea | sibirica | | | siberian yarrow | | |
| Acomastylis | rossii | | | alpine avens; Ross' avens | | |
| Aconitum | delphiniifolium | paradoxum | | larkspurleaf monkshood | | |
| Aconitum | delphiniifolium | | | larkspurleaf monkshood | | |
| Actaea | rubra | | | red baneberry | | |
| Adoxa | moschatellina | | | musk-root | | |
| Aegopodium | podagraria | | | bishop's goutweed | | E |
| Agropyron | macrourum | | | crested wheatgrass; tufted wheatgrass | | |
| Agropyron | repens | | | quackgrass | | E |
| Agropyron | smithii | | | western wheatgrass | | E? |
| Agrostis | scabra | | | rough bentgrass | | |
| Agrostis | stolonifera | | | creeping bentgrass | | E |
| Alisma | plantago-aquatica | | | European water-plantain | | E |
| Allium | schoenoprasum | | | chives | | |
| Alnus | incana | tenuifolia | | speckled alder | | |
| Alnus | sinuata | | | Sitka alder | | |
| Alnus | sp. | | | alder sp. | | |
| Alnus | tenuifolia | | | speckled alder | | |
| Alnus | viridis | crispa | | mountain alder | | |
| Alnus | viridis | fruticosa | | Siberian alder | | |
| Alnus | viridis | sinuata | | Sitka alder | | |
| Alopecurus | aequalis | | | short-awn foxtail | | |
| Alopecurus | alpinus | | | mountain foxtail | | |
| Alopecurus | pratensis | | | meadow foxtail | | E |
| Amaranthus | albus | | | white pigweed | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Amaranthus | retroflexus | | | red-root amaranth | | E |
| Ambrosia | artemisiifolia | | | annual ragweed | | ? |
| Amelanchier | alnifolia | | | Saskatoon serviceberry | | |
| Andromeda | polifolia | | | bog rosemary | | |
| Anemone | multifida | | saxicola | Hudson Bay anemone | ? | |
| Anemone | narcissiflora | interior | | narcissus anemone | | |
| Anemone | narcissiflora | villosissima | | narcissus thimbleweed | | |
| Anemone | narcissiflora | | monantha | narcissus thimbleweed | | |
| Anemone | narcissiflora | | | narcissus thimbleweed | | |
| Anemone | parviflora | | | small-flower anemone | | |
| Anemone | richardsonii | | | yellow anemone | | |
| Angelica | genuflexa | | | kneeling angelica | | |
| Angelica | lucida | | | seacoast angelica | | |
| Antennaria | alpina | | | alpine pussytoes | | |
| Antennaria | friesiana | alaskana | | Fries' pussytoes | | |
| Antennaria | friesiana | | | Fries' pussytoes | | |
| Antennaria | monocephala | | | single-head pussytoes | | |
| Antennaria | rosea | pulvinata | | rosy pussytoes | | |
| Antennaria | rosea | | | rosy pussytoes | | |
| Anthemis | cotula | | | stinking chamomile; mayweed | | E |
| Anthemis | tinctoria | | | golden camomile | | E |
| Aphragmus | eschscholtzianus | | | Aleutian-cress | x | |
| Aquilegia | formosa | | | crimson columbine | | |
| Arabis | divaricarpa | | | hybrid rockcress | | |
| Arabis | eschscholtziana | | | western hairy rockcress | | |
| Arabis | hirsuta | eschescholtziana | | western hairy rockcress | | |
| Arabis | holboellii | | | Holboell's rockcress | | |
| Arabis | kamchatica | | | lyreleaf rockcress | | |
| Arabis | lyrata | kamchatica | | lyreleaf rockcress | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Arctagrostis | latifolia | | arundinacea | wideleaf polargrass | | |
| Arctagrostis | latifolia | | latifolia | broadleaf arctagrostis | | |
| Arctagrostis | latifolia | | | wideleaf polargrass | | |
| Arctagrostis | poaeoides | | | | | |
| Arctophila | fulva | | | pendantgrass | | |
| Arctostaphylos | alpina | | | alpine manzanita | | |
| Arctostaphylos | rubra | | | red manzanita | | |
| Arctostaphylos | uva-ursi | | | bearberry | | |
| Arctous | alpina | | | alpine bearberry | | |
| Arctous | rubra | | | red fruit bearberry | | |
| Argentina | anserina | | | common silverweed; silverweed cinquefoil | | |
| Argentina | egedii | egedii | | Pacific silverweed | | |
| Armeria | maritima | arctica | | Siberian sea thrift | | |
| Armeria | maritima | sibirica | | Siberian sea thrift | | |
| Arnica | angustifolia | angustifolia | | narrowleaf arnica | | |
| Arnica | angustifolia | | | narrowleaf arnica | | |
| Arnica | frigida | | | snow arnica | | |
| Arnica | griscomii | | | snow arnica | | |
| Arnica | latifolia | | | broadleaf arnica | | |
| Arnica | lessingii | | | nodding arnica | | |
| Arnica | ovata | | | sticky leaf arnica | | |
| Artemisia | arctica | | | boreal sagebrush | | |
| Artemisia | tilesii | | | Tilesius' wormwood | | |
| Aster | junciformis | | | northern bog aster | | |
| Aster | sibiricus | | | arctic aster | | |
| Aster | sp. | | | | | |
| Astragalus | alpinus | alpinus | | alpine milkvetch | | |
| Astragalus | alpinus | | | alpine milkvetch | | |
| Astragalus | cicer | | | chickpea milkvetch | | ? |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Astragalus | polaris | | | polar milkvetch | | |
| Astragalus | umbellatus | | | tundra milkvetch | | |
| Athyrium | filix-femina | | | common ladyfern | | |
| Atriplex | gmelinii | | | Gmelin's saltbush | ? | |
| Avena | fatua | | | wild oat | | E |
| Barbarea | orthoceras | | | American yellowrocket | | |
| Beckmannia | erucaeformis | baicalensis | | American sloughgrass | | |
| Beckmannia | erucaeformis | | | American sloughgrass | | |
| Beckmannia | syzigachne | | | American sloughgrass | | |
| Berteroa | incana | | | hoary alyssum | | ? |
| Betula | glandulosa | | | resin birch | | |
| Betula | hybrids | | | | | |
| Betula | kenaica | | | Kenai birch | | |
| Betula | nana | | | dwarf birch | | |
| Betula | papyrifera | humilis | | Alaska paper birch; resin birch | | |
| Betula | papyrifera | | | paper birch | | |
| Bistorta | vivipara | | | alpine bistort | | |
| Boschniakia | rossica | | | northern groundcone | | |
| Botrychium | boreale | | | northern moonwort | | |
| Botrychium | lanceolatum | | | lanceleaf grapewort | | |
| Botrychium | lunaria | | | common moonwort | | |
| Botrychium | pinnatum | | | northern moonwort | | |
| Brassica | napus | | | field mustard | | E |
| Brassica | rapa | | | field mustard; bird's rape | | E |
| Brassica | sp. | | | | | |
| Bromus | inermis | inermis | | smooth brome | | E |
| Bromus | inermis | pumpellianus | pumpellianus | Pumpelly's brome | | |
| Bromus | inermis | | | smooth brome | | NI |
| Bromus | tectorum | | | cheatgrass | | I |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Calamagrostis | canadensis | | | bluejoint | | |
| Calamagrostis | deschampsioides | | | circumpolar reedgrass | | |
| Calamagrostis | inexpansa | | | northern reedgrass | | |
| Calamagrostis | lapponica | | | lapland reedgrass | | |
| Calamagrostis | nutkaensis | | | Pacific reedgrass | | |
| Calamagrostis | purpurescens | | | purple reedgrass | | |
| Calamagrostis | stricta | inexpansa | | northern reedgrass | | |
| Calla | palustris | | | water arum | | |
| Callitriche | palustris | | | vernal water-starwort | | |
| Callitriche | verna | | | vernal water-starwort | | |
| Caltha | palustris | asarifolia | | yellow marsh marigold | | |
| Caltha | palustris | | palustris | yellow marsh marigold | | |
| Campanula | lasiocarpa | | | mountain harebell | | |
| Campanula | rapunculoides | | | rampion bellflower | | ? |
| Campanula | rotundifolia | | | blue bellflower | | |
| Campanula | uniflora | | | arctic bellflower | | |
| Capsella | bursa-pastoris | | | sheperd's purse | | E |
| Capsella | rubella | | | sheperd's purse | | |
| Caragana | arborescens | | | Siberian peashrub; common caragana | | E |
| Cardamine | bellidifolia | | | alpine bittercress | | |
| Cardamine | oligosperma | | kamtschatica | umbel bittercress | | |
| Cardamine | pratensis | | angustifolia | cuckoo flower | | |
| Cardamine | umbellata | | | umbel bittercress | | |
| Carex | aquatilis | aquatilis | | | | |
| Carex | aquatilis | | dives | Sitka sedge | | |
| Carex | aquatilis | | | water sedge | | |
| Carex | atherodes | | | wheat sedge | x | |
| Carex | atrosquama | | | lesser blackscale sedge | | |
| Carex | bicolor | | | twocolor sedge | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Carex | bigelowii | | | Bigelow's sedge | | |
| Carex | brunnescens | pacifica | | Pacific brownish sedge | | |
| Carex | buxbaumii | | | Buxbaum's sedge | | |
| Carex | canescens | | | silvery sedge | | |
| Carex | capitata | | | capitate sedge | | |
| Carex | chordorrhiza | | | creeping sedge | | |
| Carex | circinata | | | coiled sedge | | |
| Carex | deweyana | | | Dewey sedge | x | I? |
| Carex | diandra | | | lesser panicled sedge | | |
| Carex | dioica | gynocrates | | northern bog sedge | | |
| Carex | disperma | | | softleaf sedge | | |
| Carex | echinata | phyllomanica | | star sedge | | |
| Carex | garberi | | | elk sedge | | |
| Carex | gmelinii | | | Gmelin's sedge | | |
| Carex | gynocrates | | | northern bog sedge | | |
| Carex | kelloggii | | | Kellogg's sedge | | |
| Carex | lachenalii | | | twotipped sedge | | |
| Carex | laeviculmis | | | smoothstem sedge | | |
| Carex | lasiocarpa | americana | | American woollyfruit sedge | | |
| Carex | lenticularis | | lipocarpa | Kellogg's sedge | | |
| Carex | leptalea | | | bristlystalked sedge | | |
| Carex | limosa | | | mud sedge | | |
| Carex | limosa | | | shore sedge; mud sedge | | |
| Carex | livida | | | livid sedge | | |
| Carex | loliacea | | | ryegrass sedge | | |
| Carex | lyngbyei | | | Lyngbye's sedge | | |
| Carex | mackenziei | | | Mackenzie's sedge | | |
| Carex | macloviana | | | thickhead sedge | | |
| Carex | macrochaeta | | | longawn sedge | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Carex | magellanica | irrigua | | boreal bog sedge | | |
| Carex | media | | | closedhead sedge | | |
| Carex | membranacea | | | fragile sedge | | |
| Carex | mertensii | | | Merten's sedge | | |
| Carex | microchaeta | nesophila | | Bering sea sedge | | |
| Carex | microchaeta | | | smallawned sedge | | |
| Carex | microglochin | | | fewseeded bog sedge | | |
| Carex | micropoda | | | Pyrenean sedge | | |
| Carex | nigricans | | | black alpine sedge | | |
| Carex | norvegica | inferalpina | | closedhead sedge | | |
| Carex | obtusata | | | obtuse sedge | | |
| Carex | oederi | | | little green sedge | | |
| Carex | pachystachya | | | chamisso sedge | | |
| Carex | pauciflora | | | fewflower sedge | | |
| Carex | phyllomanica | | | stellate sedge; star sedge | | |
| Carex | pluriflora | | | manyflower sedge | | |
| Carex | podocarpa | | | shortstalk sedge | | |
| Carex | praticola | | | meadow sedge | | |
| Carex | pyrenaica | micropoda | | Pyrenean sedge | | |
| Carex | ramenskii | | | Ramensk's sedge | | |
| Carex | rariflora | | | looseflower alpine sedge | | |
| Carex | rhyncophysa | | | Northwest Territory sedge | | |
| Carex | rostrata | | | beaked sedge | | |
| Carex | rotundata | | | round sedge | | |
| Carex | saxatilis | | | rock sedge | | |
| Carex | scirpoidea | | | northern singlespike sedge | | |
| Carex | sitchensis | | | Sitka sedge | | |
| Carex | sp. | | | | | |
| Carex | spectabilis | | | showy sedge | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Carex | tenuiflora | | | sparseflower sedge | | |
| Carex | utriculata | | | Northwest Territory sedge | | |
| Carex | vaginata | | | sheathed sedge | | |
| Carex | viridula | viridula | | little green sedge | | |
| Cassiope | lycopodioides | | cristapilosa | clubmoss mountain heather | | |
| Cassiope | lycopodioides | | | clubmoss mountain heather | | |
| Cassiope | stelleriana | | | Alaska bellheather | | |
| Cassiope | tetragona | | | white arctic mountain heather | | |
| Castilleja | unalaschcensis | | | Alaskan Indian paintbrush | | |
| Cerastium | arvense | | | field chickweed | | |
| Cerastium | beeringianum | | beeringianum | Bering chickweed | | |
| Cerastium | fontanum | | | common mouse-ear chickweed | | E |
| Cerastium | glomeratum | | | sticky chickweed | | E |
| Cerastium | tomentosum | | | snow-in-summer | | ? |
| Chaenorhinum | minus | | | dwarf snapdragon | | ? |
| Chamaedaphne | calyculata | | | leatherleaf | | |
| Chamerion | angustifolium | angustifolium | | fireweed | | |
| Chamerion | latifolium | | | dwarf fireweed | | |
| Chara | sp. | | | muskwort (alga) | | |
| Chenopodium | album | | | lambsquarters | | E |
| Chenopodium | capitatum | | | blite goosefoot | | |
| Chrysanthemum | arcticum | arcticum | | arctic daisy | | |
| Chrysanthemum | arcticum | | | arctic daisy | | |
| Chrysanthemum | leucanthemum | | | oxeye daisy | | |
| Chrysosplenium | tetrandrum | | | northern golden saxifrage | | |
| Cicuta | bulbifera | | | bulblet-bearing water hemlock | x | |
| Cicuta | douglasii | | | western water hemlock | | |
| Cicuta | mackenzieana | | | Mackenzie's water hemlock | | |
| Cicuta | virosa | | | Mackenzie's water hemlock | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Circaea | alpina | | | small enchanter's nightshade | | |
| Cirsium | arvense | | | Canada thistle | | AK noxious |
| Claytonia | sarmentosa | | | Alaska springbeauty | | |
| Coeloglossum | viride | bracteatum | | longbract frog orchid | | |
| Coeloglossum | viride | | virescens | longbract frog orchid | | |
| Comarum | palustre | | | purple marshlocks | | |
| Conioselinum | gmelinii | | | Pacific hemlockparsley | | |
| Conioselinum | pacificum | | | Pacific hemlockparsley | | |
| Corallorrhiza | trifida | | | yellow coralroot | | |
| Cornus | canadensis | | | bunchberry dogwood | | |
| Cornus | sericea | sericea | | redosier dogwood | | |
| Cornus | suecica | | | Lapland cornel | | |
| Corydalis | pauciflora | | | fewflower fumewort | | |
| Corydalis | sempervirens | | | rock harlequin | | |
| Crepis | elegans | | | elegant hawksbeard | | |
| Crepis | nana | | | dwarf alpine hawksbeard | | |
| Crepis | tectorum | | | narrowleaf hawksbeard | | E |
| Cryptogramma | acrostichoides | | | American rockbrake | | |
| Cypripedium | guttatum | | | spotted lay's slipper | | |
| Cystopteris | fragilis | | | brittle bladderfern | | |
| Cystopteris | montana | | | mountain bladderfern | | |
| Dactylis | glomerata | | | orchardgrass | | E |
| Dactylorhiza | viridis | | | longbract frog orchid | | |
| Dasiphora | floribunda | | | shrubby cinquefoil | | |
| Dasiphora | fruticosa | | | shrubby cinquefoil | | |
| Delphinium | glaucum | | | Sierra larkspur | | |
| Dendranthema | arcticum | arcticum | | arctic daisy | | |
| Deschampsia | caespitosa | | | tufted hairgrass | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Deschampsia | cespitosa | cespitosa | | tufted hairgrass | | |
| Descurainia | sophia | | | herb sophia | | E |
| Descurainia | sophioides | | | northern tansymustard | | |
| Diapensia | lapponica | | | pincushion plant | | |
| Dodecatheon | frigidum | | | western arctic shootingstar | | |
| Dodecatheon | pulchellum | | | darkthroat shootingstar | | |
| Douglasia | alaskana | | | Alaskan douglasia | x | |
| Draba | alpina | | | alpine draba; alpine Whitlow-grass | | |
| Draba | aurea | | | golden draba | | |
| Draba | borealis | | | boreal draba; boreal Whitlow-grass | | |
| Draba | breweri | | cana | cushion draba; Brewer's Whitlow-grass | | |
| Draba | cana | | | cushion draba; hoary draba | | |
| Draba | crassifolia | | | snowbed draba | | |
| Draba | fladnizensis | | | Austrian draba; white arctic Whitlow-grass | | |
| Draba | glabella | | | smooth draba; rock Whitlow-grass | | |
| Draba | juvenilis | | | longstalk draba; long-stalk Whitlow-grass | | |
| Draba | lactea | | | milky draba; milky Whitlow-grass | | |
| Draba | lonchocarpa | | | lancepod draba; lance-pod Whitlow-grass | | |
| Draba | longipes | | | longstalk draba; long-stalk Whitlow-grass | | |
| Draba | nivalis | | | yellow arctic draba; yellow arctic Whitlow-grass | | |
| Draba | ruaxes | | | Rainier draba; Rainier Whitlow-grass | x | |
| Draba | stenoloba | | | Alaska draba; Alaska Whitlow-grass | | |
| Draba | stenopetala | | | Anadyr draba; Anadyr Whitlow-grass | ? | |
| Dracocephalum | parviflorum | | | American dragonhead | | |
| Drosera | angelica | | | | | |
| Drosera | anglica | | | English sundew | | |
| Drosera | rotundifolia | | | roundleaf sundew | | |
| Drosera | sp. | | | sundew | | |
| Dryas | alaskensis | | | Alaska eightpetal mountain avens | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Dryas | drummondii | | | Drummond's mountain avens; yellow mountain avens | | |
| Dryas | integrifolia | | | white mountain avens; entireleaf mountain avens | | |
| Dryas | octopetala | alaskensis | | Alaska eightpetal mountain avens | | |
| Dryas | octopetala | | | eightpetal mountain avens | | |
| Dryopteris | dilatata | americana | | Spinulose shield fern; spreading woodfern | | |
| Dryopteris | dilatata | | | spreading woodfern | | |
| Dryopteris | expansa | | | spreading woodfern | | |
| Dryopteris | fragrans | | | fragrant woodfern | | |
| Echinopanax | horridum | | | devilsclub | | |
| Eleocharis | acicularis | | | needle spike-rush | | |
| Eleocharis | kamtschatica | | | Kamchatka spikerush | x | |
| Eleocharis | palustris | | | common spikerush | | |
| Eleocharis | quinqueflora | | | fewflower spikerush | x | |
| Elymus | alaskanus | alaskanus | | Alaskan wheatgrass | | |
| Elymus | glaucus | | | blue wildrye | | |
| Elymus | hirsutus | | | northern ryegrass | | |
| Elymus | macrourus | | | tufted wheatgrass | | |
| Elymus | repens | | | quackgrass; creeping wild rye | | AK noxious |
| Elymus | sibiricus | | | Siberian wildrye | | E |
| Elymus | sp. | | | | | |
| Elymus | trachycaulus | andinus | | slender wheatgrass; slender wild rye | | |
| Elymus | trachycaulus | novae-angliae | | slender wheatgrass; slender wild rye | | |
| Elymus | trachycaulus | subsecundus | | slender wheatgrass; slender wild rye | | |
| Elymus | trachycaulus | trachycaulus | | slender wheatgrass; slender wild rye | | |
| Elymus | trachycaulus | | | slender wheatgrass; slender wild rye | | |
| Elytrigia | repens | | | quackgrass | | AK noxious |
| Empetrum | hermaphroditum | | | black crowberry | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Empetrum | nigrum | hermaphroditum | | black crowberry | | |
| Empetrum | nigrum | | | black crowberry | | |
| Epilobium | adenocaulon | | | northern willow herb; fringed willow herb | | |
| Epilobium | anagallidifolium | | | pimpernel willowherb | | |
| Epilobium | angustifolium | angustifolium | | fireweed | | |
| Epilobium | angustifolium | | | fireweed | | |
| Epilobium | ciliatum | ciliatum | | fringed willowherb | | |
| Epilobium | ciliatum | glandulosum | | fringed willowherb | | |
| Epilobium | hornemannii | behringianum | | Hornemann's willowherb | | |
| Epilobium | hornemannii | hornemannii | | Hornemann's willowherb | | |
| Epilobium | hornemannii | | | alpine willow herb | | |
| Epilobium | lactiflorum | | | milkflower willowherb | | |
| Epilobium | latifolium | | | dwarf fireweed | | |
| Epilobium | palustre | | | marsh willowherb | | |
| Epilobium | sertulatum | | | Hornemann's willowherb | | |
| Equisetum | arvense | | | field horsetail; water horsetail | | N? |
| Equisetum | fluviatile | | | water horsetail | | |
| Equisetum | hyemale | | | scouringrush horsetail | | |
| Equisetum | palustre | | | marsh horsetail | | |
| Equisetum | pratense | | | meadow horsetail | | |
| Equisetum | scirpoides | | | dwarf scouringrush | | |
| Equisetum | sp. | | | | | |
| Equisetum | sylvaticum | | | woodland horsetail | | |
| Equisetum | variegatum | | | variegated scouringrush | | |
| Erigeron | acris | | | bitter fleabane | | |
| Erigeron | humilis | | | arctic alpine fleabane | | |
| Erigeron | peregrinus | | | subalpine fleabane | | |
| Erigeron | purpuratus | | | purple fleabane | | |
| Eriophorum | angustifolium | scabriusculum | | tall cottongrass | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Eriophorum | angustifolium | subarcticum | | tall cottongrass | | |
| Eriophorum | angustifolium | | | tall cottongrass | | |
| Eriophorum | gracile | | | slender cottongrass | | |
| Eriophorum | russeolum | rufescens | | Chamisso's cottongrass | | |
| Eriophorum | russeolum | | albidum | red cottongrass | | |
| Eriophorum | russeolum | | | red cottongrass | | |
| Eriophorum | scheuchzeri | scheuchzeri | | white cottongrass | | |
| Eriophorum | scheuchzeri | tenuifolium | | white cottongrass | | |
| Eriophorum | scheuchzeri | | | white cottongrass | | |
| Eriophorum | sp. | | | | | |
| Eriophorum | viridicarinatum | | | thinleaf cottonsedge | | |
| Erucastrum | gallicum | | | common dogmustard | | ? |
| Erysimum | cheiranthoides | altum | | wormseed wallflower | | E |
| Erysimum | cheiranthoides | | | wormseed wallflower | | E |
| Euphrasia | disjuncta | | | polar eyebright | | |
| Eurybia | sibirica | | | arctic aster | | |
| Eutrema | edwardsii | | | Edwards' mock wallflower | | |
| Festuca | altaica | | | Altai fescue | | |
| Festuca | brachyphylla | | | alpine fescue | | |
| Festuca | brevissima | | | Alaska fescue | | |
| Festuca | rubra | | | varioushair fescue | | |
| Festuca | sp. | | | | | |
| Festuca | vivipara | | | northern fescue | | |
| Festuca | viviparoidea | | | northern fescue | | |
| Fragaria | chiloensis | | | beach strawberry | | |
| Fritillaria | camschatcensis | | | Kamchatka fritillary | | |
| Galeopsis | bifida | | | splitlip hempnettle | | E |
| Galeopsis | tetrahit | | | brittlestem hempnettle | | ? |
| Galium | boreale | | | northern bedstraw | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Galium | sp. | | | | | |
| Galium | trifidum | trifidum | | threepetal bedstraw | | |
| Galium | triflorum | | | fragrant bedstraw | | |
| Gastrolychnis | apetala | | | apetalous catchfly | | |
| Gentiana | glauca | | | pale gentian | | |
| Gentiana | propinqua | | | fourpart dwarf gentian | | |
| Gentiana | sp. | | | | | |
| Gentianella | amarella | | | autumn dwarf gentian | | |
| Gentianella | propinqua | propinqua | | fourpart dwarf gentian | | |
| Geocaulon | lividum | | | false toadflax | | |
| Geranium | erianthum | | | woolly geranium | | |
| Geranium | pusillum | | | small geranium | | |
| Geum | macrophyllum | macrophyllum | | largeleaf avens | | |
| Geum | macrophyllum | | perincisum | largeleaf avens | | |
| Geum | macrophyllum | | | sea milkwort | | |
| Geum | perincisum | | | largeleaf avens | | |
| Geum | rossii | | rossii | Ross' avens | | |
| Glaux | maritima | | | sea milkwort | | |
| Glyceria | borealis | | | small floating mannagrass | | |
| Glyceria | pauciflora | | | pale false mannagrass | | |
| Glyceria | striata | | | fowl mannagrass | | |
| Gnaphalium | uliginosum | | | marsh cudweed | | E |
| Goodyera | repens | | ophioides | lesser rattlesnake plantain | | |
| Goodyera | repens | | | lesser rattlesnake plantain | | |
| Gymnocarpium | dryopteris | | | western oakfern | | |
| Hammarbya | paludosa | | | bog adder's-mouth orchid | | |
| Harrimanella | stelleriana | | | Alaska bellheather | | |
| Hedysarum | alpinum | | | alpine sweetvetch | | |
| Helianthus | annuus | | | common sunflower | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Heracleum | lanatum | | | common cowparsnip | | |
| Heracleum | maximum | | | common cowparsnip | | |
| Heuchera | glabra | | | alpine heuchera | | |
| Hieracium | aurantiacum | | | orange hawkweed | | E |
| Hieracium | caespitosum | | | meadow hawkweed | | I |
| Hieracium | piloselloides | | | tall hawkweed | | ? |
| Hieracium | triste | | | woolly hawkweed | | |
| Hieracium | umbellatum | | | narrow-leaf hawkweed | | ? |
| Hierochloe | alpina | | | alpine sweetgrass | | |
| Hierochloe | odorata | | | alpine sweetgrass | | |
| Hippuris | montana | | | mountain mare's-tail | | |
| Hippuris | peploides | | | sea-beach sandwort | | |
| Hippuris | tetraphylla | | | fourleaf mare's-tail | | |
| Hippuris | vulgaris | | | common mare's-tail | | |
| Honckenya | peploides | | | seaside sandplant | | |
| Hordeum | brachyantherum | | | meadow barley | | |
| Hordeum | jubatum | | | foxtail barley | | ? |
| Hordeum | vulgare | | | common barley | | E |
| Huperzia | chinensis | | | Chinese clubmoss | | |
| Huperzia | selago | chinense | | | | |
| Huperzia | selago | | | fir clubmoss | | |
| Impatiens | noli-tangere | | | western touch-me-not | | |
| Iris | setosa | setosa | | beachhead iris | | |
| Iris | setosa | | | beachhead iris | | |
| Isoetes | echinospora | | | spiny-spore quillwort | | |
| Isoetes | tenella | | | spiny-spore quillwort | | |
| Juncus | alpinoarticulatus | nodulosus | | northern green rush | | |
| Juncus | alpinus | | | northern green rush | | |
| Juncus | biglumis | | | twoflowered rush | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Juncus | bufonius | | | seasice rush | | |
| Juncus | castaneus | castaneus | | chestnut rush | | |
| Juncus | castaneus | leucochlamys | | chestnut rush | | |
| Juncus | castaneus | | | chestnut rush | | |
| Juncus | drummondii | | | Drummond's rush | | |
| Juncus | ensifolius | | | swordleaf rush | | |
| Juncus | mertensianus | | | Mertens' rush | | |
| Juncus | oreganus | | | Oregon rush; hairyleaf rush | | |
| Juncus | sp. | | | | | |
| Juncus | stygius | americanus | | moor rush | | |
| Juncus | supiniformis | | | hairyleaf rush | | |
| Juncus | triglumis | | | three-hulled rush | | |
| Juniperus | communis | | | common juniper | | |
| Juniperus | horizontalis | | | creeping juniper | x | |
| Lappula | squarrosa | | | European stickseed | | E |
| Lathyrus | palustris | pilosus | | marsh pea | | |
| Lathyrus | palustris | | | marsh pea | | |
| Ledum | groenlandicum | | | bog Labrador tea | | |
| Ledum | palustre | decumbens | | marsh Labrador tea | | |
| Ledum | palustre | groenlandicum | | bog Labrador tea | | |
| Lemna | minor | | | common duckweed | | |
| Leontodon | autumnalis | | | fall dandelion | | E |
| Lepidium | densiflorum | | | common pepperweed | | ? |
| Leptarrhena | pyrolifolia | | | fireleaf leptarrhena | | |
| Leucanthemum | maximum | | | max chrysanthemum | | ? |
| Leucanthemum | vulgare | | | oxeye daisy | | E |
| Leymus | mollis | mollis | | American dunegrass | | |
| Ligusticum | scoticum | hultenii | | Huten's licorice-root | | |
| Linaria | pinifolia | | | pineneedle toadflax | | ? |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Linaria | vulgaris | | | butter-and-eggs | | E |
| Linnaea | borealis | | | twinflower | | |
| Linum | perenne | | | blue flax | | ? |
| Listera | borealis | | | northern twayblade | | |
| Listera | cordata | | | heartleaf twayblade | | |
| Lloydia | serotina | | | common alplily | | |
| Loiseleuria | procumbens | | | alpine azalea | | |
| Lolium | multiflorum | | | Italian ryegrass | | E |
| Lolium | perenne | multiflorum | | Italian ryegrass | | E |
| Lolium | perenne | | | perennial ryegrass | | E |
| Luetkea | pectinata | | | partridgefoot | | |
| Lupinus | nootkatensis | | | Nootka lupine | | |
| Lupinus | polyphyllus | | | bigleaf lupine | | E |
| Luzula | arctica | latifolia | | wideleaf arctic woodrush | | |
| Luzula | arcuata | unalaschcensis | | Alaska curved woodrush | | |
| Luzula | arcuata | | | curved woodrush | | |
| Luzula | confusa | | | northern woodrush | | |
| Luzula | multiflora | multiflora | | common woodrush | | |
| Luzula | multiflora | | frigida | common woodrush | | |
| Luzula | multiflora | | | common woodrush | | |
| Luzula | multiflora complex | | | | | |
| Luzula | parviflora | | | smallflowered woodrush | | |
| Luzula | rufescens | | | rugous woodrush | | |
| Luzula | sp. | | | | | |
| Luzula | spicata | | | spiked woodrush | | |
| Luzula | tundricola | | | wideleaf arctic woodrush | | |
| Luzula | wahlenbergii | | | Wahlenberg's woodrush | | |
| Lychnis | chalcedonica | | | maltese cross | | ? |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Lycopodium | alpinum | | | alpine clubmoss | | |
| Lycopodium | annotinum | annotinum | | stiff clubmoss | | |
| Lycopodium | annotinum | | | stiff clubmoss | | |
| Lycopodium | clavatum | clavatum | | running clubmoss | | |
| Lycopodium | clavatum | monostachyon | | one-cone clubmoss | | |
| Lycopodium | complanatum | | | groundcedar | | |
| Lycopodium | lagopus | | | one-cone clubmoss | | |
| Lycopodium | sabinifolium | | sitchense | Sitka clubmoss | | |
| Lycopodium | sitchense | | | Sitka clubmoss | | |
| Lycopus | uniflorus | | | northern bugleweed | x | |
| Lysimachia | thyrsiflora | | | tufted loosestrife | | |
| Maianthemum | stellatum | | | starry false lily of the valley | x | |
| Malaxis | brachypoda | | | white adder's-mouth orchid | | |
| Malaxis | monophyllos | | brachypoda | white adder's-mouth orchid | | |
| Malaxis | paludosa | | | bog adder's-mouth orchid | x | |
| Malaxis | sp. | | | orchid | | |
| Malaxis | unifolia | | | green adder's mouth orchid | | |
| Matricaria | discoidea | | | disc mayweed; pineappleweed | | E |
| Matricaria | matricarioides | | | disc mayweed | | E |
| Matteuccia | struthiopteris | | | ostrich fern | | |
| Medicago | falcata | | | yellow alfalfa | | E |
| Medicago | sativa | falcata | | yellow alfalfa | | |
| Medicago | sativa | | | alfalfa | | E |
| Melandrium | noctiflorum | | | nightflowering silene | | E |
| Melilotus | alba | | | sweetclover | | I |
| Melilotus | officinalis | | | sweetclover | | E |
| Mentha | arvensis | | | wild mint | | |
| Menyanthes | trifoliata | | | buckbean | | |
| Menziesia | ferruginea | | | rusty mensiesia | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Mertensia | paniculata | | | tall bluebells | | |
| Mimulus | guttatus | | | seep monkeyflower | | |
| Minuartia | biflora | | | mountain stitchwort | | |
| Minuartia | macrocarpa | | | longpod stitchwort | | |
| Minuartia | obtusiloba | | | twinflower sandwort | | |
| Minuartia | rubella | | | beautiful sandwort | | |
| Mitella | pentandra | | | fivestamen miterwort | | |
| Moehringia | lateriflora | | | bluntleaf sandwort | | |
| Moneses | uniflora | | | single delight | | |
| Myosotis | alpestris | | | Asian forget-me-not | | |
| Myosotis | asiatica | | | Asian forget-me-not | | |
| Myosotis | sylvatica | | | woodland forget-me-not | | ? |
| Myrica | gale | | | sweetgale | | |
| Myriophyllum | exalbescens | | | shortspike watermilfoil | | |
| Myriophyllum | sibiricum | | | shortspike watermilfoil | | |
| Myriophyllum | sp. | | | watermilfoil | | |
| Myriophyllum | spicatum | | | Eurasian watermilfoil | | E |
| Myriophyllum | verticillatum | | | whorl-leaf watermilfoil | x | |
| Najas | flexilis | | | nodding waternymph | x | |
| Neotorularia | humilis | | | low northern-rockcress | | |
| Neslia | paniculata | | | ballmustard | | |
| Nitella | sp. | | | muskwort (alga) | | |
| Noccaea | arctica | | | arctic pennycress | | |
| Nuphar | lutea | polysepala | | Rocky Mountain pond-lily | | |
| Nuphar | polysepalum | | | Rocky Mountain pond-lily | | |
| Nymphaea | sp. | | | waterlily | | |
| Nymphaea | tetragona | | | pygmy waterlily; white waterlily | | |
| Onobrychis | viciifolia | | | sainfoin | | ? |
| Oplopanax | horridus | | | devilsclub | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Orthilia | secunda | | | sidebells wintergreen | | |
| Osmorhiza | berteroi | | | sweetcicely | | |
| Osmorhiza | depauperata | | | bluntseed sweetroot | | |
| Oxycoccus | microcarpus | | | small cranberry | | |
| Oxyria | digyna | | | alpine mountainsorrel | | |
| Oxytropis | bryophilia | | | blackish oxytrope | | |
| Oxytropis | campestris | | | field locoweed | | |
| Oxytropis | huddelsonii | | | Huddelson's locoweed | x | |
| Oxytropis | maydelliana | | | Maydell's oxytrope | | |
| Oxytropis | nigrescens | | | blackish oxytrope | | |
| Oxytropis | varians | | | field locoweed | | |
| Packera | pauciflora | | | alpine groundsel | | |
| Papaver | alboroseum | | | pale poppy | x | |
| Papaver | nudicaule | | | Icelandic poppy | | ? |
| Papaver | radicatum | radicatum | | rooted poppy | | |
| Papaver | rhoeas | | | corn poppy | | E |
| Parnassia | kotzebuei | | | Kotzebue's grass of Parnassus | | |
| Parnassia | palustris | neogaea | | marsh grass of Parnassus | | |
| Parnassia | palustris | | tenuis | marsh grass of Parnassus | | |
| Parnassia | palustris | | | marsh grass of Parnassus | | |
| Pedicularis | capitata | | | capitate lousewort | | |
| Pedicularis | kanei | | | woolly lousewort | | |
| Pedicularis | labradorica | | | Labrador lousewort | | |
| Pedicularis | lanata | | | woolly lousewort | | |
| Pedicularis | langsdorfii | | | Langsdorf's lousewort | | |
| Pedicularis | lapponica | | | Lapland lousewort | | |
| Pedicularis | macrodonta | | | muskeg lousewort | x | |
| Pedicularis | sp. | | | | | |
| Pedicularis | verticillata | | | whorled lousewort | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Pentaphylloides | floribunda | | | shrubby cinquefoil | | |
| Petasites | frigidus | sagittatus | | arrowleaf sweet coltsfoot | | |
| Petasites | frigidus | | | arctic sweet coltsfoot | | |
| Petasites | sagittatus | | | arrowleaf sweet coltsfoot | | |
| Phalaris | arundinacea | | | reed canarygrass | | I |
| Phalaris | canariensis | | | canarygrass | | E |
| Phegopteris | connectilis | | | long beechfern | | |
| Phleum | alpinum | | | alpine timothy | | |
| Phleum | commutatum | | americanum | alpine timothy | | |
| Phleum | pratense | | | timothy | | E |
| Phleum | sp. | | | | | |
| Phlox | sibirica | | | Siberian phlox | | |
| Phyllodoce | aleutica | | | Aleutian mountainheath | | |
| Picea | glauca | | | white spruce | | |
| Picea | lutzii | | | | | |
| Picea | mariana | | | black spruce | | |
| Picea | sp. | | | | | |
| Pinguicula | villosa | | | hairy butterwort | | |
| Plagiobothrys | scouleri | | hispidulus | sleeping popcornflower | | |
| Plantago | major | | major | common plantain | | E |
| Plantago | maritima | juncoides | | goose tongue | | |
| Platanthera | dilatata | | | scentbottle | | |
| Platanthera | hyperborea | | hyperborea | northern green orchid | | |
| Platanthera | hyperborea | | viridiflora | slender bog orchid | | |
| Platanthera | hyperborea | | | northern green orchid | | |
| Platanthera | obtusata | | | bluntleaved orchid | | |
| Poa | alpigena | | | Kentucky bluegrass | | |
| Poa | alpina | | | alpine bluegrass | | |
| Poa | annua | | | annual bluegrass | | E |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Poa | arctica | artica | | arctic bluegrass | | |
| Poa | arctica | | | arctic bluegrass | | |
| Poa | compressa | | | Canada bluegrass | | E |
| Poa | eminens | | | largeflower speargrass | | |
| Poa | glauca | | | glaucous bluegrass | | |
| Poa | palustris | | | fowl blugrass | | |
| Poa | paucispicula | | | Alaska bluegrass | | |
| Poa | pratensis | alpigena | | Kentucky bluegrass | | |
| Poa | pratensis | irrigata | | spreading bluegrass | | E |
| Poa | pratensis | pratensis | | Kentucky bluegrass | | E |
| Poa | pratensis | | | Kentucky bluegrass | | NI |
| Poa | pseudoabbreviata | | | shortcoal bluegrass | | |
| Poa | sp | | | | | |
| Poa | trivialis | | | rough bluegrass | | E |
| Polemonium | acutiflorum | | | tall Jacob's-ladder | | |
| Polemonium | pulcherrimum | | | Jacob's-ladder | | |
| Polygonum | amphibium | | | water knotweed | | |
| Polygonum | aviculare | | | prostrate knotweed | | E |
| Polygonum | convolvulus | | | black bindweed | | |
| Polygonum | fowleri | | | Fowler's knotweed | | |
| Polygonum | lapathifolium | | | curlytop knotweed | | E |
| Polygonum | pennsylvanicum | oneillii | | Pennsylvania smartweed | | |
| Polygonum | persicaria | | | lady's-thumb | | E |
| Polygonum | viviparum | | | alpine bistort | | |
| Populus | balsamifera | balsamifera | | balsam poplar | | |
| Populus | balsamifera | trichocarpa | | black cottonwood | | |
| Populus | balsamifera | | | balsam poplar | | |
| Populus | tremuloides | | | quaking aspen | | |
| Populus | trichocarpa | | | black cottonwood | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Potamogeton | alpinus | | | alpine pondweed | | |
| Potamogeton | epihydrus | | | ribbonleaf pondweed | | |
| Potamogeton | filiformis | borealis | | filiform pondweed; fineleaf pondweed | | |
| Potamogeton | filiformis | | | fineleaf pondweed | | |
| Potamogeton | gramineus | | | variableleaf pondweed | | |
| Potamogeton | natans | | | floating pondweed | | |
| Potamogeton | pectinatus | | | sago pondweed | | |
| Potamogeton | perfoliatus | richardsonii | | Richardson's pondweed | | |
| Potamogeton | praelongus | | | whitestem pondweed | | |
| Potamogeton | pusillus | | | small pondweed | | |
| Potamogeton | richardsonii | | | Richardson's pondweed | | |
| Potamogeton | sp. | | | pondweed | | |
| Potamogeton | vaginatus | | | sheathed pondweed | | |
| Potamogeton | zosteriformis | | | flatstem pondweed | | |
| Potentilla | anserina | | | silverweed cinquefoil | | |
| Potentilla | bimundorum | | | staghorn cinquefoil | | |
| Potentilla | diversifolia | | | varileaf cinquefolia | | |
| Potentilla | egedii | grandis | | Pacific silverweed | | |
| Potentilla | fruticosa | | | shrubby cinquefoil | | |
| Potentilla | hyparctica | | | arctic cinquefolia | | |
| Potentilla | multifida | | | staghorn cinquefoil | | |
| Potentilla | nana | | | arctic cinquefolia | | |
| Potentilla | norvegica | | | Norwegian cinquefoil | | |
| Potentilla | uniflora | | | oneflower cinquefoil | | |
| Primula | cuneifolia | saxifragifolia | | wedgeleaf primrose | | |
| Prunus | maackii | | | Amur chokecherry | | ? |
| Prunus | padus | | | European bird cherry | | E |
| Puccinellia | grandis | | | Nutall's alkaligrass | | |
| Puccinellia | nutkaensis | | | Nutall's alkaligrass | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Puccinellia | phryganodes | | | creeping alkaligrass | | |
| Pyrola | asarifolia | | asarifolia | liverleaf wintergreen | | |
| Pyrola | asarifolia | | purpurea | liverleaf wintergreen | | |
| Pyrola | asarifolia | | | liverleaf wintergreen | | |
| Pyrola | chlorantha | | | greenflowered wintergreen | | |
| Pyrola | grandiflora | | | largeflowered wintergreen | | |
| Pyrola | minor | | | snowline wintergreen | | |
| Pyrola | secunda | obtusa | | one-sided wintergreen; sidebells wintergreen | | |
| Pyrola | sp. | | | | | |
| Ranunculus | abortivus | | | littleleaf buttercup | | |
| Ranunculus | cymbalaria | | | alkali buttercup | | |
| Ranunculus | eschscholtzii | | | Eschscholtz's buttercup | | |
| Ranunculus | gmelini | gmelini | | yellow water crowfoot | | |
| Ranunculus | gmelinii | | | Gmelin's buttercup | | |
| Ranunculus | hyperboreus | | | high northern buttercup | | |
| Ranunculus | lapponicus | | | Lapland buttercup | | |
| Ranunculus | macounii | | | Macoun's buttercup | | |
| Ranunculus | nivalis | | | snow buttercup | | |
| Ranunculus | occidentalis | | | western buttercup | | |
| Ranunculus | pygmaeus | | | pygmy buttercup | | |
| Ranunculus | repens | | | creeping buttercup | | E |
| Ranunculus | sceleratus | | multifidus | cursed buttercup | | |
| Ranunculus | sp. | | | | | |
| Ranunculus | trichophyllus | | trichophyllus | threadleaf crowfoot | | |
| Ranunculus | trichophyllus | | | threadleaf crowfoot | | |
| Raphanus | sativus | | | cultivated radish | | E |
| Rhinanthus | minor | borealis | | arctic rattlebox; little yellow rattle | | |
| Rhinanthus | minor | | | little yellow rattle | | |
| Rhodiola | integrifolia | | | ledge stonecrop | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Rhynchospora | alba | | | white beaksedge | | |
| Ribes | aureum | | | golden currant | | ? |
| Ribes | glandulosum | | | skunk currant | | |
| Ribes | hudsonianum | | | northern black currant | | |
| Ribes | lacustre | | | prickly currant | | |
| Ribes | laxiflorum | | | trailing black currant | | |
| Ribes | sp. | | | | | |
| Ribes | triste | | | red currant | | |
| Romanzoffia | sitchensis | | | Sitka mistmaiden | | |
| Rorippa | barbareifolia | | | hoary yellowcress | | |
| Rorippa | hispida | | | hispid yellowcress | | |
| Rorippa | palustris | hispida | | hispid yellowcress | | |
| Rorippa | palustris | palustris | | bog yellowcress | | |
| Rorippa | sp. | | | | | |
| Rorippa | sylvestris | | | creeping yellowcress | | ? |
| Rosa | acicularis | | | prickly rose | | |
| Rosa | nutkana | | | Nootka rose | | |
| Rubus | arcticus | acaulis | | dwarf raspberry | | |
| Rubus | arcticus | stellatus | | arctic blackberry | | |
| Rubus | arcticus | | | arctic blackberry | | |
| Rubus | chamaemorus | | | cloudberry | | |
| Rubus | idaeus | melanolasius | | grayleaf red raspberry | | |
| Rubus | idaeus | | | American red raspberry | | |
| Rubus | pedatus | | | strawberryleaf raspberry | | |
| Rubus | stellatus | | | arctic blackberry | | |
| Rumex | acetosella | | | garden sorrel | | E |
| Rumex | aquaticus | | fenestratus | western dock | | |
| Rumex | arcticus | | | arctic dock | | |
| Rumex | crispus | | | curly dock | | E |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Rumex | fenestratus | | | western dock | | |
| Rumex | salicifolius | | transitorius | willow dock | | |
| Rumex | sp. | | | | | |
| Rumex | spiralis | | | winged dock | | |
| Rumex | transitorius | | | willow dock | | |
| Ruppia | cirrhosa | | | spiral ditchgrass | | |
| Ruppia | spiralis | | | spiral ditchgrass | | |
| Sagina | nivalis | | | snow pearlwort | | |
| Sagina | saginoides | | | arctic pearlwort | | |
| Salicornia | europaea | | | slender grasswort | ? | |
| Salicornia | maritima | | | slender grasswort | | |
| Salix | alaxensis | | | flatleaf willow | | |
| Salix | arctica | | | arctic willow | | |
| Salix | arctophila | | | northern willow | | |
| Salix | barclayi | | | Barclay's willow | | |
| Salix | bebbiana | | | Bebb willow | | |
| Salix | brachycarpa | niphoclada | | barrenground willow | | |
| Salix | commutata | | | undergreen willow | | |
| Salix | fuscescens | | | Alaska bog willow | | |
| Salix | glauca | | | grayleaf willow | | |
| Salix | lanata | | | lanate willow | | |
| Salix | lasiandra | | | low blueberry willow; Pacific willow | | |
| Salix | lucida | lasiandra | | Pacific willow | | |
| Salix | myrtillifolia | | | blueberry willow | | |
| Salix | niphoclada | | | barrenground willow | | |
| Salix | ovalifolia | | | oval-leaf willow | | |
| Salix | phlebophylla | | | skeletonleaf willow | | |
| Salix | planifolia | pulchra | | tealeaf willow | | |
| Salix | planifolia | | | diamondleaf willow | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Salix | polaris | | | polar willow | | |
| Salix | pulchra | | | tealeaf willow | | |
| Salix | reticulata | | | netleaf willow | | |
| Salix | richardsonii | | | Richardson's willow | | |
| Salix | rotundifolia | | | least willow | | |
| Salix | scouleriana | | | Scouler's willow | | |
| Salix | sitchensis | | | Sitka willow | | |
| Salix | sp. | | | | | |
| Sambucus | racemosa | | | red elderberry | | |
| Sanguisorba | canadensis | | | Candian burnet | | |
| Sanguisorba | menziesii | | | Menzies burnet | | |
| Sanguisorba | stipulata | | | Candian burnet | | |
| Saxifraga | adscendens | | | wedgeleaf saxifrage | | |
| Saxifraga | bronchialis | | | yellowdot saxifrage | | |
| Saxifraga | caespitosa | | | tufted alpine saxifrage | | |
| Saxifraga | calycina | | | | | |
| Saxifraga | cernua | | | nodding saxifrage | | |
| Saxifraga | eschscholtzii | | | ciliate saxifrage | | |
| Saxifraga | flagellaris | | | whiplash saxifrage | | |
| Saxifraga | foliolosa | | | leafysteam saxifrage | | |
| Saxifraga | hirculus | | | yellow marsh saxifrage | | |
| Saxifraga | lyalii | | | redstem saxifrage | | |
| Saxifraga | lyallii | hultenii | | Hulten's saxifrage | | |
| Saxifraga | nelsoniana | | | heartleaf saxifrage | | |
| Saxifraga | nivalis | | | alpine saxifrage | | |
| Saxifraga | oppositifolia | | | purple mountain saxifrage | | |
| Saxifraga | razshivinii | | | Alaska saxifrage | | |
| Saxifraga | reflexa | | | reflexed saxifrage | | |
| Saxifraga | rivularis | | | weak saxifrage | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Saxifraga | serpyllifolia | | | thymeleaf saxifrage | | |
| Saxifraga | tricuspidata | | | three toothed saxifrage | | |
| Scheuchzeria | palustris | | | rannoch-rush; pod grass | | |
| Schizachne | purpurascens | | | false melic; purple oat | x | |
| Schoenoplectus | maritimus | | | cosmopolitan bulrush; saltmarsh bulrush | | |
| Schoenoplectus | tabernaemontani | | | softstem bulrush | | |
| Scirpus | maritimus | | | cosmopolitan bulrush; saltmarsh bulrush | | |
| Scirpus | microcarpus | | | panicled bulrush | | |
| Scirpus | paludosus | | | cosmopolitan bulrush; saltmarsh bulrush | | |
| Scirpus | validus | | | softstem bulrush | | |
| Scutellaria | galericulata | | | marsh skullcap; hooded skullcap | | |
| Selaginella | selaginoides | | | club spikemoss; low spikemoss | | |
| Senecio | congestus | | | mastodon flower; marsh fleabane | | |
| Senecio | lugens | | | small blacktip; black-tip groundsel | | |
| Senecio | pauciflorus | | | alpine groundsel; few-flowered ragwort | | |
| Senecio | triangularis | | | arrowleaf ragwort; arrow-leaf groundsel | | |
| Senecio | vulgaris | | | old-man-in-the-spring | | E |
| Shepherdia | canadensis | | | russet buffaloberry; Canada buffaloberry | | |
| Sibbaldia | procumbens | | | creeping sibbaldia; Arizona cinquefoil | | |
| Silene | acaulis | | | moss campion | | |
| Silene | dioica | | | red catchfly | | ? |
| Silene | latifolia | alba | | bladder campion | | E |
| Silene | noctiflora | | | nightflowering silene; night-flowering catchfly | | E |
| Silene | uralensis | uralensis | | apetalous catchfly | | |
| Sisymbrium | altissimum | | | tall tumblemustard | | E |
| Smilacina | stellata | | | starry false lily of the valley; starflower Solomon's-plume | | |
| Solidago | canadensis | | lepida | Canada goldenrod | | |
| Solidago | lepida | | | Canada goldenrod | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Solidago | multiradiata | | | Rocky Mountain goldenrod | | |
| Solidago | sp. | | | | | |
| Sonchus | arvensis | uliginosus | | field sowthistle | | E |
| Sonchus | arvensis | | | field sowthistle; perennial sowthistle | | AK noxious |
| Sorbaria | sorbifolia | | | false spirea | | ? |
| Sorbus | aucuparia | | | European mountain ash | | E |
| Sorbus | scopulina | | | Green's mountain ash | | |
| Sparganium | angustifolium | | | narrowleaf bur-reed | | |
| Sparganium | hyperboreum | | | northern bur-reed | | |
| Sparganium | minimum | | | small bur-reed | | |
| Sparganium | natans | | | small bur-reed | | |
| Sparganium | sp. | | | bur-reed | | |
| Spergula | arvensis | | | corn spurry | | E |
| Spergularia | canadensis | | | Canadian sandspurry | | |
| Spergularia | rubra | | | red sandspurry | | E |
| Spiraea | beauverdiana | | | beauverd spirea; Steven's spiraea | | |
| Spiraea | stevenii | | | Steven's spiraea | | |
| Spiranthes | romanzoffiana | | | hooded lady's tresses | | |
| Stellaria | borealis | sitchana | | Sitka starwort | | |
| Stellaria | borealis | | | boreal starwort | | |
| Stellaria | calycantha | | | northern starwort | | |
| Stellaria | crassifolia | | | fleshy starwort | | |
| Stellaria | humifusa | | | saltmarsh starwort | | |
| Stellaria | laeta | | | chickweed, starwort | | |
| Stellaria | longifolia | | | longleaf starwort | | |
| Stellaria | longipipes | | | longstalk starwort | | |
| Stellaria | media | | | common chickweed | | E |
| Stellaria | monantha | | | chickweed, starwort | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Stellaria | sp. | | | | | |
| Stellaria | umbellata | | | umbrella starwort | x | |
| Streptopus | amplexifolius | | | claspleaf twistedstalk | | |
| Stuckenia | filiformis | filiformis | | fineleaf pondweed | | |
| Stuckenia | pectinatus | | | sago pondweed | | |
| Stuckenia | sp. | | | pondweed | | |
| Stuckenia | vaginata | | | sheathed pondweed | | |
| Stuckenia | vaginatus | | | sheathed pondweed | | |
| Swertia | perennis | | | felwort | | |
| Swida | stolonifera | | | redosier dogwood | | |
| Symphyotrichum | boreale | | | northern bog aster | | |
| Tanacetum | vulgare | | | common tansy | | E |
| Taraxacum | alaskanum | | | northern dandelion | | |
| Taraxacum | carneocoloratum | | | fleshy dandelion | x | |
| Taraxacum | officinale | ceratophorum | | common dandelion | | |
| Taraxacum | officinale | officinale | | common dandelion | | E |
| Taraxacum | officinale | | | common dandelion | | NI |
| Taraxacum | phymatocarpum | | | northern dandelion | | |
| Taraxacum | sp. | | | dandelion | | |
| Thalictrum | alpinum | | | alpine meadow-rue | | |
| Thalictrum | sparsiflorum | | | fewflower meadow-rue | | |
| Thelypteris | phegopteris | | | long beechfern | | |
| Thlaspi | arcticum | | | arctic pennycress | x | |
| Thlaspi | arvense | | | pennycress | | E |
| Tilia | cordata | | | littleleaf linden | | ? |
| Tofieldia | coccinea | | | northern asphodel | | |
| Tofieldia | glutinosa | | | sticky tofieldia | | |
| Tofieldia | pusilla | | | Scotch false asphodel | | |
| Triantha | glutinosa | | | sticky tofieldia | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Trichophorum | alpinum | | | alpine bulrush | | |
| Trichophorum | caespitosum | | | tufted bulrush | | |
| Trientalis | europaea | arctica | | arctic starflower | | |
| Trientalis | europaea | | | arctic starflower | | |
| Trifolium | aureum | | | golden clover | | E |
| Trifolium | hybridum | | | alsike clover | | E |
| Trifolium | pratense | | | red clover | | E |
| Trifolium | repens | | | white clover | | E |
| Trifolium | sp. | | | | | |
| Triglochin | maritimum | | | seaside arrowgrass | | |
| Triglochin | palustris | | | marsh arrowgrass | | |
| Tripleurospermum | inordorum | | | scentless false mayweed | | E |
| Tripleurospermum | perforatum | | | scentless false mayweed | | E |
| Trisetum | spicatum | alaskanum | | spike trisetum | | |
| Trisetum | spicatum | molle | | spike trisetum | | |
| Trisetum | spicatum | | | spike trisetum | | |
| Triticum | aestivum | | | common wheat | | E |
| Tsuga | heterphylla | | | western hemlock | | |
| Tsuga | mertensiana | | | mountain hemlock | | |
| Typha | latifolia | | | broadleaf cattail | | |
| Urtica | dioica | gracilis | | California nettle | | |
| Utricularia | intermedia | | | flatleaf bladderwort | | |
| Utricularia | macrorhiza | | | common bladderwort | | |
| Utricularia | minor | | | lesser bladderwort | | |
| Utricularia | sp. | | | bladderwort | | |
| Utricularia | vulgaris | macrorhiza | | common bladderwort | | |
| Vaccinium | caespitosum | | | dwarf bilberry | | |
| Vaccinium | ovalifolium | | | oval-leaf blueberry | | |
| Vaccinium | oxycoccos | | | small cranberry | | |

| GENUS | SPECIES | SUBSPECIES | VARIETY | Common Name | Rare | Exotic |
|---|---|---|---|---|---|---|
| Vaccinium | uliginosum | | | bog blueberry | | |
| Vaccinium | vitis-idaea | | | lingonberry | | |
| Vahlodea | atropurpurea | paramushirensis | | mountain hairgrass | | |
| Vahlodea | atropurpurea | | | mountain hairgrass | | |
| Valeriana | capitata | | | capitate valerian | | |
| Valeriana | sitchensis | | | Sitka valerian | | |
| Valeriana | sitchensis | | | Sitka valerian; marsh valerian | | |
| Veratrum | viride | | | green false hellebore | | |
| Verbascum | thapsus | | | common mullein | | E |
| Veronica | americana | | | American speedwell | | |
| Veronica | peregrina | | | neckweed | | E |
| Veronica | wormskjoldii | | | American alpine speedwell | | |
| Viburnum | edule | | | squashberry | | |
| Vicia | cracca | | | bird vetch, dog pea, tufted vetch | | I |
| Viola | epipsila | | | dwarf marsh violet | | |
| Viola | langsdorffii | | | Aleutian violet | | |
| Viola | renifolia | | brainerdii | white violet | | |
| Viola | renifolia | | | white violet | | |
| Viola | selkirkii | | | Selkirk's violet | x | |
| Viola | sp. | | | | | |
| Viola | tricolor | | | johnny jumpup | | ? |
| Woodsia | ilvensis | | | rusty woodsia | | |
| Zannichellia | palustris | | | horned pondweed | x | |
| Zigadenus | elegans | | | mountain deathcamas | | |
| Zostera | sp. | | | eelgrass | | |

Notes:
E = Exotic (as identified through various sources such as NatureServe (NatureServe.org) and consultant reports)
I = Introduced (as identified in the USDA NRCS Plants Database (http://plants.usda.gov/)

NI = Some subspecies or varieties are native while others are introduced (as identified in the USDA NRCS Plants Database http://plants.usda.gov/
I? = "Probably introduced" (as identified in the USDA NRCS Plants Database http://plants.usda.gov/
? = Needs further study; some sources say introduced, others say native
AK Noxious = on the Alaska Noxious Weed List and managed under specific regulations http://www.plants.alaska.gov/noxious-weeds.php
Rare = on the Alaska Natural Heritage Program (most current is 2008 and is located at http://aknhp.uaa.alaska.edu/botany/rare-plants-species-lists/

## Vegetation Inventory

An extensive initial survey of EAFB vegetation and vegetation types was conducted as part of the 1982-1983 biological survey (Elmendorf AFB 1994). Vegetation types were mapped from aerial photography and ground-truthed. Sample plots were established, and trees, shrubs, and herbs were identified. Plant cover and abundance were described, and physical characteristics of the site, such as site and soil moisture, presence and depth of peat and organic layers, presence of fire scars, and level of disturbance, were recorded by written and photographic record. A low intensity timber survey was also conducted as part of this survey. All photos, data, and collected material are on file at the USFWS Herbarium in Anchorage. A re-inventory of vegetation on EAFB was conducted in 1999 (Lipkin and Tande 2001), and an associated project established permanent long-term vegetation monitoring plots.

A FRA-wide floristic inventory was performed in 1994 (Lichvar and Raccine 1995). FRA was mapped by category: ecotypes (1:50,000 scale), ecosections (1:100,000), and ecodistricts (1:500,000). Ecotypes delineate areas with homogeneous topography, terrain, soil, surface-form, hydrology, and vegetation. Ecosections have homogeneous geomorphic features, and recurring patterns of water, soils and vegetation. More than one vegetation type can be represented, but they are usually related as a successional sequence. Ecodistricts are broader areas with similar geology, geomorphology, and hydrology and are similar to physiographic units. FRA has 46 ecotypes (Jorgenson *et al*. 2003).

Further FRA vegetation inventory efforts were accomplished by conducting comprehensive "fence line-to-fence line" flora and vegetation community planning level surveys. Vegetation monitoring is accomplished through the ITAM RTLA program. Baseline floristic surveys were conducted to identify all vegetative species that occur on FRA. This was initiated in 1994 with 120 allocated core plots. Ninety-four plots were inventoried that year, and remaining plots (26) were inventoried in 1995. All core plots were inventoried again in 1996 (U.S. Army, Alaska 1998). This survey was designed to be updated at least once every 10 years to determine trends in floristic biodiversity and to improve the quality of the floristic database.

Beginning in 1998 the program was modified to determine training land status and capability for supporting military training (U.S. Army, Alaska 1998). RTLA on JBER-Richardson is a long-term monitoring program used to evaluate the ecological health of training areas and helps prioritize areas for Land Rehabilitation and Management actions.

FRA also conducted a vegetation community survey. This survey was designed to be updated at least once every 10 years. Vegetation surveys have been conducted as part of an ecological land classification that synthesizes results from integrated resources studies to map ecologically sensitive portions of the landscape to facilitate land management and minimize impacts to ecosystems. This was designed to emphasize three aspects of ecosystem management: the sensitivity and recovery of ecosystems to disturbance, permafrost distribution and relative stability, and the value of wildlife habitats.

### Vegetation Research Results

*A Floristic Survey of Vascular Plant Species on Elmendorf Air Force Base, Alaska* (Lipkin and Tande 2001).

The goal of this inventory was to identify rare vascular plants, document any species not previously identified, and secondarily, identify non-native plants in selected disturbed areas. This single season survey added 99 species to the EAFB plant list bringing the total to 301 taxa. Among those, five were considered rare (S3) by the Alaska Natural Heritage Program State Ranking. Rare plants were found in the Kettle Lake fens (2), lake shores of Sixmile and Hillberg lakes (1), and the salt marsh adjacent to the

Port of Anchorage (2). A very limited survey of non-native species produced 18 taxa. Non-native plants were not seen to be invading undisturbed habitats and were concentrated within a few meters of disturbed sites.

*Establishment and Characterization of Long-term Monitoring Sites on Elmendorf Air Force Base, Alaska* (Tande *et al*. 2001a).

The goal of this 1999 study was to develop vegetation monitoring methodology by establishing permanent plots with applications to other natural resources; implement, test, and refine methodology; provide vegetative baseline data for plots; and secondarily, establish electronic data archival and retrieval including GIS layers for GeoBase. The project established 30 plots, collected baseline site description data for 24 plots, and established a Long-term Monitoring Manual. Plots represented six major vegetation types; 12 sites are located within dominant old-growth white spruce/birch mixed forest.

*Long Term Vegetation Monitoring Plots: Revisit of 5 Plots on Elmendorf Air Force Base* (Klein *et al*. 2008).

In 2008 five of EAFB's 24 long-term vegetation monitoring plots, which were established and initially measured in 1999, were revisited and analyzed. The objective was to make comparison of the vegetative community structure between years, identify notable changes in structure, and identify vegetation community health issues. The primary observation was old growth forest plots were "shrubbier" in 2008 than in 1999, and most spruce bark beetle-killed trees prevalent in 1999 were no longer standing. Canopy coverage in the shrub layer increased in beetle-killed plots, probably a result of reduced canopy of white spruce. The black spruce forest plot sampled had a dramatic decrease in dwarf shrubs, and the birch forest plot had an increase in confers and decrease in deciduous trees. Infestations of highly invasive orange hawkweed were noted north of 46th Street. Revisited plots represented only three of five dominant vegetation communities on EAFB. Researchers recommended more samples to include the lesser vegetation communities and the remaining 25 plots should be sampled within the next five years.

*Long Term Monitoring Protocols: Vegetation, Birds, and Small Mammals on JBER, Alaska.* (HDR Alaska, Inc. 2013)

Prior to joint-basing, the above long-term monitoring projects (Tande 2001a and Klein 2008) differed from how the Army was collecting similar data. The Army employed a system developed by the US Forest Service entitled Forest Inventory and Analysis (FIA). The objective of this project was to unify the two systems, maintain historically collected data to the extent practicle, and streamline the data collection by adopting one system. Individual goals of this project were to eliminate redundant plots, emplace plots in ecotypes not adequately covered, and provide for a repeatable sample protocol. Data collection cards were updated to current available technologic capabilities and a permanent, repeatable sampling system was developed that will allow the collection of vegetative, avian, and mammalian survey data at one centralized point. In all, 122 points were identified and 12 plots have been marked and sampled for vegetative data.

*Identification and Characterization of Disturbed Alder Sites on Elmendorf Air Force Base, Alaska* (Tande *et al*. 2001b).

The goal of this study was to define differences between alder on disturbed and undisturbed natural sites and map the distribution for GeoBase. The investigators found three species of alder with the dominant species being Sitka alder (*Alnus sinuata*) and thin-leaf alder (*Alnus tenuifolia*). They found that species composition alone did not define disturbed and undisturbed alder sites. Ultimately aerial photo

assessments that helped identify sharp polygon borders best indicated man-made origins. The distributions of disturbed and undisturbed alder communities were mapped.

*Elmendorf Air Force Base Invasive Terrestrial Plant Species Survey Technical Report and Management Work Plan* (HDR Alaska, Inc. 2007).

The goal of this study was to develop a current inventory of invasive vascular plants present on EAFB, develop a map of invasive species distribution, clarify risk from each species, and propose management/control strategies. During June and July 2007, field crews conducted surveys of EAFB to identify presence, distribution, and density of terrestrial invasive plant species. The effort was two-fold; conduct a search for flowering European bird cherry (*Prunus padus*) during June along drivable routes near riparian or wetland areas, and then visit predetermined sampling sites in July, while recording infestations along travel routes to those sites. The later survey focused on previously disturbed areas and adjacent natural areas. The overall survey sampled 1,438 acres at 94 sites and 31.2 miles of roads and trails.

The survey produced 67 invasive plant species, of which only 29 had been previously recorded for EAFB. Eleven species were previously unrecorded for the Anchorage area. Three species were previously unrecorded for southcentral Alaska (HDR Alaska, Inc. 2007).

Invasive species management recommendations were prioritized by comparing invasiveness rank developed by the Alaska Natural Heritage Program to frequency of occurrence. Highest priority species for local eradication had high invasiveness rank and low frequency of occurrence. First priorities for local eradication were reed canary grass (*Phalaris arundinaceae*), white sweet clover (*Mellotus alba*), orange hawkweed (*Hieracium aurantiacum*), cheatgrass (*Bromus tectorum*), bird vetch (*Vicia cracca)*, Canada thistle (*Cirsium arvense)*, and European bird cherry. Highest priority species for containment were found in "hot spots." First priorities for containment were species with medium to high invasiveness rank and high frequency and included the following: dandelion (*Taraxicum officinale*), white clover (*Trifolium repens*), alsike clover (*Trifolium hybridum*), annual hawksbeard (*Crepis tectorum*), quackgrass (*Elymus repens*), smooth brome (*Bromus inermis)*, and Kentucky bluegrass (*Poa pratensis* ssp. *pratensis)*. Best management practices to avoid introduction or spread of invasive plants specific to EAFB are listed and categorized into Construction and Maintenance, Seeding and Planting, Horses, and Recreational Vehicles in the report.

*Elmendorf Air Force Base Aquatic Invasive Species Survey Report and Management Work Plan* (HDR Alaska, Inc. 2008).

The goal of this study was to develop a current inventory of aquatic invasive species of vascular plants and mollusks present in EAFB lakes and streams, clarify risk from each species, and propose management/control strategies. During July 2008, field crews conducted surveys of EAFB to identify presence and distribution of aquatic invasive plant and mollusk species. The overall survey sampled 34 sites at 12 water bodies, including Ship Creek. Sample sites were prioritized for higher risk sites and higher risk water bodies. The survey found no invasive plant or mollusk species. Invasive species management recommendations and best management practices to avoid introduction or spread of aquatic invasive species to include prevention, monitoring, and education are included in the report (HDR Alaska, Inc. 2008).

*Invasive Plant Species Risk Assessment and Management Plan, JBER-Richardson, Alaska* (HDR Alaska, Inc. 2012)

The goal of this study was to assess the risk of invasive species to all of former Ft. Richardson. The resulting survey and management plan was conducted and analyzed similar to the Elmendorf study

completed in 2007 (above). Results of this study have given managers more comprehensive knowledge of the threat to a now joint base from invasive species. This study has led to the development of a joint management plan (draft) and has allowed JBER NEPA experts to pursue an in-house EA for management of invasive species.

*Invasive Plant Species Management Plan for JBER, Alaska* (CEIEC Staff)
This document (IPSMP) will integrate all invasive species studies conducted on either Elmendorf or Ft Richardson in recent years. The resulting document will exhibit all known invasive species, locations, recommended management actions, and will track progress in years to come. The IPSMP is currently in draft form and is being completed in-house.

*Measurements of BASH Compatible Vegetation Survey, Elmendorf Air Force Base* (Anderson *et al* 2007). The goal of this study was to collect vegetation measurements of shrub habitat that would deter waterfowl, raptor, and gulls and that would meet moose habitat compensatory obligations from construction and fencing activities. The shrub habitat standards have been applied to those non- cantonment fields outside the newly installed airfield security fence.

**BASH Compatible Vegetation Study**

Environmental Compliance Consultants was contracted to document the compatibility of managing manipulated land areas near the EAFB airfield for moose browse and reducing BASH risk (Anderson *et al*. 2007). The overriding assumption was based on an intuitive, yet unmeasured, behavioral model that predicts reduced attraction by large birds as the canopy coverage provided by shrubs increases. To quantify this relationship, the study attempted to measure value to moose of vegetative structure and composition through quantifying percent moose use of current annual growth, shrub height, canopy coverage, and number and species of shrubs. The measure of BASH risk was based primarily on the presumption that as percent canopy coverage increased, the BASH risk decreased.

During early summer 2006, field personnel sampled a total of 220 2x5-meter plots in nine pre-designated sample areas, representing 1,596.7 hectares (3,945.5 acres) under the air traffic pattern for the airfield. A measure of correlation found an expected strong (0.767 correlation coefficient) relationship between average height and canopy coverage and a moderate correlation (0.616) between canopy coverage and current annual growth use. The later relation provided the strength for ranking areas for vegetative manipulation, primarily to reduce BASH risk but to also enhance moose habitat.

The FRA antenna field ranked highest for moose value and lowest for BASH risk. The antenna field was followed by two Alaska Railroad mitigation sites and remnants of enhanced moose habitat in the Moose Crossing housing area.

Areas designated as highest priority for shrub habitat enhancement are two areas in/near the clear zone at the departure of Runway 06, followed by the approach zone to Runway 34. The northern side of the approach zone for Runway 06 would follow in ranking for vegetation manipulation. The landfill area south of the Defense Reutilization and Marketing Office ranked highest for BASH risk, based on low percentage of canopy coverage; however, enhancement activities during 2005-2008 met manipulation requirements.

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# Appendix F. Fauna of Joint Base Elmendorf-Richardson

**MAMMALS**

| Common Name | Scientific Name |
|---|---|
| Bat, Little Brown | *Myotis lucifugus* |
| Bear, Black | *Ursus americanus* |
| Bear, Brown | *Ursus arctos* |
| Beaver | *Castor canadensis* |
| Coyote | *Canis latrans* |
| Fox, Red | *Vulpes vulpes* |
| Hare, Snowshoe | *Lepus americanus* |
| Lemming, Northern Bog | *Synaptomys borealis* |
| Lynx | *Lynx canadensis* |
| Marmot, Hoary | *Marmota caligata* |
| Marten | *Martes americana* |
| Mink | *Mustela vison* |
| Moose | *Alces alces* |
| Mouse, House * | *Mus musculus* |
| Mouse, Meadow Jumping | *Zapus hudsonius* |
| Muskrat | *Ondatra zibethica* |
| Otter, River | *Lutra canadensis* |
| Pika, Collared | *Ochotona collaris* |
| Porcupine | *Erethizon dorsatum* |
| Porpoise, Harbor | *Phocoena phocoena* |
| Seal, Harbor | *Phoca vitulina* |
| Sheep, Dall | *Ovis dalli* |
| Shrew, Dusky | *Sorex monticola* |
| Shrew, Masked | *Sorex cenereus* |
| Shrew, Northern Water | *Sorex palustris* |
| Shrew, Pigmy | *Microorex hoyi* |
| Shrew, Tundra | *Sorex arcticus* |
| Shrew, Vagrant | *Sorex vagrans* |
| Squirrel, Arctic Ground | *Spermophilus parryi* |
| Squirrel, Northern Flying ? | *Glaucomys brinus* |
| Squirrel, Red | *Tamiasciurus hudsonicus* |
| Vole, Alaska (singing) | *Microtus miurus* |
| Vole, Meadow | *Microtus pennsylvanicus* |
| Vole, Northern Redback | *Clethrionomys rutilus* |
| Vole, Tundra | *Microtus oeconomus* |
| Weasel, Least | *Mustela nivalis* |
| Weasel, Short-tailed | *Mustela erminea* |
| Whale, Beluga | *Delphinapterus leucas* |
| Wolf, Gray | *Canis lupus* |
| Wolverine | *Gulo gulo* |

? No verified observation but habitat present
* Non-native

**BIRDS**

| Common Name | Scientific Name |
|---|---|
| Blackbird, Rusty * | *Euphagus carolinus* |
| Bufflehead | *Bucephala albeola* |
| Canvasback | *Aythya valisineria* |
| Chickadee, Black-capped * | *Parus atricapillus* |
| Chickadee, Boreal * | *Parus hudsonicus* |
| Crane, Sandhill # | *Grus canadensis* |
| Creeper, Brown * | *Certhia americana* |
| Crossbill, White-winged * | *Loxia leucoptera* |
| Crow, Northwestern | *Corvus caurinus* |
| Dipper, American * | *Cinclus mexicanus* |
| Dove, Rock + | *Columba livia* |
| Dowitcher, Short-billed + @ | *Limnodromus griseus* |
| Dowitcher, Long-billed | *Limnodromus scolopaceus* |
| Duck, Harlequin + | *Histrionicus histrionicus* |
| Duck, Mallard * | *Anas platyrhynchos* |
| Duck, Ring-necked* | *Aythya collaris* |
| Dunlin | *Calidris alpina* |
| Eagle, Bald * | *Haliaeetus leucocephalus* |
| Eagle, Golden @ | *Aquila chrysaetus* |
| Falcon, Peregrine # | *Falco peregrinus* |
| Flicker, Northern | *Colaptes auratus* |
| Flycatcher, Alder * | *Empidonax alnorum* |
| Flycatcher, Olive-sided * | *Contopus borealis* |
| Gadwall | *Anas strepera* |
| Godwit, Hudsonian | *Limosa haemastica* |
| Goldeneye, Barrow @ | *Bucephala islandica* |
| Goldeneye, Common @ | B*ucephala clanqula* |
| Golden-plover, American # | *Pluvialis dominica* |
| Goose, Canada * | *Branta canadensis* |
| Goose, Greater White-fronted | *Anser albifrons* |
| Goose, Snow | *Chen caerulescens* |
| Goshawk* | *Accipiter gentilis* |
| Grebe, Horned @ * | *Podiceps auritus* |
| Grebe, Red-necked* | *Podiceps grisegena* |
| Grosbeak, Pine * | *Pinicola enucleator* |
| Grouse, Spruce* | *Dendragopus obscurus* |
| Gull, Bonaparte's * | *Larus philadelphia* |
| Gull, Glaucous-winged | *Larus glaucescens* |
| Gull, Mew * | *Larus canus* |
| Gull, Herring | *Larus argentatus* |
| Harrier, Northern * | *Circus cyaneus* |
| Hawk, Red-tailed* | *Buteo jamaicensis* |
| Hawk, Rough-legged | *Buteo lagopus* |
| Hawk, Sharp-shinned | *Accipiter striatus* |
| Jay, Gray* | *Perisoreus canadensis* |
| Jay, Steller's * | *Cyanocitta stelleri* |

| | |
|---|---|
| Junco, Dark-eyed* | *Junco hyemalis* |
| Kestrel, American | *Falco sparverius* |
| Killdeer | *Charadrius vociferus* |
| Kingfisher, Belted * | *Ceryle alcyon* |
| Kinglet, Golden-crowned + | *Regulus satropa* |
| Kinglet, Ruby-crowned * | *Regulus calendula* |
| Longspur, Lapland # | *Calcarius lapponicus* |
| Loon, Pacific * | *Gavia arctica* |
| Loon, Common * | *Gavia immer* |
| Loon, Red-throated @ | *Gavia stellata* |
| Magpie, Black-billed * | *Pica pica* |
| Merganser, Common | *Mergus merganser* |
| Merganser, Hooded @ | *Lophodytes cucullatus* |
| Merlin * | *Falco columbarius* |
| Nuthatch, Red-breasted @ | *Sitta canadensis* |
| Owl, Boreal? | *Aegolius funereus* |
| Owl, Northern Saw-whet* | *Aegolius ???* |
| Owl, Great Gray * | *Strix nebulosa* |
| Owl, Great horned * | *Bubo virginianus* |
| Owl, Hawk @ | *Surnia ulula* |
| Owl, Short-eared # | *Asio flammeus* |
| Pewee, Western + | *Contopus sordidulus* |
| Phalarope, Red-necked + | *Phalaropus lobatus* |
| Phalarope, Wilson's | *Phalaropus tricolor* |
| Pipit, American | *Anthus rubescens* |
| Pintail, Northern * | *Anas acuta* |
| Plover, Black-bellied | *Pluvialis squatarola* |
| Plover, Semipalmated * | *Charadrius semipalmatus* |
| Ptarmigan, Rock | *Lagopus mutus* |
| Ptarmigan, White-tailed | *Lagopus leucurus* |
| Ptarmigan, Willow # | *Lagopus laogpus* |
| Raven, Northern * | *Corvus corax* |
| Redpoll, Common * | *Carduelis flammea* |
| Redpoll, Hoary * | *Carduelis hornemanni* |
| Robin, American* | *Turdus migratorius* |
| Sandpiper, Baird's | *Calidris bairdii* |
| Sandpiper, Least + | *Calidris minutilla* |
| Sandpiper, Pectoral @ | *Calidris melanotos* |
| Sandpiper, Semipalmated @ | *Calidris pusilla* |
| Sandpiper, Solitary + | *Tringa solitaria* |
| Sandpiper, Spotted + | *Actitis macularia* |
| Sandpiper, Western @ | *Calidris mauri* |
| Scaup, Greater | *Aythya marila* |
| Scaup, Lesser | *Aythya affinis* |
| Scoter, White-winged # | *Melanitta fusca* |
| Shoveler, Northern @ | *Anas clypeata* |
| Shrike, Northern | *Lanius excubitor* |
| Siskin, Pine * | *Carduelis pinus* |
| Snipe, Wilson's * | *Gallinago delicate* |
| Sparrow, American tree @ | *Spizella arborea* |
| Sparrow, Fox * | *Passerella iliaca* |

| | |
|---|---|
| Sparrow, Golden-crowned @ | *Zonotrichia atricapilla* |
| Sparrow, Lincoln's* | *Melospiza lincolnii* |
| Sparrow, Savannah * | *Passerculus sandwichensis* |
| Sparrow, Song * | *Melospiza milidia* |
| Sparrow, White-crowned* | *Zonotrichia leucophrys* |
| Starling, European ** | |
| Surfbird | *Aphriza virgata* |
| Swallow, Bank * | *Riparia riparia* |
| Swallow, Cliff * | *Hirundo pyrrhonota* |
| Swallow, Northern Rough-winged | *Stelgidopteryx serripennis* |
| Swallow, Tree * | *Tachycineta bicolor* |
| Swallow, Violet-green * | *Tachycineta thalassina* |
| Swan, Trumpeter * | *Cygnus buccinator* |
| Swan, Tundra @ | *Cygnus columbianus* |
| Teal, Blue-winged @ * | *Anas discors* |
| Teal, Cinnamon | *Anas cyanoptera* |
| Teal, Green-winged* | *Anas crecca* |
| Tern, Aleutian @ # | *Sterna aleutica* |
| Tern, Arctic * | *Sterna paradisaea* |
| Thrush, Gray-cheeked # | *Cathorus minima* |
| Thrush, Hermit * | *Cathorus guttata* |
| Thrush, Swainson's * | *Cathorus ustulata* |
| Thrush, Varied + | *Ixoreus naevius* |
| Turnstone, Ruddy | *Arenaria interpres* |
| Warbler, Arctic ? | *Phylloscopus borealis* |
| Warbler, Blackpoll * | *Dendroica striata* |
| Warbler, Orange-crowned * | *Vermivora celata* |
| Warbler, Myrtle | *Setophaga coronate hooveri* |
| Warbler, Townsend's ? | *Dendroica townsendi* |
| Warbler, Wilson's + | *Wilsonia pusilla* |
| Warbler, Yellow* | *Dendroica petechia* |
| Warbler, Yellow-rumped* | *Dendroica coronata* |
| Waterthrush, Northern* | *Seiurus novaboracensis* |
| Waxwing, Bohemian + | *Bombycilla garrulus* |
| Whimbrel | *Numenius phaeopus* |
| Wigeon, American* | *Anas americana* |
| Wigeon, Eurasian | *Anas penelope* |
| Woodpecker, Black-backed + | *Picoides arcticus* |
| Woodpecker, Downy * | *Picoides pubescens* |
| Woodpecker, Hairy * | *Picoides villosus* |
| Woodpecker, American Three-toed * | *Picoides tridactylus* |
| Yellowlegs, Greater | *Tringa melanoleuca* |
| Yellowlegs, Lesser | *Tringa flavipes* |

* Confirmed nester
@ Rare
? No verified observation
\+ Suspected nester
\# Migrant
** Non-native

**AMPHIBIANS and REPTILES**

| Common Name | Scientific Name |
|---|---|
| Frog, Wood | *Rana sylvatica* |

**FISH**

| Common Name | Scientific Name |
|---|---|
| Char, Arctic | *Salvelinusalpinus* |
| Cod, Saffron | *Eleginus gracilis* |
| Eulachon | *Thaleichthys pacificus* |
| Flounder, Starry | *Platichthys stellatus* |
| Grayling, Arctic | *Thymallus arcticus* |
| Salmon, Chum (dog) | *Oncorhynchus keta* |
| Salmon, King (chinook) | *Oncorhynchus tshawytsha* |
| Salmon, Kokanee | *Oncorhynchus* spp. |
| Salmon, Pink (humpback) | *Oncorhynchus gorbuscha* |
| Salmon, Red (sockeye) | *Oncorhynchus nerka* |
| Salmon, Silver (coho) | *Oncorhynchus kisutch* |
| Pacific tomcod | *Microgadus proximus* |
| Pike, Northern | *Esox lucius* |
| Sculpin, Pacific staghorn | *Leptocottus armatus* |
| Sculpin, Slimy | *Cottus cognatus* |
| Smelt, Rainbow | *Osmerus mordax* |
| Snailfish | *Careproctus spp* |
| Stickleback, Threespine | *Gasterosteus aculeatus* |
| Stickleback, Ninespine | *Pungitius pungitius* |
| Trout, Dolly Varden | *Salvelinus malma* |
| Trout, Rainbow | *Oncorhynchus mykiss gairdneri* |

Sources:
673 CES/CEANC 2010 (Appendix F)
U.S. Army Alaska 1998 (Appendix 8-2)

**MACRO-INVERTEBRATES**

| | |
|---|---|
| Polychaete worms | |
| Shrimp | *Crangon spp* |

**Macro-invertebrate list from MWH Ship Creek study:**
***Insect (#s found at Ship Creek 3 sites) Genus or family by Order***

**Ephemeroptera**

Epeorus 22, 3, 1
Drunella 18, 35, 36
Ephemerella 12, 19, 3
Baetis 9, 2, 2
Cinygmula 5

**Trichoptera**

Brachycentrus 1, 19, 11
Limnephilus 11
Glossosoma 4, 28, 9
Ecclisomyia 21, 4, 2

**Plecoptera**

Neaviperla 8, 2
Isoperla 6, 4
Zapada 4, 5
Nemoura 5, 10, 1
Capniidae/Leucridae 15, 3

**Diptera**

Chironomidae 34, 49, 42
Dicronota 1, 2
Rhabidomastix 1

**Other**

Oligochaete 2, 1, 3
Nematoda 1
Hydracarina 1

## Exotic/Invasive Mammal, Bird, and Fish Species on Joint Base Elmendorf-Richardson

| Scientific Name | Common Name | Family | Confirmed for JBER-Elmendorf (H. Griese 2009) | Confirmed for JBER-Richardson (P.C. McKee 2009) | Source (Year recorded) |
|---|---|---|---|---|---|
| Esox lucius | Northern pike | Esocidae | | X | 4 |
| Columba livia | Rock dove/pigeon | Columbidae | X | X | 1 |
| Sturnis vulgaris | European starling | Sturnidae | X | X | H. Griese (2002) |
| Mus musculus | House mouse | Muridae | X | X | 3 |

Sources:

1. Rothe, T.C., S.H. Lanigan, P.A. Martin, and G.F. Tande. 1983. *Natural Resource Inventory of Elmendorf Air Force Base, Alaska*. U.S. Fish and Wildlife Service Special Studies. Anchorage, Alaska.

2. 3rd Civil Engineering Squadron. 2001. *Integrated Natural Resources Management Plan for Elmendorf Air Force Base, 2001-2006.* Prepared by Center for Ecological Management of Military Lands, Colorado State University, Fort Collins, CO. 135 pp.

3. Peirce, K.N. 2003. *A Small Mammal Inventory on Fort Richardson, Alaska, Final Report.* Center for Environmental Management of Military Lands, Colorado State University, U.S. Army Environmental Resources Department. Fort Richardson, AK. 40 pp.

4. Miller, M.G. and D. Bosch. 2004. *Area Management Report for the Recreational Fisheries of Anchorage 2003*. Alaska Department of Fish and Game, Fishery Management Series No. 04-07, Anchorage, AK

# Appendix G. Partnership Documents Affecting Joint Base Elmendorf-Richardson

**Appendix G.1.** Memorandum Of Understanding Between The U.S. Department Of Defense and The U.S. Fish And Wildlife Service And The Association Of Fish And Wildlife Agencies For A Cooperative Integrated Natural Resource Management Program On Military Installations

**Appendix G.2.** Cooperative Agreement between the Alaska District, Corps of Engineers and the Bureau of Land Management, Alaska Authorizations on Withdrawn Lands

**Appendix G.3.** Cooperative Agreements and Memorandums of Agreement/Understanding for Joint Base Elmendorf-Richardson

**Appendix G.4.** Cooperative Agreement COOP 14-010 between the Alaska Department of Fish and Game and U.S. Air Force, 673d Civil Engineer Group for Rehabilitation of Salmon Fisheries in Otter Creek Drainage on Joint Base Elmendorf-Richardson

**Appendix G.5.** Partnerships that JBER has formed or is Likely to Form in the Near Future.

# Appendix G.1. Memorandum Of Understanding Between The U.S. Department Of Defense and The U.S. Fish And Wildlife Service And The Association Of Fish And Wildlife Agencies For A Cooperative Integrated Natural Resource Management Program On Military Installations

A. PURPOSE

The purpose of this Memorandum of Understanding (MOU) is to further a cooperative relationship between the U.S. Department of Defense (DoD), U.S. Department of the Interior- Fish and Wildlife Service (FWS), and state fish and wildlife agencies (states) acting through the Association of Fish and Wildlife Agencies (AFWA) (hereafter referred to as the Parties) in preparing, reviewing, revising, updating and implementing Integrated Natural Resource Management Plans (INRMPs) for military installations.

B. BACKGROUND

In recognition that military lands have significant natural resources, Congress enacted the Sikes Act in 1960 to address wildlife conservation and public access on military installations. The 1997 amendments to the Sikes Act require the DoD to develop and implement an INRMP for each military installation with significant natural resources. A 2012 amendment to the Sikes Act now authorizes the preparation of INRMPs for state-owned National Guard installations used for training pursuant to chapter 5 of title 32 of the United States Code. DoD must prepare all INRMPs in cooperation with the FWS and states. Each INRMP must reflect the mutual agreement of the Parties concerning conservation, protection, and management of fish, wildlife, plants and their habitats on military lands.

INRMPs provide for the management of natural resources, including fish and wildlife and their habitats. To the maximum extent practicable, they incorporate ecosystem management principles, and describe procedures and projects that manage and maintain the landscapes necessary to sustain military-controlled lands for mission purposes. INRMPs also allow for multipurpose uses of resources, including public access appropriate for those uses, provided such access does not conflict with military land use, security requirements, safety, or ecosystem needs, including the needs of fish and wildlife resources. Effective communications and coordination among the Parties, initiated early in the planning process at national, regional, and the military installation levels, is essential to developing, reviewing, and implementing comprehensive INRMPs. When such partnering involves the participation and coordination of all Parties regarding existing FWS and state natural resources management plans or initiatives, such as threatened and endangered species recovery plans or State Wildlife Action Plans, the mutual agreement of all Parties is achieved more easily. INRMPs provide for the conservation and rehabilitation of natural resources on military lands in ways that help ensure the readiness of the Armed Forces. Thus, a clear understanding of land use objectives for military lands should enable the Parties to have a common understanding of DoD's land management requirements.

This MOU addresses the responsibilities of the Parties to facilitate optimum management of natural resources on military installations. It replaces a DoD-FWS-AFWA MOU for *Cooperative Integrated Natural Resources Management Program on Military Installations* dated January 31, 2006, which expired January 31, 2011.

C. AUTHORITIES

This MOU is established under the authority of the Sikes Act, as amended, 16 U.S.C. 670a-670f, which requires the Secretary of Defense to carry out a program to provide for the conservation and rehabilitation of natural resources on military installations in cooperation with the FWS and states. The DoD's primary mission is national defense. DoD manages approximately 28 million acres of land and waters under the Sikes Act to support sustained military activities while conserving and protecting biological resources. The FWS manages approximately 150 million acres of the National Wildlife Refuge System, and administers numerous fish and wildlife conservation and management statutes and authorities, including

the: Fish and Wildlife Coordination Act, Migratory Bird Treaty Act of 1918, Endangered Species Act, Marine Mammal Protection Act, Bald and Golden Eagle Protection Act, Anadromous Fish Conservation Act, Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, Federal Noxious Weed Act, Alien Species Prevention Enforcement Act of
1992, North American Wetland Conservation Act, and Coastal Barrier Resources Act.
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.
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, Indian tribes, nongovernmental organizations, and individuals to provide for the maintenance and improvement of natural resources, or to benefit natural and historic research, both on and off DoD installations.
The Sikes Act (16 U.S.C. 670a(d)(2) also encourages the Secretary of Defense, to the greatest extent practicable, to enter into agreements to use the services, personnel, equipment, and facilities, with or without reimbursement, of the Secretary of the Interior or states in carrying out the provisions of this section.
The Economy Act (31 U.S.C. 1535 and 1536) allows a federal agency to enter into an agreement with another federal agency for services, when those services can be rendered in a more
convenient or cost effective manner by another federal agency.

D. RESPONSIBILITIES

The Parties to this agreement hereby enter into a cooperative program of INRMP development, review, and implementation with mutually agreed-upon fish and wildlife conservation objectives to satisfy Sikes Act goals.

1. The DoD, the FWS and AFWA (Parties) mutually agree:

a. To meet at least annually at the headquarters' level to discuss implementation o f this MOU. The DoD and FWS will alternate responsibilities for coordinating this annual meeting and any other meetings related to this MOU. Proposed amendments to the MOU should be presented in writing to the parties at least 15 days prior to the annual meeting. The terms of this MOU and any proposed amendments may be reviewed at the annual meeting. The meeting may also review mutual Sikes Act research and technology needs, accomplishments, and other emerging issues.

b. To participate in a Sikes Act Tripartite Core Group consisting of representatives from the Parties. This Core Group will meet at least quarterly, coordinated by the DoD, to discuss and develop projects and guidance to help prepare and implement INRMPs and to discuss Sikes Act issues of national importance.

c. To engage in sound management practices for natural resource protection and management pursuant to this MOU with full consideration for military readiness; native fish and wildlife; threatened, endangered and at-risk species; and the environment.

d. To promote the sustainable multipurpose use of natural resources on military installations- including hunting, fishing, trapping, and non-consumptive uses such as wildlife viewing, boating, and camping- in ways that are consistent with DoD's primary military mission and to the extent reasonably practicable.

e. To develop and implement supplemental Sikes Act MOUs or other agreements, as needed, at the regional and/or state level.

f. To recognize the most current DoD and FWS Sikes Act Guidance as the guidance for communication and cooperation o f the Parties represented by this MOU.

g. To post current DoD, FWS, and state Sikes Act guidance documents within 14 days of completion on the following sites:

i. For DoD: https://www.denix.osd.mil/nr

ii. For FWS: http://www.fws.gov/habitatconservation/sikes_act.html

iii. For the states: http://www.fishwildlife.org

h. To cooperatively prepare and conduct full reviews of all new INRMPs in a timely manner.

i. To require the DoD Components and appropriate FWS and state offices to conduct a review for operation and effect of each INRMP no less often than every five years, as required by the Sikes Act, and to document these reviews. As a means of facilitating and streamlining this statutory requirement, use the annual progress review of each INRMP as conducted by each DoD Component per DoD policy.

j. To encourage collaboration in annual progress reviews between representatives from each military installation with an INRMP and appropriate representatives from the other Parties.

i. The Parties shall discuss the performance of each military installation in meeting relevant DoD Natural Resources Focus Area metrics, and potential improvements to INRMP implementation, such as new projects or management practices.

ii. Meetings may be in person or by another mutually acceptable means.

iii. The Parties shall discuss methods and projects that the FWS and states can implement that support INRMP goals and objectives.

k. To streamline and expedite the review of INRMP updates or revisions, and to effectively address review for critical habitat exclusions based on the INRMP conservation benefit, when feasible:

i. DoD and the FWS will develop and implement a streamlined review process within six months of signature of this MOU that will allow for expedited review and approval (new signatures) of updated sections of each INRMP.

ii. DoD will provide a means o f easily identifying all changesto each updated or revised INRMP when forwarding it for review.

iii. FWS will focus review on those parts of updated INRMPs that reflect changes from the previously reviewed version.

iv. FWS and the appropriate states will review all INRMPs with major revisions (e.g., changes required by mission realignments, the listing of new species or other significant action that has the potential to affect military operations or readiness).

v. DoD, FWS, and the states (acting through AFWA) will continue to seek opportunities to

make INRMP review processes more efficient while sustaining and enhancing INRMP conservation effectiveness.

vi. The DoD Components may submit to the USFWS, a priority INRMP list to address those installations seeking critical habitat exclusions to facilitate coordination with USFWS Endangered Species office.

vii. To ensure consistency, the Parties accept the following definitions:

**a) Compliant INRMP:** An INRMP that has been both approved in writing, and reviewed, within the past five years, as to operation and effect, by authorized officials of DoD, DOl, and each appropriate state fish and wildlife agency.

**b) Review for operation and effect:** A comprehensive, joint review by the parties to the INRMP, conducted no less often than every five years, to determine whether the plan needs an update or revision to continue to address adequately Sikes Act purposes and requirements.

**c) INRMP update:** Any change to an INRMP that, if implemented, is not expected to result in consequences materially different from those in the existing INRMP and analyzed in an existing NEP A document. Such changes will not result in a significant environmental impact, and installations are not required to invite the public to review or to comment on the decision to continue implementing the updated INRMP .

**d) INRMP revision:** Any change to an INRMP that, if implemented, may result in a significant environmental impact, including those not anticipated by the parties to the INRMP when the plan was last approved and/or reviewed as to operation and effect. All such revisions require approval by all parties to the INRMP, and will require a new or supplemental NEPA analysis.

l. That none of the Parties to the MOU is relinquishing any authority, responsibility, or duty established by law, regulation, policy, or directive.

m. To designate the officials listed below, or their delegates to participate in the activities pursuant to this MOU.

i. DoD: Deputy Director, Natural Resources Conservation Compliance, ODUSD (I&E) ESOH

ii. FWS: National Sikes Act Coordinator, Fish and Aquatic Conservation

iii. AFWA: Director, Government Affairs

**2. DoD agrees to:**

a. Communicate the establishment of this MOU to all DoD Components.

b. Take the lead in developing policies and guidance related to INRMP development, updates, revisions, and implementation, and to ensure the involvement, as appropriate, in these processes ofthe FWS and state fish and wildlife agencies.

c. Ensure distribution of the DoD and FWS Sikes Act Guidance to all appropriate DoD Components.

d. Encourage DoD Components to invite appropriate FWS and state fish and wildlife agency offices to

participate in annual INRMP reviews. All such invitations should be extended at least 15 business days in advance of the scheduled review to facilitate meaningful participation by all three Parties. Meetings may be in person or by other mutually agreed upon means.

e. Encourage DoD Components to take full advantage of FWS and state fish and wildlife agency natural resources expertise through the use of Economy Act transfers and cooperative agreements. Encourage DoD Components and FWS to explore the use of the Fish and Wildlife Coordination Act for technical assistance, fish stocking, and other conservation projects. Priority should be given to projects that:

i. Sustain the military mission.

ii. Effectively apply ecosystem management principles.

iii. Consider the strategic planning priorities of the FWS and the state fish and wildlife agency.

f. Encourage DoD Components to give priority to INRMP requirements that:

i. Sustain military mission activities while ensuring conservation of natural resources.

ii. Provide adequate staffing with the appropriate expertise for updating, revising, and implementing each INRMP within the scope of DoD Component responsibilities, mission, and funding constraints.

g. Encourage DoD Components to discuss with the FWS and state fish and wildlife agencies all issues of mutual interest related to the protection, conservation, and management of fish and wildlife resources on DoD installations.

h. Subject to mission, safety, security, and ecosystem requirements, provide public access to military installations to facilitate the sustainable multipurpose use of its natural resources.

i. Identify natural resource research needs, and develop research proposals with input from the Parties.

j. Identify opportunities to work with the DoD Components to facilitate:

i. Cooperative regional and local natural resource conservation partnerships and initiatives with FWS and state fish and wildlife agency offices.

ii. Natural resources conservation technology transfer and training initiatives between the DoD Components, federal land management agencies, and state fish and wildlife agencies.

k. Provide law enforcement support to protect fish, wildlife, and plant resources on military installations consistent with jurisdiction and authority.

3. FWS agrees to:

a. Communicate the establishment of this MOU to each FWS Regional Office and appropriate field offices in close proximity to military installations.

b. Distribute the DoD and FWS Sikes Act Guidelines to each FWS Regional Office and appropriate field office in close proximity to military installations.

c. Designate regional and field office FWS liaisons to develop partnerships and help DoD implement joint management of ecosystem-based natural resource management programs, and provide a list of those liaisons to the DoD as needed.

d. Provide technical assistance with the appropriate expertise to the DoD in managing its resources within the scope of FWS responsibilities and funding constraints.

e. Encourage field offices to coordinate current and proposed FWS natural resource initiatives and research efforts with those that may relate to DoD installations, and to provide applicable installations with new and relevant information pertaining to distribution and/or research regarding listed and candidate species and species at-risk.

f. Inform DoD Components and affected installations regarding upcoming and reasonably foreseeable proposed listing and critical habitat designations that may potentially affect military installations in a timely manner before publication o f such proposals in the Federal Register.

g. Encourage regional and field offices to expedite pending INRMP reviews that may affect foreseeable proposed listing of threatened and endangered species and critical habitat designations.

h. Provide law enforcement support as appropriate to protect fish, wildlife, and plant resources on military installations within the jurisdiction of the FWS.

i. Identify FWS refuges and other potential federal management areas in close proximity to military installations, and, where appropriate, participate in the joint management of ecosystem-based natural resource management projects that support INRMP and other planning goals, objectives, and implementation.

4. AFWA agrees to:

a. Communicate the establishment o f this MOU to each state fish and wildlife agency director and appropriate personnel.

b. Distribute the DoD and FWS Sikes Act Guidelines to each state fish and wildlife agency director and appropriate staff.

c. Facilitate and coordinate with the states to encourage them to:

i. Participate in developing, reviewing, updating, revising, approving and, as appropriate implementing INRMPs in a timely way upon request by military installation personnel.

ii. Designate state liaisons to help develop partnerships and to help DoD installation staff implement natural resource conservation and management programs.

iii. Identify state wildlife management areas in close proximity to military installations and, where appropriate, participate in the joint management of ecosystem-based natural resources projects that support INRMP goals, objectives, and implementation.

iv. Provide technical assistance to DoD installation staff in adaptively managing natural resources within the scope o f state responsibilities, funding constraints, and expertise.

v. Identify state personnel needs to develop, review, update/revise, approve, and implement

INRMPs, and facilitate the identification of funding opportunities to address the fulfillment of state priorities.

vi. Coordinate current and proposed state natural resources research efforts with those that may relate to DoD installations.

vii. Coordinate with DoD installations to develop new, and implement existing, conservation plans and strategies, including, but not limited to State Wildlife Action Plans; the National Fish, Wildlife and Plants Climate Adaptation Strategy; goals or initiatives of the North American Bird Conservation Initiative (NABCI) and/or Partners in Amphibian and Reptile Conservation (PARC); and the National Fish Habitat Action Plan.

E. STATEMENT OF NO FINANCIAL OBLIGATION

This MOU does not impose any financial obligation on the part of any signatory.

F. ESTABLISHMENT OF COOPERATIVE AGREEMENTS

The Parties are encouraged to enter into cooperative or interagency agreements to coordinate and implement natural resource management on military installations. If fiscal resources are required, the Parties must develop a separately funded cooperative or interagency agreement.

Such cooperative or interagency agreements may also be entered into under the authority of the Sikes Act (16 U.S.C. 670c-l). Interagency agreements may be entered into under the authority of the Economy Act (31 U.S.C. 1535 and 1536). The Parties should also explore opportunities to utilize the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-666c) to facilitate agreements for FWS technical assistance, fish stocking, and other conservation activities. Each funded cooperative or interagency agreement shall include a work plan and a financial plan that identify goals, objectives, and a budget and payment schedule. A cooperative or interagency agreement to accomplish a study or research also will include a study design and methodology in the work plan. It is understood and agreed that any funds allocated via these cooperative or interagency agreements shall be expended in accordance with its terms and in the manner prescribed by the fiscal regulations and/or administrative policies of the party making the funds available.

G. AMENDMENTS

This MOU may be amended at any time by mutual written agreement of the Parties.

H. TERMINATION

Any party to this MOU may remove itself upon sixty (60) days written notice to the other parties.

I. EFFECTIVE DATE AND DURATION

This MOU will be in effect upon date of final signature, and will continue for ten years from date of final signature. The parties will meet six (6) months prior to the expiration of this MOU to discuss potential modifications and renewal terms.

## Appendix G.2. Cooperative Agreement between Alaska District, Corps of Engineers and Bureau of Land Management, Alaska Authorizations on Withdrawn Lands

I. Purpose
This agreement between the Department of the Army, Alaska District, Corps of Engineers (Corps) and the Department of the Interior, Bureau of Land Management, Alaska State Office defines the 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.

II. Authority

A. Bureau of Land Management
1. Federal Land Policy and Management Act (43 U.S.C. 1701).
2. Recreation and Public Purposes Act (43 U.S.C. 869).
3. Mineral Leasing Act (30 U.S.C. 181).

B. Corps of Engineers
1. 40 U.S.C., Section 51
2. 10 U.S.C., Sections 2667, 2668, and 2669.

C. Unless the order of withdrawal specifically indicates otherwise, lands withdrawn for military purposes are under the control of the military and the military has the authority to authorize use of the lands.

III. ures

A. The Corps will process applications for rights-of-way, leases, licenses, and permits on public lands in Alaska withdrawn for the Army and the Air Force with the following exceptions:

1. Where the order of withdrawal specifically reserves this authority to the Department of the Interior or Bureau of Land Management.

2. Applications pursuant to the Recreation and Public Purposes Act.

3. Applications pursuant to the Mineral Leasing Act.

If the order of withdrawal has a specific termination date, the Corps shall not issue use authorizations for a period longer than the term of the withdrawal without the concurrence of Bureau of Land Management.

B. Bureau of Land Management will process applications for rights-of-way, leases, licenses, and permits noted as exceptions in (A) above, but only with the concurrence of the Corps.

IV. Implementation

A. This agreement becomes effective upon signature by both parties.

B. This agreement may be terminated by mutual agreement of the parties or upon 30 days written notice by either party.

C. This agreement supersedes Bureau of Land Management Agreement No. AG-50910-127 between the District Engineer and the Bureau of Land Management dated October 12, 1973.

# Appendix G.3. Cooperative Agreements and Memorandums of Agreement/Understanding for Joint Base Elmendorf-Richardson

| Type | Parties | Subject | AF level | Who With | Date | 673 CEIEC/ POC |
|---|---|---|---|---|---|---|
| MOA | Memorandum of Agreement between the Maritime Administration and USAF, PACAF, EAFB | Gravel Extraction | 3 WG/CC | MARAD | 8-Aug-05 | EP |
| CA | AK-COOP-I 38<br>Cooperative Agreement for the Protection, Development and Management of Vegetation Resources of Air Force Installations, Alaska | Vegetation expertise | 11 AF/CC | ADNR, Division of Agriculture | 5-Nov-96 | NR |
| MOA | Memorandum of Agreement between 3 WG EAFB and ADFG | Hatchery Water and Sport Fish Stocking | 3d Log Group CC | ADFG | (expired) 5-Apr-01 | NR |
| MOU | Memorandum of Understanding regarding Watchable Wildlife in Alaska | Wildlife viewing | 11 AF/CC | ADFG | 14-Feb-98 | NR |
| MOU | Memorandum of Understanding regarding Comprehensive Wildlife Management Plan | Human/wildlife conflicts | 3 WG/CC | ADFG et al. | 28-Mar-00 | NR |
| MOA | AK-MOA-054<br>Memorandum of Agreement between the U.S. Army Garrison Alaska, US Air Force, EAFB, ADFG, and U.S. Dept of Agriculture - Animal and Plant Health Inspection, Wildlife Services | Bear/human conflict response | 3 WG/CC | ADFG et al. | Pending | NR |
| MOA | AK-MOA-213<br>Memorandum of Agreement Between U.S. Army Garrison, Fort Richardson and EAFB | Geographical Information System (GIS) data sharing | 3 WG/CC | U.S. Army Garrison, Fort Richardson | 3 June 06 | |
| MOA | MOA-28-H-730<br>Memorandum of Agreement between the Municipality of Anchorage, State of Alaska Division of Forestry, Ted Stevens International Airport, Kulis Air National Guard Base, Alaska National Guard Fort Richardson and 673 ABW EAFB | Fire prevention, hazardous material response, and protection from wildland fires | 3 WG/CC | Municipality of Anchorage, et al. | 8 Aug 02 | |

| Type | Parties | Subject | AF level | Who With | Date | 673 CEIEC/ POC |
|---|---|---|---|---|---|---|
| | | | | | | |
| MOA | WS0587-02288-001<br>Memorandum of Agreement between U.S. Department of Agriculture – Animal and Plant Health Inspection, Wildlife Services, and 673 ABW EAFB | BASH program support | 3d Log Group CC | USDA/APHIS/WS | 21 Aug 02 | |
| MOA | Native Village Eklutna | Support for conducting research for natural resources management | | | 18 May 10 | |
| CA | AK-COOP-090<br>USAG-AK and Center for Environmental Management of Military Lands at Colorado State University | Support for natural and cultural resources, as well as environmental management | | CSU-CEMML | 4 Aug 97 | |
| CA | AK-COOP-I 33<br>USAG-AK and the University of Alaska | Natural and cultural resource support | | UAA | 27 Jul 01 | |
| CA | USAG-AK, Salcha-Delta Soil and Water Conservation District and Palmer Soil and Water Conservation District | Natural and cultural resource support and erosion control and habitat management | | | | |
| MOA | USAG-AK Range Office, BLM Alaska Fire Service, USAG-AK Fire Chief, and JBER | Annual coordination for fire index program | | | | |
| | Alaska Fire Service and USARAK 1995 | | | | | |
| MOU | ADFG and 673d CEG | Otter Creek Rehabilitation | 673d CEG/CC | ADFG | 07/11/13? | Johnson |
| MOU | 3 WG/SE, AKARNG Bryant Airfield Manager | BASH Program | 3 WG/SE | Bryant Field Airfield Manager (Mr. James Noe) | 30 Aug 2012 | N/A |

COOPERATIVE AGREEMENT

COOP 14-010

between the

ALASKA DEPARTMENT OF FISH AND GAME

and the

U. S. AIR FORCE, 673d CIVIL ENGINEER GROUP

for

Rehabilitation of Salmon Fisheries in Otter Creek Drainage on Joint Base Elmendorf-Richardson

1. References

a. Sikes Act (16 USC 670a-670o), 15 September 1960.

b. Executive Order 13112, Invasive Species, 3 February 1999.

c. Department of Defense (DoD) Instruction 4715.03, Natural Resources Conservation Program, 14 February 2011.

d. U.S. Air Force Instruction 32-7064, Integrated Natural Resources Management, 17 September 2004.

e. Joint Base Elmendorf-Richardson (JBER) Integrated Natural Resource Management Plan, September 2012.

f. Magnuson -Stevens Fishery Conservation and Management Act, Essential Fish Habitat amended to incorporate essential fish habitat (EFH), December 19, 1997.

g. Endangered Species Act (16 USC 1531 et seq.), 28 December 1973.

h. Clean Water Act (33 USC 1251-1387), 18 October 1972.

i. AS 36.30.850 (b), 2 AAC 12, and AS 16.05.050 (13)

2. Purpose: The purpose of this Cooperative Agreement is to itemize specific tasks, responsibilities and funding obligations agreed to by the Alaska Department of Fish.and Game (ADF&G), Sport Fish Division and JBER. This cooperative agreement will specifically address efforts to rehabilitate and enhance the fisheries in Otter Lake as approved by the U.S. Army Corps of Engineers (USACE), and outlined in the 2012 JBER Integrated Natural Resources Management Plan (INRMP). Items not specifically listed will generally be the responsibility of JBER unless ADF&G agrees to assist with the implementation of said items. The Department of Defense (DoD) and the State of Alaska, through their duly designated representatives whose

signatures appear on the JBER INRMP, specifically approve the INRMP and below items of cooperation.

3. Background and Objectives

a. Whereas, 16USC 670a -6700 (Sikes Act), requires military installations to cooperatively develop an INRMP with ADF&G, U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Services (NMFS). The 2012 JBER INRMP provides the fisheries management plans that include the rehabilitation and enhancement of Otter Lake. This action will specifically benefit the endangered Cook Inlet beluga whale *(Delphinapterus leucas)* (CIB) and as outlined in the INRMP, control invasive northern pike *(Esox lucius)* as required to meet Executive Order 13112 requirements.

b. Whereas, justification for the POA permit, issued by the USACE, following the Clean Water Act (CWA), to fill 27 acres ofwetlands on JBER in addition to 111 acres of fill in the adjacent Cook Inlet waters. Mitigation was required by the permit, for the loss of those wetlands. If feasible, the mitigation was to occur locally in a manner that the CIB and salmon would benefit. The USACE established the POA Wetland Mitigation Advisory Committee (PMAC) to recommend project approval and the allocation of funds to meet those objectives. Said funds are managed by Great Lands Trust.

c. The intent is for ADF&G to seek project funding from Great Land Trust to use asthe primary funding source for the Otter Lake rehabilitation project. JBER will not receive any portion of the wetland mitigation funding nor will any portion of said funds be paid to athird party as compensation for any obligation incurred by JBER. Management, use and oversight of any funds ADF&G receives from Great Land Trust shall be at the sole discretion of ADF&G.

d. Whereas, DoD encourages the use of Cooperative Agreements with partner agencies to accomplish mutually beneficial management and research activities through DoD Instruction 4715.03.

e. Now therefore, ADF&G and JBER shall enter into this Cooperative Agreement for the purpose of Otter Lake Treatment to rid it of locally invasive northern pike.

4. Scope: This agreement applies to all JBER-controlled lands associated with the Otter Lake Rehabilitation Project.

5. Agreements

a. Joint Base Elmendorf-Richardson 673d Civil Engineer Squadron Natural Resources Conservation Program (673 CES/CEANC) agrees to:
   (1) Provide installation access, training and orientation to ADF&G employees, and their contractors, as required for the completion of this project.
   (2) Consult and advise on all project designs, management and safety plans.

(3) Provide pre-treatment and post-treatment water quality data to ADF&G for rotenone application planning.

4)-Ensure completion of_National Environmental. Policy_Act(NEPA) and ESA Section 7 consultation requirements.

(5) Develop and submit a National Pollutant Discharge Elimination System (NPDES) Permit application, Electronic Notice oflntent (eNOI), Alaska Department of Environmental Conservation (ADEC) Pesticide Use Permit, Rotenone Treatment Management Plan, Fish Habitat Permit, and other required permits.

(6) Secure appropriate installation permits, approvals, and provide installation coordination for the treatment of Otter Lake.

(7) Provide installation public awareness of the project.

(8) Provide technical advice and trained manpower as resources are available.

(9) Design and conduct avian surveys to monitor fish predation, principally after treating Otter Lake with rotenone.

(10) Following the rotenone treatment, collect monthly samples throughout the winter for laboratory analysis on the degradation rate of rotenone presence in Otter Lake.

(11) Following the rotenone treatment, monitor sentinel fish in the outlet creek to determine if neutralization in the creek is needed.

(12) Close Otter Lake to recreational use until the rotenone is fully degraded in the lake.

b. Alaska Department of Fish and Game, Sport Fish Division, agrees to:

(1) Accept and manage funds from Great Land Trust, for this project, as approved by the USACE PMAC. No amount of said funds may be paid to JBER or to any third party to cover an obligation incurred by JBER.

(2) Contract for all project work not accomplished by JBER in-house staff or ADF&G staff, and serve as sole contract management authority for all work accomplished by contracted activity.

(3) Incooperation with JBER staff, delineate which tasks shall be accomplished with JBER resources, with ADF&G resources, and through contract labor paid for with Great Lands Trust funds. ADF&G shall prepare an annual Financial Report covering all expenditures of funds obtained from the Great Land Trust in support of this project. Said report shall be due no later than 30 days from the anniversary of this effective date of this Agreement.

(4) Assist JBER personnel in the development of 5. a. (6), as noted above.

(5) Conduct Treatment of Otter Lake on JBER using PMAC funds as provided by Great Land Trust. Activities will include:

(a) Prepare and conduct rehabilitation of Otter Lake through the rotenone application as approved by plans and permits ensuring a watershed system that is eradicated of locally invasive northern pike.

(b) Submit required pesticide use reports to JBER within 30 days of rotenone degradation for annual reporting requirements.

(c) Provide an appropriate Otter Lake stocking plan. The establishment of a recreational fishery will occur once northern pike eradication is complete. Stocking of stickleback and rainbow trout is planned to occur within 12 months of pike removal.

(d) Evaluate northern pike rotenone treatment survival by gill netting the Otter Lake watershed the spring subsequent to the rotenone treatment.

(e) Provide procedures and recommendations for annual follow-up monitoring on the success of the project.

(6) Provide seasonal progress reports on an agreed schedule, meeting any reporting requirements of state and federal permits.

(7) Provide quarterly report expenditures to JBER prior to the end of the first month of the next quarter.

c. All parties agree to:

(1) Work cooperatively to develop scopes of work and draft and final design or operational plans required to implement the rehabilitation projects.

(2) Work cooperatively to ensure military preparedness and "no net loss" in support of the military mission.

6. Use & Financial Reports:

a. Use Reports, as used in this section, means recorded information regardless of form or medium on which it may be recorded. The term includes technical data and computer databases, and documentation thereof. The term does not include information incidental to administration. All project data and results will be mutually owned by ADF&G, USACE, and JBER. Coordination and concurrence is required from all parties listed above prior to distribution of data or results.

b. Financial Report means all documents identifying the amount of funds Great Lands Trust funds obtained by the State of Alaska and disposition of said funds.

c. Disclosure of information. Due to the potential sensitive nature of activities and observations associated with the military mission on JBER, all parties must obtain permission to publish any news releases or publications regarding this project through the JBER Public Affairs Office (PAO).

7. Review: The parties shall review this Cooperative Agreement annually.

8. Modifications: Either party may propose modifications to this Cooperative Agreement; the modification to Cooperative Agreement becomes effective upon the review and signature by both parties.

9. Release: ADF&G and its contractors shall release and hold harmless JBER from any and all liability arising from or related to activities undertaken on JBER property pursuant to this Cooperative Agreement. ADF&G and its contractors shall be responsible for all claims or damages from personal injury or property to the extent they result from the negligence of its contactor and employees.

**10. Contacts:** Each party agrees to advise the other of any changes to their points of contacts. The current contacts are:

Mr. Brent Koenen
Chief, Conservation Section
673 CES/CEANC
6346 Arctic Warrior Drive
JBER, AK 99506-3221
907-384-6224
brent.koenen@us.af.mil

Ms. Jessica Johnson
Fishery Biologist
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Ms. Kristine Dunker
Fishery Biologist III
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333 Raspberry Road
Anchorage, AK 99518
907-267-2889
kristine.dunker@alaska. gov

**11. Duration of the Cooperative Agreement:** From the effective date through 31 December 2017

**12 Availability of Funds:** JBER's obligations, as set out in this Cooperative Agreement, are dependent upon the availability of sufficient Federal funds. Inthe event Federal funds are not available, the obligations of this Agreement are suspended until sufficient Federal funds are available or until this Agreement is terminated according to the terms of this Agreement. JBER shall provide ADF&G written notice of its inability to proceed due to non-availability of Federal Funds.

**13 Termination:** Cooperative Agreement may be terminated upon mutual agreement or unilaterally by a single party. The terminating party shall provide a written notice to the other party, ninety (90) days prior to the intended date of termination of the Cooperative Agreement.

**14. Effective date:** Cooperative Agreement will become effective upon the date of the last signature dated below.

15. The parties hereby agree to the tenns and conditions set forth above.

| | |
|---|---|
| Y HAI HT | ANrnONY R. RAMAGE |
| Director, Administrative Services | Colonel, USAF |
| Department of Fish and Grune | Commander |
| &l:i.0/1..3 | |
| Date | Date |

# Appendix G.5. Partnerships JBER has Formed or is Likely to Form in the Near Future

Partnerships that JBER has formed or is likely to form in the near future include the following.

- USFWS - Loon Watch program, Rusty Blackbird nesting study and legacy project, "Highlighting the benefits of military lands to declining boreal wetland birds". USFWS monitors and manages volunteers that conduct annual distribution on production of loons on JBER lakes. USFWS, in cooperation with ADFG, Alaska Bird Observatory, and others, have studied the nesting behavior and distribution of rusty blackbirds on JBER during 2007 through 2010 (Matsuoka *et al*. 2009).
- NOAA - National Marine Fisheries Service - in addition to information sharing which began in the late 1980's, the Army and Air Force have assisted with the following NMFS-led projects: CIB tagging, stranding response, necropsies, photo id, contaminant studies of CIB prey species with Mote Marine Lab, CIB pathogens with UC Davis, characterization of amino acid signatures of CIB prey species with NMML, investigation of remote monitoring of CIB using passive acoustic monitoring with NMML, ADFG, University of Alaska Fairbanks and the University of Hawaii (Cook Inlet Beluga Acoustics team - CIBA), and characterization of CIB fine scale behavior using visual and passive acoustics with CIBA.
- Anchorage Audubon Society - Christmas Bird Counts and periodic summer season bird counts. Anchorage Audubon coordinates and keeps statistics on winter bird population on portions of JBER covered by the Anchorage and Eagle River counts.
- Alaska Department of Natural Resources, Division of Forestry - Exotic insect monitoring. Division of Forestry's entomologist occasionally monitors the presence of exotic insects that may enter the JBER ecosystem from the Port of Anchorage.
- BLM – JBER intends on establishing an agreement with the BLM in 2015. The agreement will detail silviculture responsibilities, including managing forestry resources and revenues, invasive species, and recreational development/management.
- US Forest Service-DOF-JBER have an MOA (JBER-MOA-216) detailing installation wildland fire management and fire suppression responsibilities.
- Port of Anchorage and Knik Arm Bridge and Toll Authority - Beluga whale numbers and activity and movement patterns. In preparation of the environmental impact statement for respective projects, data are being collected on beluga whales in Knik Arm adjacent to JBER.
- Native Village of Eklutna - Natural and cultural resource interests. The Native Village of Eklutna shares a common interest in the optimal management of cultural and natural resources on JBER. In a government-to-government capacity Native Village of Eklutna is frequently invited to participate in resource identification, inventory, research, and monitoring review. Native Village of Eklutna is a primary resource for identification of cultural sites that may be affected by JBER developments or habitat projects that may affect the surface soils.

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# Appendix H. Fish and Wildlife Monitoring/Management Programs, Protocols, and Results on JBER

## *MAMMALS*

### Black Bear

A cooperative study of black bears on EAFB and FRA, involving Air Force, Army and ADF&G personnel, was initiated in 1989. The study objectives were to investigate black bear ecology, determine population numbers and productivity, and experiment with various methods of dealing with problem bears, such as translocation and aversive conditioning. The study was completed in 1997 (Bostick 1997), although selected bears were monitored into 2004 under the EAFB management indicator species monitoring program. Although not habitat-based, this study did provide some insight into bear use of habitat on JBER, as well as likely travel corridors and seasonal preferences. The study resulted in recommending management changes. EAFB and FRA have attempted to minimize bear problems by dumpster modification and collection combined with public education programs. All newcomers are informed of conflict prevention measures.

### Brown Bear

ADF&G began a study in 2005 to determine brown bear numbers, habitat use, movement corridors, and food selection on EAFB and FRA (Farley *et al*. 2008). Three bears were captured using culvert barrel traps, and eight bears were aerial darted from a helicopter. Four males and seven females were tagged and fitted with global positioning system, store-on-board, up-loadable collars with automatic release devices. Locations were recorded from 12 May 2005 through 27 November 2006.

Using DNA analyses of 446 hair samples, researchers identified a minimum number of 36 (26 males and 19 females) bears within the study area, of which five used military land north of the Glenn Highway (EAFB and FRA) and 13 used FRA lands south of the highway. In addition to bears that were handled, hair was collected from hair snares, vegetation, and dumpsters throughout the study area through summer 2007 to identify individual bears.

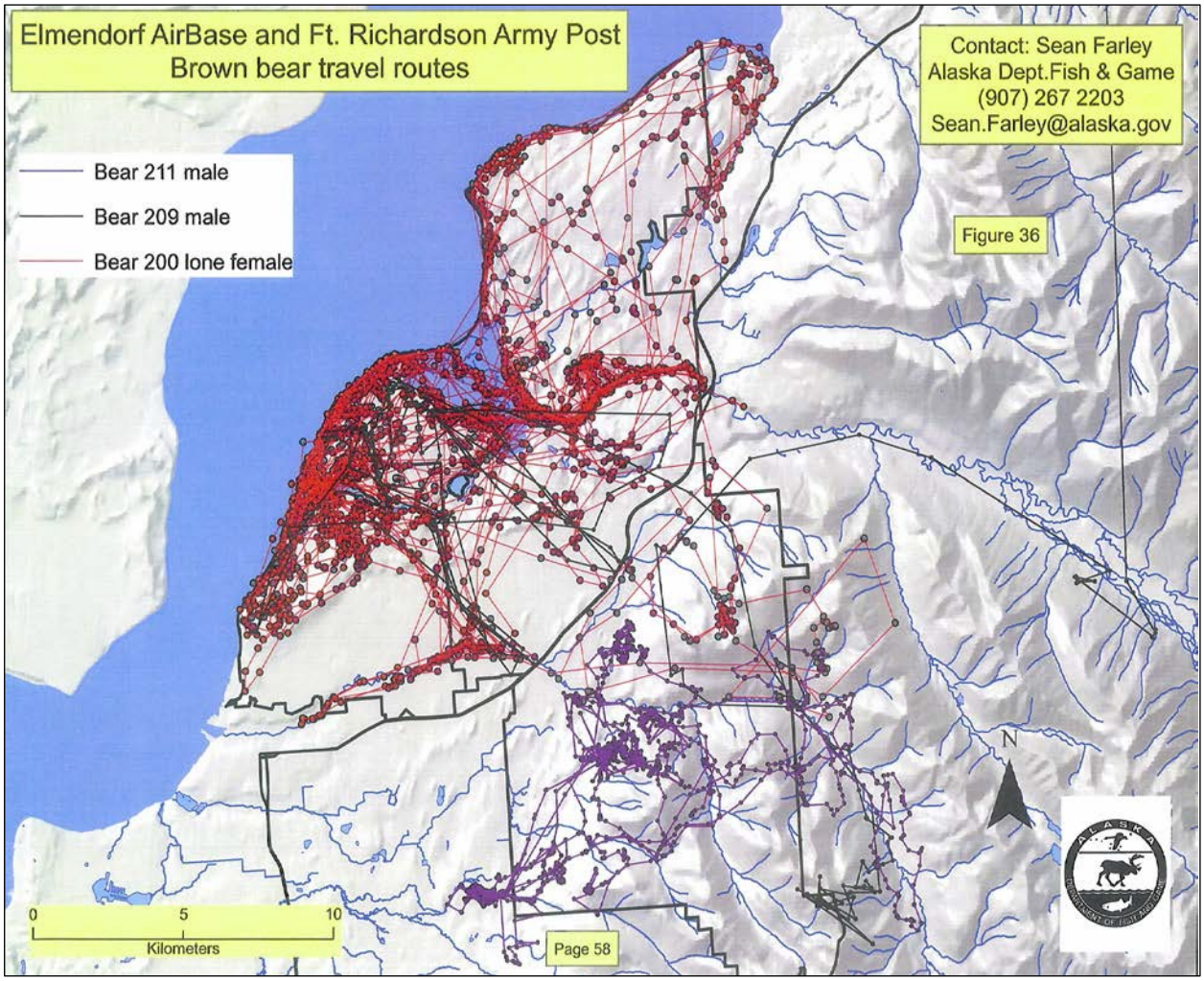
Bears foraged, reared young, and denned in close proximity to human development and human presence but seemed influenced by extent of vegetative cover. Most bears were seasonally attracted to salmon streams and were often within 10 meters of streams when salmon were present; however, three of five sows with cubs preferred alpine/subalpine habitats to raise their young. Most den sites were on mountain slopes; however, one sow denned and produced young less than 1,200 meters from the EAFB runway.

Farley et al (2008) identified several primary movement corridors for brown bear feeding on and passing through. These movement corridors are in part a function of habitat modification from clearing, development, and fencing. Bear movement was restricted by the Glenn Highway and associated game fence, but crossing efforts appeared at Ship Creek, near the north end of the east side fence, the weigh station, and Eagle River. Bears preferred forested habitat but frequently selected human developed trails for ease of travel. Primary movement corridors on military land followed Ship, Sixmile, and Campbell creeks, Eagle River, Knik Arm bluff, and undeveloped land east of the JBER airfield. The latter served as the primary connection between Ship Creek and undeveloped land north of the airfield and should be recognized as an important movement corridor for JBER wildlife (see figure below). Protecting these key

corridors will serve to keep bears and other wildlife from transgressing into industrial and housing areas in addition to prevent habitat fragmentation.

Stable isotope analysis of bear hair suggested the sampled population consumed 37% salmon (5-74%); 34% terrestrial meat (8-56%, presumably mostly moose), and 30% vegetation/berries (3-41%). The bears' attraction to salmon, which if allowed to freely pass the EAFB dam on Ship Creek, has the potential for increasing bear-human conflicts, elevating safety risks for humans.

**Brown Bear Movement Corridors Identified on Joint Base Elmendorf-Richardson-north** (Farley *et al*. 2008)




In 2012 and 2013 a study of black and brown bears in the anchorage area, including portions of JBER, was initiated by ADF&G to investigate movement and behavior patterns. This study used GPS collars equipped with video cameras. Video and locations from this study can be viewed on ADF&G's website at: http://www.adfg.alaska.gov/index.cfm%3Fadfg%3Dlivingwithbears.anchorageurbanbearsstorymap. A final report from this study is forthcoming.

**Beaver**

Beavers have caused damage by plugging culverts and waterways and cutting trees, posing risk to structures and vehicles. Areas where beavers have created problems included the Eagleglen Golf Course, Green Lake Chalet, Fairchild Avenue as it crosses the Lower Sixmile Lake dam, and along Sixmile Creek. Beaver problems have been handled on a case-by-case basis, with removal of individual animals. When it is imperative that the animals be removed, depredation permits were obtained, and volunteer trappers, the MCAs, or Wildlife Services contractors removed the beavers. Between 2001 and 2010, 5-15 beavers have been removed annually on JBER-Elmendorf.

**JBER-Elmendorf Beaver Population and Harvest Monitoring**

**Protocol.** During late September to mid-October, just before local lake surfaces freeze, JBER-Elmendorf water bodies are searched for active beaver lodges. Searches are conducted by foot or boat. Active lodges, indicated by a fresh cache and cuttings at the lodge, are marked on a map, and the size of the cache is estimated (surface square feet). An estimate of family size at each active lodge is made based on relative volume of the cache.

**Harvest strategy.** Where beaver are determined to be nuisance or undesirable, such as the Waterfowl Exclusion Area, all beaver are designated as surplus. In water bodies where beaver are desirable, a harvest of 20-40% of the estimated beaver population is designated as surplus.

Harvest through off-season nuisance beaver permits and beavers taken by volunteer trappers during the legal Game Management Unit 14C trapping season (1 December - 15 April) are recorded by size of the hide (width + length) if available. Size data are compiled by ADF&G.

| Year | Nuisance Harvest | Fall Active Lodges | Number of Water Bodies | Estimated Population (1 Dec) | Estimated Surplus | Trapper Harvest | Total Harvest |
|---|---|---|---|---|---|---|---|
| 2001 | No/data | n/d | n/d | n/d | n/d | 0 | n/d |
| 2002 | 5 | 8 | 6 | 39-50 | 24-28 | 17 | 22 |
| 2003 | 7 | 6 | 5 | 10-20 | 0 | 0 | 7 |
| 2004 | 6 | 8 | 6 | 18-28 | 6-8 | 6 | 12 |
| 2005 | 6 | 8 | 7 | 20-32 | 8-12 | 10 | 16 |
| 2006 | 6 | 6 | 6 | 15-25 | 5-7 | 6 | 12 |
| 2007 | 5 | 5 | 5 | 12-18 | 4-6 | 3 | 8 |
| 2008 | 5 | 4 | 3 | 6-10 | 2 | 2 | 7 |
| 2009 | 3 | 2 | 2 | 4-6 | 0 | 0 | 3 |
| 2010 | 10 | 3 | 3 | 6-8 | 0 | 0 | 10 |
| 2011 | 0 | n/d | n/d | n/d | n/d | 0 | 0 |
| 2012 | 0 | n/d | n/d | n/d | n/d | 0 | 0 |
| 2013 | 0 | n/d | n/d | n/d | n/d | 0 | 0 |
| 2014 | 0 | n/d | n/d | n/d | n/d | 0 | 0 |
| 2015 | 15 | n/d | n/d | n/d | n/d | 0 | 15 |

**Cook Inlet Beluga Whale**

See Appendix J *Cook Inlet Beluga Whale Monitoring Protocol and Results*

**Snowshoe Hare**

**JBER-Elmendorf Wildlife Winter Track Surveys**

**Protocol.** Observer(s) travel one of 13 set routes (Figure 2 below) by foot, snowshoe, ski, or vehicle recording all animals leaving tracks that cross a single line, usually at the edge of the route. The observer(s) identifies and records species, number, and direction of travel and a GPS location for every set of tracks or trail. No effort is made to eliminate multiple recordings of the same animal, but parallel travel by an individual is noted. Routes range from 1.0-2.0 km in length; the total of all routes is estimated at 19 km. Track surveys are conducted within 24 - 72 hours of the most recent track clearing snow event during November-February. An index of snowshoe hare density is calculated by counting all hare tracks on routes 4 and 5 and then dividing total tracks by nights since last snow and then by 100 to derive tracks/night/100feet. Hare index is generated from the earliest counts in November-December.

**Effort Summary**

| Year | Dates | Routes Surveyed | Total Surveys | Species Identified |
|---|---|---|---|---|
| 2004-05 | 4 Dec-16 Jan | 10 | 12 | MOOS, WOLF, COY, FOX, LYNX, MINK, STWE, PORC, SNHA, RESQ, SHRW, MICR, PASS |
| 2005-06 | 21 Nov | 3 | 3 | MOOS, DOG, COY, FOX, STWE, PORC, SNHA, RESQ, SHRW, MICR, |
| 2006-07 | 30 Nov-09 Mar | 8 | 10 | MOOS, WOLF, DOG, COY, FOX, LYNX, STWE, MINK, PORC, SNHA, RESQ, SHRW, MICR, ZAPUS, |
| 2007-08 | 14 Nov | 2 | 2 | MOOS, COY, FOX, STWE, PORC, SNHA, SHRW, MICR |
| 2008-09 | No count | 0 | 0 | |
| 2009-10 | No count | 0 | 0 | |

**Figure 1. JBER-Elmendorf Snowshoe Hare Track Index (tracks/night/100 feet) (No counts 2008-2009)**

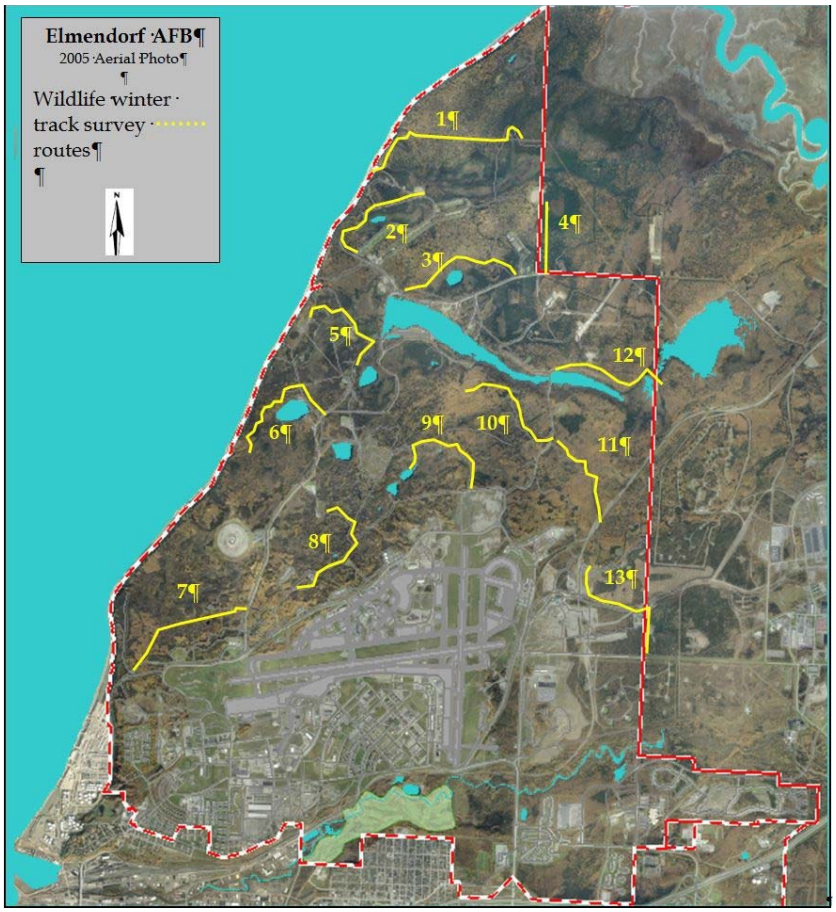



**Figure 2. Furbearer Winter Survey Routes, EAFB, 2004-2009**

## Microtines

**Protocol.** Small mammal inventories on JBER use a combination of live (Sherman live traps and pitfall) and museum special snap traps. Areas sampled are chosen based on a variety of factors. Each plot is sampled for three nights, with traps checked every 24 hours. Each plot consists of 120 traps set along two 300-meter linear transects that are roughly parallel (depending on topography) and 30 meters apart. Each transect consists of 20 stations set 15 meters apart. Each station has a circular array (about one meter apart) of three traps: one museum special snap trap, one Sherman live trap, and one conical pitfall trap. Snap traps are baited with a mixture of rolled oats and peanut butter, and Sherman live traps are typically baited with raisins and de-shelled sunflower seeds. Pitfall traps are not baited. Trap placement within the specific circular configuration varies but are usually set along natural runways when possible.

All easily identifiable live specimens captured are placed in a plastic bag to protect both the animal and collector, measured and then released immediately on-site. Live specimens that cannot be positively identified in the field are euthanized quickly using cervical dislocation, per Colorado State University animal handling procedures. Specimens are placed in individual plastic bags along with a waterproof label noting specimen number, date, location, species, condition of specimen, and collector(s) name. Specimens are then placed in an iced cooler within one hour of collection and frozen within three hours to maintain high quality tissue samples for possible future studies.

All specimens, except for those identified in the field and released, are sent to the museum at the University of Alaska Fairbanks for curation. Specimens are cleaned, processed, identified, and preserved in the University of Alaska Museum Mammal Collection. External and internal parasites are collected for future studies. Tissue samples from most specimens are collected and immediately frozen in an ultra-low temperature freezer (-80 Celsius). All data are entered into the Museum database.

A total of 11,160 trap nights yielded 1,199 specimens including the common shrew (*Sorex cinereus*), pygmy shrew (*Sorex hoyi*), dusky shrew (*Sorex monticolus*), tundra shrew (*Sorex tundrensis*), tundra vole (*Microtus oeconomus*), meadow jumping mouse (*Zapus hudsonius*), house mouse (*Mus musculus*), red-backed vole (*Clethrionomys rutilus*), meadow vole (*Microtus pennsylvanicus*), northern water shrew (*Sorex palustris*), short-tailed weasel (*Mustela erminea*) and arctic ground squirrel (*Spermophilus parryii*). The captures of the northern water and pygmy shrews represented important records due to the lack of knowledge on these species.

Three new species were added to the checklist of mammals on JBER. Currently, 46 species of terrestrial and aquatic mammals are known to occur on post. We now have a well-documented baseline of small mammal occurrence and a better understanding of their distribution, abundance and habitat associations. More results can be found in *A Small Mammal Inventory on Fort Richardson, Alaska, Final Report* (Peirce 2003).

Following recommendations by HDR in their report: *Long-term Monitoring Protocols: Vegetation, Birds, and Small Mammals* (HDR Alaska, Inc. 2013) monitoring of small mammals across JBER was associate with a larger long-term ecological monitoring project. Small mammal sampling plots will be located at the LTVM plots across JBER. A subset of the LTVM plots will be sampled for small mammals each year on a ten year rotation. Some modifications to the sampling protocol were also adopted to include: 1) Co-locate 3 small mammal transects that radiate from plot center at 60, 180, and 300 degrees; 2) Use a combination of Sherman live traps, Victor snap traps, and plastic pitfall traps to improve trapping success. This protocol was implemented beginning in summer of 2014.

## Moose

### Annual JBER Aerial Moose Survey

**Protocol.** Aerial surveys of the moose population in and around JBER have been conducted for approximately 40 years (comprehensive data available from 80s to present) and are currently conducted jointly by JBER and ADF&G. These annual comprehensive surveys are usually flown during early winter when obscuring deciduous foliage is at a minimum and when there is sufficient fresh snow depth (approximately 1-2 feet) to cover dark vegetation and soil that would otherwise mask the presence of individual moose. Every attempt is made to complete the surveys prior to the middle of December to minimize sexing errors due to the annual antler shed and to allow antler-class data collection. Data analysis and report generation are conducted by ADF&G. Data from these surveys are used in a variety of management decisions.

The area covered by this survey includes JBER and the upper Ship Creek Valley for a total coverage area of approximately 90,000 acres. This total area is divided into 14 discrete units called Survey Units. Contained within each survey unit is a smaller area of land called an intensive plot. Survey unit and intensive plot boundaries remain the same from year to year and follow recognizable topographic features to the greatest practicable extent. The size of each survey unit varies, depending on area topography, and range from just over 4,100 (survey unit 13) to just over 9,500 acres (survey unit 5). Intensive plot sizes likewise vary and range from just under 450 acres (intensive plot 8) to just under 900 acres (intensive plot 2).

Surveys typically employ the services of two experienced contract pilots flying small, maneuverable aircraft with low stall speeds (*e.g.*, PA-18, Piper Supercub). Total survey time varies, depending on a variety of factors, but usually requires 18 hours (1 -2 hours per survey unit) combined flight time flown over two consecutive days.

Data are collected by a single trained observer in each plane (typically one JBER and one ADF&G) and are recorded on a standard data form. Data recorded per animal observed include sex, relative antler class (if bull), number of calves (if cow) and if located in the intensive plot (called sightability corrector factor in the data sheet). Also indicated per survey unit are start/stop times, temperature, snow age and cover, light type and intensity, predominant habitat type and conditions potentially affecting survey results.

Surveys are conducted around 800 feet aboveground level at an approximate airspeed of 60-70 mph. Each survey unit is flown in its entirety using a standard linear search pattern, and then each intensive plot is resurveyed using a more intensive circular search pattern. The standard search consists of consecutive parallel transects (modified as required by topography and survey conditions) covering the entire survey unit (including the intensive plot). Transect width varies from approximately .25 -.5 mile. Every moose observed along the focus transect is circled to ensure data integrity.

The standard search portion of the survey provides data on the number of animals actually observed in the survey unit as a whole but must be adjusted for animals not seen by the observer to obtain a more accurate picture of population size. This adjustment is accomplished, in part, by intensively resurveying a portion of the survey unit (*i.e.*, the intensive plot) using an overlapping circular flight pattern. The objective of this intensive search is to obtain an exact count of the number of animals contained within each intensive plot.

These data are then compared to the number of moose observed in the intensive plot during the standard search and are used by ADF&G to generate a Sightability Correction Factor for that survey. This

Sightability Correction Factor is a multiplier that is used to adjust the observed number of moose to account for animals that were missed during that particular survey. For example, suppose that eight moose were observed within the intensive plot during the standard search of a given survey unit and that nine were actually sighted during the intensive search of the intensive plot. Assuming that every animal within that intensive plot was counted during the intensive survey and that the intensive plot is representative of the entire survey unit, it is assumed that for every 8 animals observed in the standard search, one animal was missed (.125 animals were missed for every animal sighted or 12.5% of observed total were missed). To adjust the number of observed animals then, the total number of observed moose is multiplied by 1.125 (Sightability Correction Factor).

**Alaska Department of Fish and Game Fall Moose Survey Results for JBER and Ship Creek Drainage within Chugach State Park, 1980 - Present.**

| | | | | | | | Moose Population (Reed 1989) Estimations Using Gasaway *et al*. (1986) Survey Methodology | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Reg year** | **Total Moose Observed** | **Bulls: 100 Cows** | **Yearling Bulls: 100 Cows** | **Calves: 100 Cows** | **Calves (%)** | | **Population Size** | **Total Bull** | **Total Yearling Bulls** | **Total Cow** | **Total Calf** |
| **1980-81** | 332 | 46 | 20 | 38 | 21 | | | | | | |
| **1981-82** | 349 | 51 | 21 | 62 | 29 | | | | | | |
| **1982-83** | 359 | 55 | 33 | 57 | 27 | | | | | | |
| **1983-84** | 386 | 60 | 24 | 55 | 26 | | | | | | |
| **1984-85** | 260 | 65 | | 40 | 19 | | | | | | |
| **1985-86** | 216 | 40 | | 34 | 19 | | | | | | |
| **1986-87** | 464 | 49 | 25 | 62 | 30 | | | | | | |
| **1987-88** | 494 | 41 | 20 | 38 | 21 | | | | | | |
| **1988-89** | 511 | 45 | 19 | 47 | 25 | | | | | | |
| **1989-90** | 527 | 34 | 14 | 37 | 22 | | | | | | |
| **1990-91** | ns | | | | | | | | | | |
| **1991-92** | 490 | 38 | 10 | 38 | 21 | | | | | | |
| **1992-93** | ns | | | | | | | | | | |
| **1993-94** | 456 | | | | | | 612 | | | | |
| **1994-95** | 401 | 40 | 15 | 28 | 17 | | 621 | 147 | 57 | 370 | 103 |
| **1995-96** | ns | | | | | | | | | | |
| **1996-97** | 294 | 57 | 10 | 31 | 16 | | 341 | 103 | 19 | 182 | 56 |
| **1997-98** | 356 | 59 | 12 | 33 | 17 | | 435 | 133 | 27 | 227 | 74 |
| **1998-99** | 386 | 42 | 13 | 32 | 18 | | 502 | 121 | 38 | 289 | 92 |
| **1999-00** | 408 | 57 | 24 | 31 | 16 | | 474 | 144 | 62 | 252 | 78 |
| **2000-01** | ns | | | | | | | | | | |
| **2001-02** | 482 | 63 | 20 | 33 | 14 | | 555 | 179 | 56 | 282 | 95 |
| **2002-03** | ns | | | | | | | | | | |
| **2003-04** | 527 | 58 | 18 | 40 | 20 | | 649 | 189 | 59 | 326 | 130 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2004-05** | ns | | | | | | | | | | |
| **2005-06** | 395 | 57 | 16 | 31 | 17 | | 435 | 131 | 36 | 231 | 73 |
| **2006-07** | 404 | 45 | 14 | 30 | 17 | | 452 | 115 | 36 | 258 | 78 |
| **2007-08** | ns | | | | | | | | | | |
| **2008-09** | 335 | 48 | 11 | 15 | 9 | | 473 | 139 | 32 | 287 | 43 |
| **2009-10** | ns | | | | | | | | | | |
| **2010-11** | 211 | 31 | 7 | 26 | 16 | | 339 | 67 | 15 | 215 | 55 |
| **2011-12** | 280 | 37 | 8 | 14 | 9 | | 335 | 83 | 18 | 222 | 31 |
| **2012-13** | ns | | | | | | | | | | |
| **2013-14** | 242 | 37 | | 21 | | | 347 | 57 | | 153 | 32 |
| **2014-15** | ns | | | | | | | | | | |
| **2015-16** | ns | | | | | | | | | | |

ns = No survey conducted

Reed, D.J. 1989. Draft. Moosepop: Program Documentation and Instructions. Alaska Department of Fish and Game. Fairbanks, AK. 15pp.
Gasaway, W.C., S.D. Dubois, D.J. Reed, and S.J. Harbo. 1986. Estimating Moose Population Parameters from Aerial Surveys. Biological Papers of the University of Alaska, No. 22. 108pp.

**Moose Hunter Effort/Success Summary, 2001-2015**

**JBER - Elmendorf Moose Hunt Summary**

| Year | Permits | Apps | Hunted (paid) [a] | Days Hunted | Total Shots Reported | Success | % | Male | Female |
|---|---|---|---|---|---|---|---|---|---|
| 2001 | 15 | 608 | | | Unk | 8 | | 5 | 5 |
| 2002 | 15 | 518 | 13(13) | | Unk | 9 | 69.2 | 5 | 4 |
| 2003 | 20 | 857 | 20(20) | 140 | +33 | 10 | 50.0 | 6 | 4 |
| 2004 | 20 | 610 | 19(19) | 120 | 27 | 9 | 47.4 | 6 | 3 |
| 2005[b] | 25 | 586 | 19(20) | 108 | 34 | 16 | 84.2 | 10 | 6 |
| 2006[c] | 25 | 653 | 21(21) | 213 | 41 | 11 | 52.4 | 6 | 5 |
| 2007 | 25 | 767 | 22(22) | 160 | 30 | 10 | 45.3 | 4 | 6 |
| 2008 | 25 | 758 | 22(23) | 215+ | 31 | 12 | 54.5 | 7 | 5 |
| 2009 | 18 | 753 | 16(17) | 128 | 16 | 8 | 50.0 | 8 | 0 |
| 2010 | 18 | unk | 15(15) | unk | unk | 6 | 33.3 | 6 | 0 |
| 2011 | 13 | unk | 12(12) | unk | unk | 4 | 33.3 | 4 | 0 |
| 2012 | 13 | unk | 11(11) | unk | unk | 3 | 27.3 | 3 | 0 |
| 2013 | 13 | unk | 13(13) | unk | unk | 7 | 53.8 | 7 | 0 |
| 2014 | 17 | unk | 13(13) | unk | unk | 8 | 61.5 | 8 | 0 |
| 2015 | un | unk | 15 | unk | unk | 3 | 20.0 | unk | unk |

[a] Elmendorf began charging all moose hunters $125 access fee 2002.
[b] Includes nuisance bull calf shot 2 Nov. by unsuccessful DM-428 hunter – new allowance by ADF&G.
[c] Includes nuisance bull shot 6 Oct.

**Hunt DM-428 (Archery, Day after Labor Day – Sept 30)**

| Year | Permits | Apps | Hunted | Days hunted | Total Shots Reported | Success | % | Male | Female |
|---|---|---|---|---|---|---|---|---|---|
| 2001 | 10 | 492 | 9 | unk | unk | 4 | 44.4 | 4 | 0 |
| 2002 | 10 | 394 | 9 | unk | unk | 5 | 55.6 | 5 | 0 |
| 2003 | 10 | 330 | 10 | unk | unk | 4 | 40.0 | 4 | 0 |
| 2004 | 10 | 286 | 8 | 73 | 15 | 5 | 62.5 | 5 | 0 |
| 2005[b] | 13 | 263 | 9 | 76 | 16 | 6 | 66.7 | 6 | 0 |
| 2006[c] | 13 | 310 | 10 | 103 | 15 | 5 | 50.0 | 5 | 0 |
| 2007 | 13 | 396 | 13 | 104 | 10 | 4 | 30.8 | 4 | 0 |
| 2008 | 13 | 363 | 11 | 134 | 13 | 4 | 36.4 | 4 | 0 |
| 2009 | 13 | 414 | 13 | 109 | 15 | 7 | 53.8 | 7 | 0 |
| 2010 | 13 | unk | 12 | unk | unk | 4 | 33.3 | 4 | 0 |
| 2011 | 10 | unk | 9 | unk | unk | 3 | 33.3 | 3 | 0 |
| 2012 | 10 | unk | 8 | unk | unk | 1 | 12.5 | 1 | 0 |
| 2013 | 10 | unk | 10 | unk | unk | 7 | 70.0 | 7 | 0 |
| 2014 | 12 | unk | 10 | unk | unk | 6 | 60.0 | 6 | 0 |
| 2015 | unk | unk | 12 | unk | unk | 3 | 25.0 | unk | unk |

b

Includes nuisance bull calf shot 2 Nov. by unsuccessful DM-428 hunter – new allowance by ADF&G.
[c] Includes nuisance bull shot 6 Oct.

**Hunt DM-429 (Archery, Day after Labor Day – Sept 30)**

| Year | Permits | Apps | Hunted | Days Hunted | Total Shots Reported | Success | % | Male | Female |
|---|---|---|---|---|---|---|---|---|---|
| 2001 | 5 | 116 | 5 | unk | unk | 4 | 80.0 | unk | unk |
| 2002 | 5 | 124 | 4 | unk | unk | 4 | 100.0 | unk | unk |
| 2003 | 5 | 77 | 4 | unk | unk | 3 | 75.0 | unk | unk |
| 2004 | 5 | 64 | 5 | 21 | 8 | 3 | 60.0 | 0 | 3 |
| 2005 | 7 | 82 | 6 | 20 | 10 | 6 | 100.0 | 0 | 6 |
| 2006 | 7 | 88 | 6 | 64 | 14 | 4 | 66.7 | 0 | 4 |
| 2007 | 7 | 102 | 7 | 42 | 13 | 5 | 71.4 | 0 | 5 |
| 2008 | 7 | 114 | 7 | 66 | 9 | 4 | 57.1 | 1 | 3 |
| 2009 | 0 | 1 | -- | -- | -- | -- | -- | -- | -- |
| 2010 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| 2011 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| 2012 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| 2013 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

**Hunt DM-430 (Archery, October 15 – November 15)**

| Year | Permits | Apps | Hunted | Days Hunted | Total Shots Reported | Success | % | Male | Female |
|---|---|---|---|---|---|---|---|---|---|
| 2001 | 0 | 0 | | | | | | | |
| 2002 | 0 | 0 | | | | | | | |
| 2003 | 5 | 440 | 5 | 23 | 6 | 3 | 60.0 | 2 | 1 |
| 2004 | 5 | 260 | 5 | 26 | 4 | 1 | 20.0 | 1 | 0 |
| 2005 | 5 | 241 | 4 | 12 | 8 | 4 | 100.0 | 4 | 0 |
| 2006 | 5 | 255 | 5 | 46 | 12 | 2 | 40.0 | 1 | 1 |
| 2007 | 5 | 269 | 2 | 16 | 7 | 1 | 50.0 | 0 | 1 |
| 2008 | 5 | 281 | 4 | 15+ | 9 | 4 | 100.0 | 2 | 2 |
| 2009 | 5 | 338 | 3 | 19 | 1 | 1 | 33.3 | 1 | 0 |
| 2010 | 5 | unk | 3 | unk | unk | 2 | 66.7 | 2 | 0 |
| 2011 | 3 | unk | 3 | unk | unk | 1 | 33.3 | 1 | 0 |
| 2012 | 3 | unk | 3 | unk | unk | 2 | 66.7 | 2 | 0 |
| 2013 | 3 | unk | 3 | unk | unk | 0 | 0 | 0 | 0 |
| 2014 | 5 | unk | 3 | unk | unk | 2 | 66.7 | 2 | 0 |
| 2015 | unk | unk | 3 | unk | unk | 0 | 0.0 | unk | unk |

**JBER – Richardson Moose Hunt Summary**

| Year | Permits | Hunted | Success | % | Male | Female |
|---|---|---|---|---|---|---|
| 2001 | 115 | 63 | 33 | 52.4 | 14 | 19 |
| 2002 | 120 | 104 | 42 | 40.4 | 27 | 15 |
| 2003 | 115 | 99 | 43 | 43.4 | 21 | 22 |
| 2004 | 120 | 104 | 32 | 30.8 | 21 | 11 |
| 2005 | 120 | 101 | 43 | 42.6 | 27 | 16 |
| 2006 | 120 | 102 | 42 | 41.2 | 24 | 18 |
| 2007 | 120 | 102 | 43 | 42.2 | 23 | 20 |
| 2008 | 120 | 104 | 50 | 48.1 | 31 | 19 |
| 2009 | 120 | 101 | 43 | 42.6 | 24 | 19 |
| 2010 | 126 | 99 | 46 | 46.5 | 24 | 22 |
| 2011 | 128 | 107 | 65 | 60.7 | 46 | 19 |
| 2012 | 119 | 101 | 42 | 41.6 | 29 | 13 |
| 2013 | 119 | 96 | 47 | 49.0 | 32 | 15 |
| 2014 | 108 | 87 | 34 | 39.1 | 25 | 9 |
| 2015 | unk | 97 | 37 | 38.1 | un | unk |

**DM422 (Muzzleloader, Day after Labor Day – Sept 30; Dec 15 – Jan 15)**

| Year | Permits | Hunted | Success | % | Male | Female |
|---|---|---|---|---|---|---|
| 2001 | 20 | 5 | 2 | 40.0 | 2 | 0 |
| 2002 | 22 | 19 | 8 | 42.1 | 8 | 0 |
| 2003 | 20 | 18 | 3 | 16.7 | 3 | 0 |
| 2004 | 20 | 18 | 5 | 27.8 | 5 | 0 |
| 2005 | 20 | 18 | 8 | 44.4 | 8 | 0 |
| 2006 | 20 | 18 | 5 | 27.8 | 5 | 0 |
| 2007 | 20 | 16 | 4 | 25.0 | 4 | 0 |
| 2008 | 20 | 19 | 8 | 42.1 | 8 | 0 |
| 2009 | 20 | 19 | 6 | 31.6 | 6 | 0 |
| 2010 | 18 | 14 | 6 | 42.9 | 6 | 0 |
| 2011 | 18 | 15 | 7 | 46.7 | 7 | 0 |
| 2012 | 18 | 16 | 4 | 25.0 | 4 | 0 |
| 2013 | 18 | 16 | 2 | 12.5 | 2 | 0 |
| 2014 | 15 | 13 | 7 | 53.8 | 7 | 0 |
| 2015 | unk | 12 | 2 | 16.7 | unk | unk |

**DM421 (Muzzleloader, Day after Labor Day – Sept 30; Dec 15 – Jan 15)**

| Year | Permits | Hunted | Success | % | Male | Female |
|---|---|---|---|---|---|---|
| 2009 | 0 | | | | | |
| 2010 | 6 | 5 | 3 | 60.0 | 3 | 0 |
| 2011 | 6 | 6 | 4 | 66.7 | 4 | 0 |
| 2012 | 6 | 5 | 2 | 40.0 | 2 | 0 |
| 2013 | 6 | 6 | 4 | 66.7 | 4 | 0 |
| 2014 | 5 | 3 | 2 | 66.7 | 2 | 0 |
| 2015 | unk | 3 | 2 | 66.7 | unk | unk |

**DM423 (Muzzleloader, Day after Labor Day – Sept 30; Dec 15 – Jan 15)**

| Year | Permits | Hunted | Success | % | Male | Female |
|---|---|---|---|---|---|---|
| 2001 | 5 | 1 | 0 | 0 | 0 | 0 |
| 2002 | 5 | 4 | 2 | 50.0 | 0 | 2 |
| 2003 | 5 | 5 | 3 | 60.0 | 0 | 3 |
| 2004 | 5 | 4 | 1 | 25.0 | 0 | 1 |
| 2005 | 5 | 5 | 4 | 80.0 | 0 | 4 |
| 2006 | 5 | 5 | 1 | 20.0 | 0 | 1 |
| 2007 | 5 | 5 | 3 | 60.0 | 0 | 3 |
| 2008 | 5 | 3 | 2 | 66.7 | 0 | 2 |
| 2009 | 5 | 3 | 0 | 0 | 0 | 0 |
| 2010 | 3 | 1 | 1 | 100 | 0 | 1 |
| 2011 | 3 | 2 | 1 | 50.0 | 0 | 1 |
| 2012 | 3 | 3 | 0 | 0 | 0 | 0 |
| 2013 | 3 | 3 | 1 | 33.3 | 0 | 1 |
| 2014 | 3 | 2 | 0 | 0 | 0 | 0 |
| 2015 | unk | 5 | 3 | 60.0 | unk | unk |

**DM424 (Archery, Day after Labor Day – Sept 30)**

| Year | Permits | Hunted | Success | % | Male | Female |
|---|---|---|---|---|---|---|
| 2001 | 40 | 13 | 1 | 7.7 | 1 | 0 |
| 2002 | 43 | 39 | 13 | 33.3 | 13 | 0 |
| 2003 | 40 | 33 | 10 | 30.3 | 10 | 0 |
| 2004 | 40 | 36 | 10 | 27.8 | 10 | 0 |
| 2005 | 40 | 31 | 12 | 38.7 | 12 | 0 |
| 2006 | 40 | 32 | 10 | 31.1 | 10 | 0 |
| 2007 | 40 | 37 | 8 | 21.6 | 8 | 0 |
| 2008 | 40 | 35 | 15 | 42.9 | 15 | 0 |
| 2009 | 40 | 35 | 12 | 34.3 | 12 | 0 |
| 2010 | 40 | 33 | 6 | 18.2 | 6 | 0 |
| 2011 | 40 | 34 | 15 | 44.1 | 15 | 0 |
| 2012 | 40 | 35 | 14 | 40.0 | 14 | 0 |
| 2013 | 40 | 32 | 17 | 53.1 | 17 | 0 |
| 2014 | 40 | 36 | 15 | 41.1 | 15 | 0 |
| 2015 | unk | 35 | 9 | 25.7 | unk | unk |

**DM426 (Archery, Dec 15 – Jan 15)**

| Year | Permits | Hunted | Success | % | Male | Female |
|---|---|---|---|---|---|---|
| 2009 | 0 | | | | | |
| 2010 | 25 | 21 | 15 | 71.4 | 6 | 9 |
| 2011 | 26 | 20 | 14 | 70.0 | 9 | 5 |
| 2012 | 26 | 22 | 13 | 59.1 | 6 | 7 |
| 2013 | 26 | 18 | 9 | 50.0 | 1 | 8 |
| 2014 | 20 | 14 | 4 | 28.6 | 1 | 3 |
| 2015 | unk | 17 | 9 | 52.9 | unk | unk |

**DM427 (Archery, Dec 15 – Jan 15)**

| Year | Permits | Hunted | Success | % | Male | Female |
|---|---|---|---|---|---|---|
| 2001 | 50 | 44 | 30 | 68.2 | 11 | 19 |
| 2002 | 50 | 42 | 19 | 45.2 | 6 | 13 |
| 2003 | 50 | 43 | 27 | 62.8 | 8 | 19 |
| 2004 | 55 | 46 | 16 | 34.8 | 6 | 10 |
| 2005 | 55 | 47 | 19 | 40.4 | 7 | 12 |
| 2006 | 55 | 47 | 26 | 55.3 | 9 | 17 |
| 2007 | 55 | 44 | 28 | 63.6 | 11 | 17 |
| 2008 | 55 | 47 | 25 | 53.2 | 8 | 17 |
| 2009 | 55 | 44 | 25 | 56.8 | 6 | 19 |
| 2010 | 34 | 25 | 15 | 60.0 | 3 | 12 |
| 2011 | 35 | 30 | 24 | 80.0 | 11 | 13 |
| 2012 | 26 | 20 | 9 | 45.0 | 3 | 6 |
| 2013 | 26 | 21 | 14 | 66.7 | 8 | 6 |
| 2014 | 25 | 19 | 6 | 31.6 | 0 | 6 |
| 2015 | unk | 25 | 12 | 48.0 | unk | unk |

**Moose Exclusion Gates along Glenn Highway**

**Introduction.** In an effort to exclude moose from portions of the Glenn Highway along the property line of Fort Richardson (now Joint Base Elmendorf-Richardson; JBER), fencing with one-way gates was installed in the late 1980s. The gates were designed reduce moose-vehicle collisions by reducing moose access to the roadway, allowing moose that ended up on the highway side of the fence to exit through a gate, but preventing passage through the gate toward the highway. Similar designs have been widely used to reduce wildlife-vehicle collisions in a variety of habitats with many large wildlife species. Because the design (Fig. 1) includes moving parts and elements susceptible to damage, maintenance of the system is crucial to its effectiveness.

**Survey.** On 9 October 2014 all moose gates (19 total, 10 with 2 openings and 9 with 1 opening) along the Glenn Highway adjacent to JBER were visited. Each gate was assessed as to the condition of the tines, whether or not the gate moves freely, and the necessity of vegetative clearing around the gate. Additionally, each gate was assigned a unique identifier, which was marked on the gate with paint pen (Fig 2), and a GPS waypoint was taken.

**Results.** All of the gates require some level of maintenance. Thirteen gates have bent or broken tines (Figs. 3 and 4). Three of the gates do not freely open and all but one gate stick, i.e. do not close readily after opening. Eight gates have over-grown vegetation in or around them (Fig. 5) such as to limit their effectiveness. All but two of the gates are equipped with a grease fitting (Fig. 6) to allow for easy lubrication. A summary of the results and GPS locations can be found in table 1.

**Recommendations.** At a minimum, to maximize the moose exclusions systems effectiveness at reducing moose-vehicle collision likeliness, all gates should be lubricated and vegetation cleared from those that need it. A bi-annual maintenance schedule should be established for lubrication and assessment of other requirements. Gates with bent or broken elements should be repaired. Anecdotally, moose have been observed jumping over gates from the JBER side toward the highway side of the fence. Some gates have a pole running over the top, above the moving elements. This may discourage moose from jumping over the gate. Replicating this on the gates that do not have it, or developing and alternative design, should be considered.

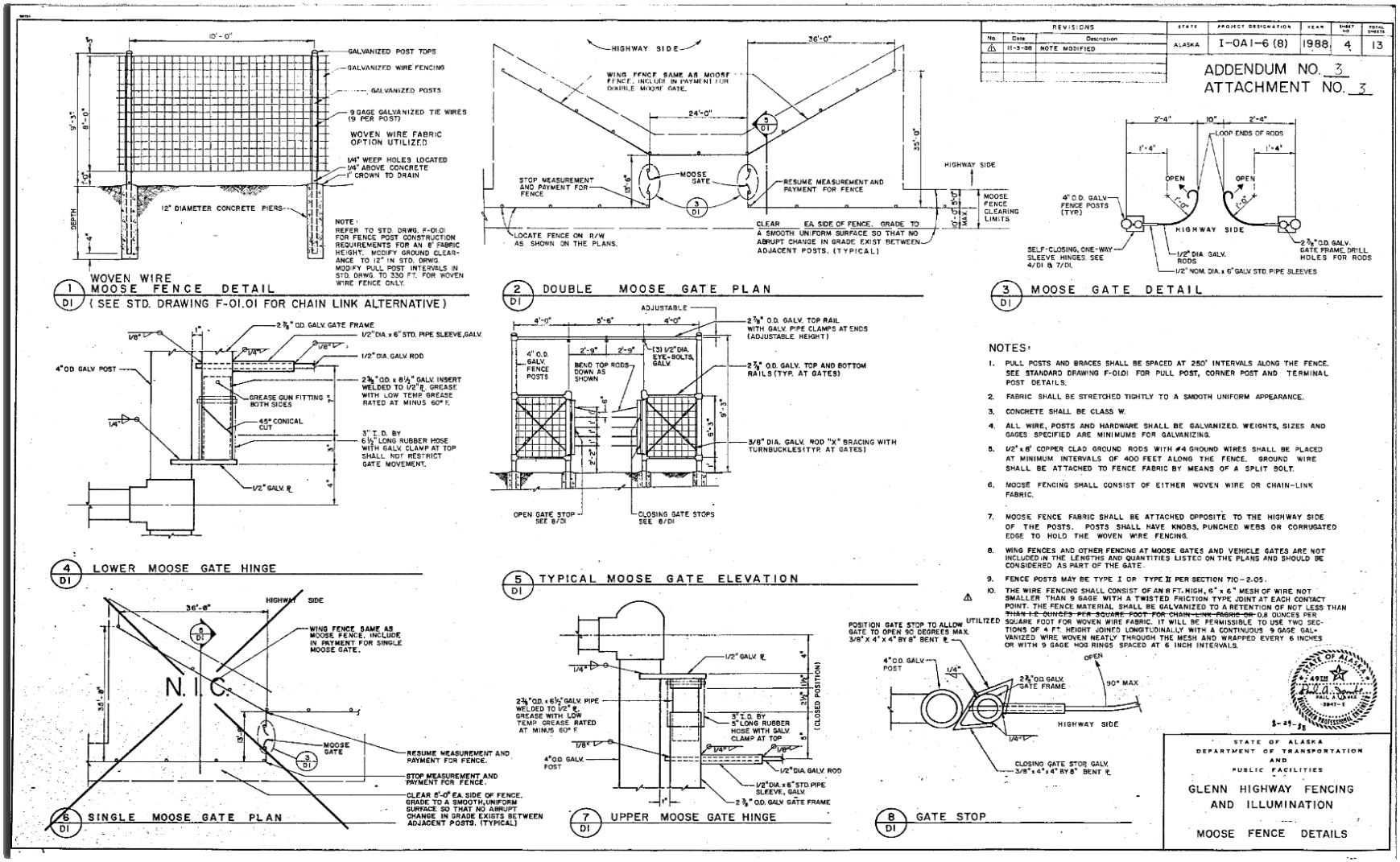



**Figure 1**. General design of moose gates along the Glenn Highway. Some gates vary slightly from this design. From State of Alaska Department of Transportation document referencing project designation I-0A1-6(8) / 57483, 1988.

**Figure 2**. Unique identifier marked on gate with paint pen.

**Figure 3**. Gate with bent tines.

**Figure 4**. Gate with bent and broken tines.

**Figure 5**. Gate with overgrown vegetation.

**Figure 6**. Grease fitting (arrow) to facilitate lubrication.

**Table 1**. Summary of data collected 9 October 2014 on the condition of moose gates. Bent or broken indicates that at least one tine on a gate at that location is bent or broken

| Gate ID | Latitude | Longitude | # of Entrances | Tine Condition | Opens Freely | Sticks | Needs Veg Clearing |
|---|---|---|---|---|---|---|---|
| GE1 | 61.2315 | -149.7105 | 2 | broken and bent | yes | yes | yes |
| GE2 | 61.2374 | -149.9644 | 1 | bent | yes | yes | yes |
| GE3 | 61.2380 | -149.6928 | 1 | bent | yes | yes | yes |
| GE4 | 61.2394 | -149.6888 | 1 | bent | yes | yes | yes |
| GE5 | 61.2398 | -149.6882 | 1 | good | yes | yes | yes |
| GE6 | 61.2413 | -149.6863 | 2 | bent | yes | yes | yes |
| GE7 | 61.2499 | -149.6669 | 2 | bent | yes | yes | yes |
| GE8 | 61.2563 | -149.6508 | 2 | bent | yes | yes | no |
| GW1 | 61.2729 | -149.6355 | 2 | good | yes | yes | no |
| GW2 | 61.2636 | -149.6419 | 2 | good | no | yes | no |
| GW3 | 61.2562 | -149.6538 | 2 | bent | yes | yes | no |
| GW4 | 61.2508 | -149.6678 | 2 | good | yes | yes | no |
| GW5 | 61.2419 | -149.6876 | 2 | bent | yes | yes | no |
| GW6 | 61.2387 | -149.6944 | 1 | broken and bent | yes | no | no |
| GW7 | 61.2383 | -149.6954 | 1 | bent | no | yes | no |
| GW8 | 61.2302 | -149.7211 | 2 | bent | yes | yes | yes |
| GW9 | 61.2250 | -149.7942 | 1 | good | no | yes | no |
| GW10 | 61.2253 | -149.7495 | 1 | good | yes | yes | no |
| GW11 | 61.2250 | -149.7677 | 1 | bent | yes | yes | no |

## Harbor Seal

Harbor seals have been monitored opportunistically annually since 2007 during scheduled CIBW observations and are occasionally noted in Eagle Bay and Eagle River from the mouth to as far upstream as Bravo Bridge (one occasion), and (at high tide) in Otter Creek. As many as four seals have been observed at one time at the mouth of Eagle River although the usual number of seals observed is between 1-2. Seal behavior observed in Eagle Bay and at the mouth of Eagle River includes: Milling, prey pursuit, feeding (salmon), travelling, leaping from water, and basking while hauled out on land. Harbor seals are most often observed in Eagle Bay and Eagle River during August (41% of total observations) and September (36%) with July (12%), June (7%), May (3%) and October (2%) yielding far fewer detections. Harbor seals have not been observed in the area during the months of November or December.

### Gray Wolf

A wolf telemetry study on EAFB and FRA was initiated in 1995 (Bostick 1995) due to increasing wolf-human and wolf-dog conflicts conflicts. Those conflicts increased again beginning in 2007. The telemetry study initiated in 1995 revealed that at least two wolf packs, totaling about 15 animals, used the EAFB area on a regular basis. Five wolves (4 females and 1 male) were captured and radio collared. However, the study came to an untimely end with the death of four of the five collared animals within months of capture. The high rate of deaths caused concern in natural resources staff, and the cooperative trapping effort ended. The belief was that the project was responsible for the high mortality. However, results actually pointed to the high turnover in a pack taking up residence on the edge of an urban setting.

It was thought that a follow up study designed to collect global positioning system data from adult wolves should circumvent the high mortality rate while more accurately representing pack activities. A single wolf from each pack was collared during 2009/2010 as a component of a wildlife movement corridor study(see Figure 1 for map of locations). A removal program, prompted by aggressive wolf behavior, was initiated in 2010 and removed 10 wolves from two packs.

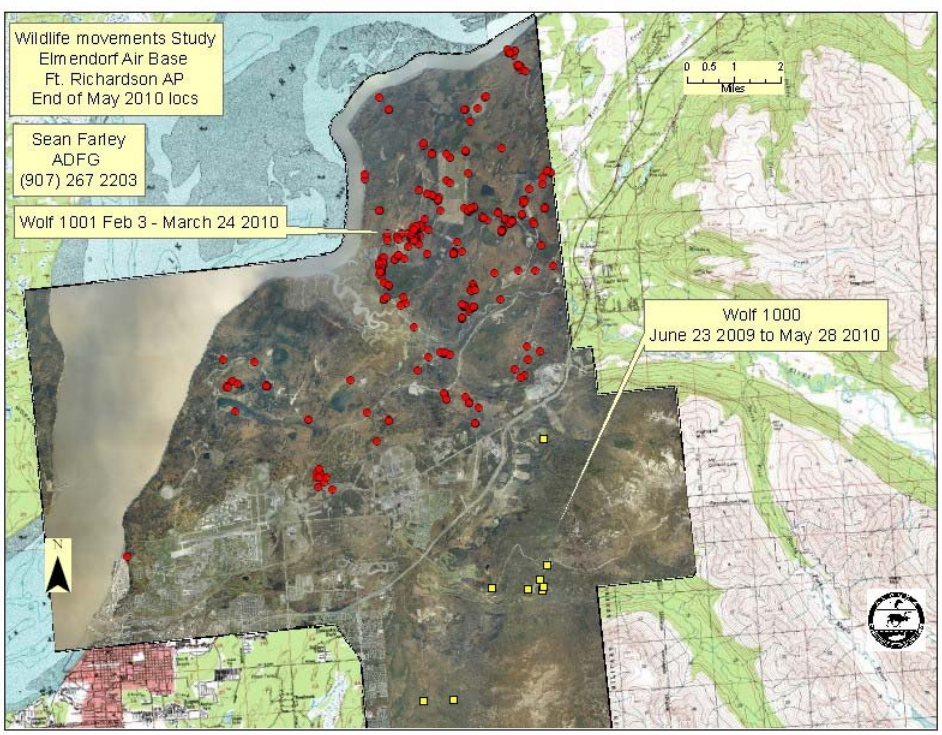



**Figure 1. Locations of two wolves collared on JBER between 2009 and 2010.**

**Wolverine**

Winter 2009-2010 marked the second year of a live trapping effort for wolverines on JBER-Richardson. Along with elucidating movement patterns for this species, it was hoped that collaring animals would lead to further refinement of track surveys used to calculate population densities. In addition to live trapping, an attempt was made to "trap" wolverines using cameras to identify unique chest patterns of individual animals.

Traps were open for a total of 581 trap nights. Live trapping took place from 23 November 2009 to 11 May 2010. Only one animal, an adult male, was captured, on 5 April 2010. This animal was fitted with an ear tag but came out of the immobilization drugs before it could be fitted with a collar. Numerous pictures were taken of wolverines at each trap site, and it is likely that at least three and possibly four individuals were identified in the project area. A wolverine with a red right ear tag (either CWF001 or CWF003, or possibly both) was a common visitor to the Stuckagain trap site. In addition, the same night that the large male (CWM002) was captured at the Stuckagain site, another wolverine was observed climbing onto the run pole for the camera trap at this site.

Over the course of the project 9,227 photos were taken at wolverine trap sites. Of these, 863 (9.3%) were positive for the presence of wolverine. Of the six trap sites, only three (Stuckagain, Oilwell Road, and Rawcliffe) had wolverine activity. The Stuckagain trap site was the most active with 454 photos, followed by Oilwell Road (266) and Rawcliffe (143).

Wolverines were recorded several times of the day; however, most wolverines were found at trap sites during early morning and late evening hours. There were several instances in which cameras at live trapping sites took photos during the middle of the day, only to have nothing recorded. It is possible that a wolverine moving at the perimeter of the cameras range could have triggered a photo to be taken while failing to record an animal.

Camera trapping took place from 12 March to 11 May 2010 totaling 104 trap nights and 2,083 photos. Of these, 222 (10.6%) were positive for the presence of wolverine. Unfortunately, only one wolverine presented itself for a proper photo of its chest markings, and even this photo was of low quality and might not be useful for individual identification. Several other species were seen at trap sites, including marten, fox, moose, wolf, coyote, black and brown bear, several species of birds, and domestic dogs. By far the most common non-target species at trap sites was marten. Wolves were common at trap sites along Bulldog Trail during November to March. No wolves were observed at the Stuckagain trap site, though coyotes were common.

## *BIRDS*

A partial inventory of birds was conducted on EAFB (Rothe *et al*. 1983). Since 2002, breeding birds have been surveyed each spring using modified variable circular plot counts (Reynolds *et al.* 1980) and a typical 50-stop roadside breeding bird survey (Robbins *et al*. 1986). In addition, breeding owl surveys and winter berry-use surveys have added to knowledge of birds on JBER-E.

A 1994, USFWS raptor inventory (Schempf 1995) identified six different types of raptors on FRA. An intensive owl survey conducted by the USFWS in 1997 (Browne and Andres 1997) identified three species of owl on FRA. Inventory and monitoring of landbirds has been conducted on FRA and the USFWS has also assisted with bird surveys. Forty bird plots were established in conjunction with Range and Training Land Assessment, and two Measuring Avian Productivity and Survival surveys have recorded 55 species. Inventories conducted by the Environmental Research and Development Center, Cold Regions Research Center have identified 103 avian species, including 25 waterfowl species in the salt marsh or the surrounding forested border of ERF (Steele and Reitsma 1991-1994, Collins *et al*. 1995-2003). A list of birds observed on JBER is included in Appendix F.

### Geese/Waterfowl

Waterfowl habitat management on JBER is either designed to improve habitat or to remove or make habitat less useful. Habitat for loons was enhanced by placement of artificial nesting platforms on several lakes. Waterfowl, and in particular, goose habitat, is reduced around the airfield and golf courses as part of the BASH program. Grass is allowed to grow along the flightline to discourage geese from roosting; some grass species known to be unpalatable to geese are planted; and grassy fields are broken up by planting trees to discourage geese use. Where possible, habitat losses associated with these activities will be mitigated off-site in areas where human conflicts are not an issue.

Eagle River Flats waterbird surveys in response to white phosphorous contamination have been conducted by fixed-wing aircraft with the following methodology. Aerial transect surveys are patterned after standard Department of Interior aerial survey techniques. Approximately 10 parallel transects are flown twice, in opposite directions, during each survey. Transect lines run generally in a north/south direction from tree line on the south side of ERF to the coast of Knik Arm on the north. Due to considerable variability of water conditions, lighting conditions, and numbers of birds on ERF, transect endpoints are not fixed points and may vary depending on conditions. The controlling factor will be complete coverage of suitable habitat for waterbirds with good visibility under conditions at the time. Surveys are conducted at maximum altitude of 75 meters and airspeed of 100-150 km/hour. Surveys are started on the west side of ERF and proceed inland. The observer sits on the right side of the airplane and counts all waterbirds on the right side out to a maximum of 200 meters. The pilot initiates the first transect at a distance from the tree line indicated by the observer, not to exceed 200 meters. At the end of the transect, the pilot turns and flies the same transect in the opposite direction, allowing the observer to count in the opposite direction using visual landmarks to mark the outside edge of that transect. The pilot initiates the next transect at a distance not to exceed 200 meters to the side of the previously used visual landmarks and establishes new visual landmarks for the next transect. This procedure is repeated until the entire ERF area has been surveyed.

### Passerines

#### JBER Breeding Bird Surveys

**<u>Point Counts</u>**

**Protocol.** Point counts following protocol similar to variable circular plots (Reynolds *et al* 1980). Observer(s) conducts point counts of every bird heard or seen using the Alaska Landbird Monitoring System as described by Handel (2003). These counts using 30 points were established in 2001 as Long-term Vegetation Monitoring Plots on the north side of JBER-Elmendorf (Tande *et al*. 2001a). Points represent non-developed habitats on the northern end of JBER-Elmendorf. Sampling at each site lasts 10 minutes; birds heard or observed are recorded by direction and distance. Counts begin at ½ hour before sunrise during 1-30 June. Counts end by 0800 on individual days. Several days may be required to complete all points.

**Effort Summary**

| Year | Dates | Points Counted | Total Species | Dominant Species and MIS (Total/Points) |
|---|---|---|---|---|
| 2003 | 4-12 June | 30 | 48 | SWTH (90/30), MYWA (37/21), AMRO 36/21), DEJU (24/15), GRAJ (19/15), ALFL (20/8), OSFL(14/13), CORE (13/8), WISN (12/10), WWCR(12/6), RUBL(1/1), SOSA(0/0), TOWA(0/0), BLPW(4/3), NOGH(1/1), |
| 2004 | 9-22 June | 30 | 40 | SWTH (108/29), MYWA (46/24), DEJU (29/20), AMRO (30/15), WWCR (31/13), GRAJ (14/13), ALFL (31/11), RCKI (13/11), WISN (13/11), OSFL(7/7), RUBL (0/0), SOSA(1/1), TOWA(0/0), BLPW(0/0), NOGH(0/0) |
| 2005 | No count | | | |
| 2006 | No count | | | |
| 2007 | 9-20 June | 30 | 35 | SWTH(103/30), MYWA(44/24), AMRO(38/22), DEJU(30/15), ALFL(36/14), GRAJ(14/14), RCKI(18/12), LISP(16/12), WISN(14/12), OSFL(6/6), RUBL(0/0), SOSA(1/1), TOWA(0/0), BLPW(4/3), NOGH(0/0) |
| 2008 | No count | | | |
| 2009 | No count | | | |

Following recommendations by HDR in their report: *Long-term Monitoring Protocols: Vegetation, Birds, and Small Mammals* (HDR Alaska, Inc. 2013) monitoring of birds across JBER was associate with a larger long-term ecological monitoring project. Point-count surveys for birds will be conducted at the LTVM plots across JBER. A subset of the LTVM plots will be sampled for birds each year on a ten year rotation. This protocol was implemented beginning in summer of 2014.

**Roadside Surveys**

**Protocol.** Breeding bird roadside counts (Robbins *et al* 1986) are conducted along a 25 mile route on JBER-Elmendorf and JBER-Richardson. Birds seen and heard during 3-minute survey periods are recorded at each stop. Initiated in 2006 on JBER-Elmendorf as an alternate survey-year method, the count was first conducted on 7 May, and repeated on 29 May and 18 June in an attempt to measure abundance of early breeding passerines. Observer(s) conduct standard roadside breeding bird counts at 50 points that are ½ mile distance from previous stops. The observer or assistant records every bird heard or seen during the 3-minute period at each stop. Counts begin ½ hour before sunrise during 1-20 June. This survey was intended to complement the point counts by covering the cantonment areas in addition to the undeveloped north side of JBER-Elmendorf. Bird detections are mapped on Alaska Landbird Monitoring System point

count forms to allow comparisons of data. Three counts were conducted once/month during May and June (2006 only). The two May 2006 counts were intended to better evaluate breeding densities of early and late nesters. The roadside count is weighted toward developed areas while the point count Alaska Landbird Monitoring Survey represents more undeveloped habitats.

**Effort Summary**

| Year | Dates | Points Counted | Total Species | Dominant Species and MIS (Total/Points) |
|---|---|---|---|---|
| 2006 | 18 June | 50 | 46 | AMRO(72/41), ALFL(56/34), SWTH(69/32), DEJU(55/32), MYWA(38/28), WCSP(27/19), SASP(33/18), RCKI(23/17), WISN(18/12), OSFL(2/2), RUBL(0/0), SOSA(0/0), TOWA(1/1), BLPW(0/0), NOGH(0/0) |
| 2007 | 9 June | 50 | 49 | AMRO(85/43), MYWA(51/34), SWTH(88/33), ALFL(67/32), DEJU(56/32), SASP(22/17), CORE(23/16), LISP(22/16), WCSP(19/16), OSFL(5/4), RUBL(4/4), SOSA(0/0), TOWA(0/0), BLPW(2/2), NOGH(0/0) |
| 2008 | 14 June | 50 | 45 | SWTH(82/32), AMRO(70/33), ALFL(54/32), DEJU(52/32), WCSP(31/17), MYWA(30/23), SASP(21/13), WISN(18/15), CORE(16/12), OSFL(3/3), RUBL(0/0), SOSA(2/2), TOWA(0/0), BLPW(1/1). NOGH(0/0) |
| 2009 | 14 June | 50 | 45 | AMRO(74/37), ALFL(72/33), SWTH(72/29), MYWA(42/30), DEJU(28/22), WISN(20/16), WCSP(21/13), SASP(19/14), OCWA(16/14), OSFL(3/3), RUBL(0/0), SOSA(2/2), TOWA(1/1), BLPW(1/1), NOGH(0/0) |

**FRA Alaska Landbird Monitoring System and Breeding Bird Survey Synopsis for 2008**

**Alaska Landbird Monitoring System**

An Alaska Landbird Monitoring Survey grid was established in the Arctic Valley area of FRA (Figure 1 below) where 21 of 25 points were surveyed. Seven distinct habitats ranging from tall shrub thicket to dwarf shrub mat were sampled. A total of 24 bird species were identified (mean of 6.14, range 3-11) with 174 overall detections. Some species may have been missed due to later arrival in 2008 as a result of a severe snow event in late April.

ALMS survey methodologies will be conducted at the LTVM sites. Not all of the 120 available plots will be used for this type of survey because of the requirements of ALMS, however, JBER staff are in the process of selecting appropriate points for replication in future studies. *Long-term Monitoring Protocols: Vegetation, Birds, and Small Mammals* (HDR Alaska, Inc. 2013).

**Breeding Bird Survey**

A FRA Breeding Bird Survey route has been run continuously since 1994. Due to injury, a new observer (McKee) ran this route in 2008. A total of 37 species were identified (mean of 6.44, range 2-11) with 502 overall detections. Four species (Alder Flycatcher, Swainson's Thrush, Yellow-rumped Warbler, and Junco) accounted for 60% of all detections.

**FRA Alaska Landbird Monitoring System Survey Synopsis for 2010**

Summer 2010 was the second year in which an Alaska Landbird Monitoring System survey was conducted on FRA. The survey grid was established in summer 2008 and is run every two years. Results of 2010 efforts are summarized below.

**Methods**

The purpose of Alaska Landbird Monitoring System is to monitor long-term trends in breeding populations of landbirds. The entire state of Alaska is overlain with a virtual 10X10 km sampling grid. Within this grid, sampling blocks have been randomly ordered and a starting point within each block is randomly selected as the center point in an array of 25 points. Points are arranged in a 5X5 array (Handel and Cady 2004).

Spacing between points in an Alaska Landbird Monitoring System grid is determined by the type of habitat being surveyed. In closed habitats, spacing is 250 m, while in open habitats, spacing is set at 500 m. The grid on FRA was established in the Arctic Valley area, which is made up of a mosaic of habitat types, but dominated by more or less open habitats ranging from grass meadows to dwarf shrub (Figure 1 below). Because of this, all points on the FRA grid were spaced 500 m apart.

A minimum of 15 points is needed to establish an Alaska Landbird Monitoring System grid. Points that are located in unsafe terrain are excluded. Detailed habitat data are collected at each point, and all points are photo referenced. Habitat data on all points are collected every 10 years or after a major disturbance, such as a fire. Twenty-one points were established in 2008 with the other four being excluded due to heavy snow loads and extreme slopes.

**Results**

Eighteen species were detected during the counts. One other species (willow ptarmigan) was seen between survey points 5 and 10, but was not detected during the survey. Five species (golden-crowned sparrow, savannah sparrow, hermit thrush, orange crowned warbler and Wilson's warbler) accounted for 62% of all bird detections. The mean number of species detected per point was 5.6 (range 2-15). The mean number of detections per point was 8.3. Total number of bird detections was 174. Two species (lapland longspur and snow bunting) were detected for the first time in 2010.

Seven distinct habitat types are within the FRA grid: dwarf shrub mat, deciduous forest, tall shrub thicket, grass meadow, dwarf shrub meadow, medium shrub thicket and low shrub thicket. The highest number of species were detected in the dwarf shrub meadow habitat type ($\bar{x}$ = 8) while the highest number of detections was in the tall shrub thicket habitat type ($\bar{x}$ = 12.6). There was no significant difference in the mean number of species between habitat types ($F(6,14) = .88$, $p = .52$) or the mean number of detections between habitat types ($F(6,14) = 1.79$, $p = .17$).

Comparisons between the two survey years (2008 and 2010) do not warrant statistical analysis at this time as no trends can be detected with such a limited dataset, but some initial results are worth mentioning. Species diversity was lower in 2010 ($\bar{x}$ = 5.6) than in 2008 ($\bar{x}$ = 6.1), although the largest number of species detected per point was higher in 2010 (N = 15) than in 2008 (N = 11). The overall number of detections between years was identical (N = 174). Detections by habitat type were similarly distributed with the highest average detections coming from the tall shrub thicket and grass meadow habitat types in both years. Species diversity was highest in the grass meadow type in 2008 and the dwarf shrub meadow type in 2010.

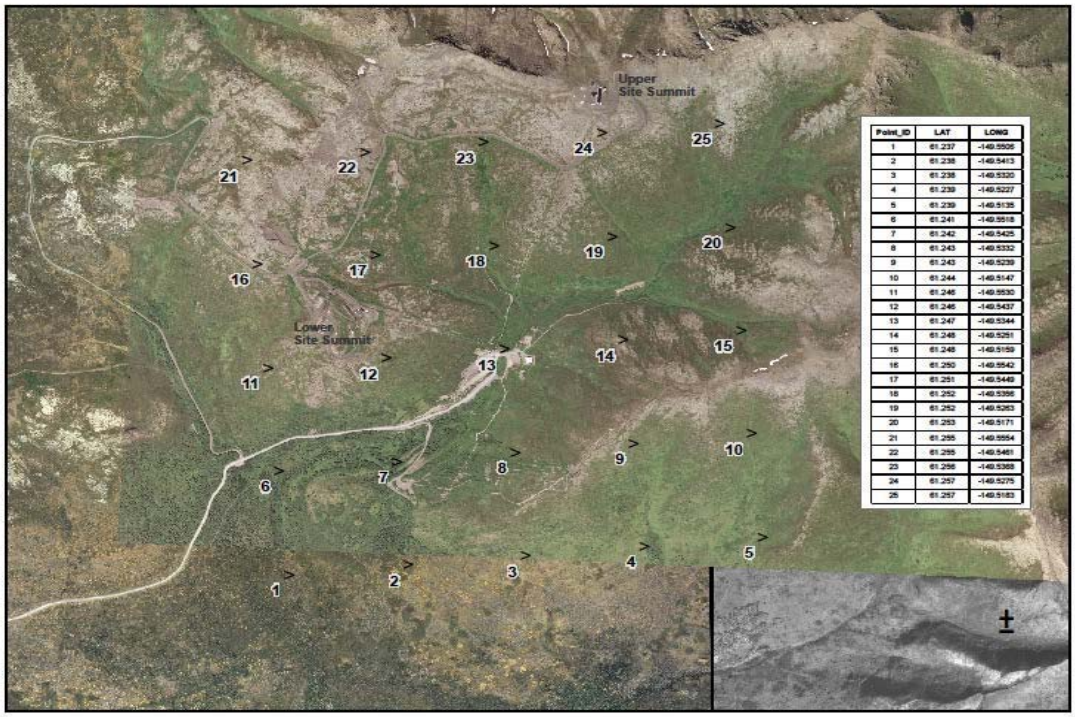



**Figure 1. Alaska Landbird Monitoring System Grid in Arctic Valley Area of FRA.**

### Rusty Blackbird

The Rusty Blackbird, a USFWS bird of conservation concern, has suffered one of the steepest declines of any bird species in North America with populations reduced by 90-98 percent since 1966. Matsuoka *et al* (2008) found that JBER lands were relatively important for this declining species with 21 and 23 nests found during 2007 and 2008, respectively. The study also found that Rusty Blackbirds on JBER nest in vegetation that was close to water, birds nesting (58 ± 14 m) from the water's edge. The freshwater surface area was typically 54.6 ± 24.5 acres and had 22.5 ± 12.6 acres of emergent vegetation. In Anchorage, birds selectively nested in patches with high relative densities of black spruce in scrub-shrub wetlands near the open water. Nests were in spruce trees typically 6.9±1.0 m in height and with a trunk diameter at breast height of 9.2 ± 1.1 cm. Spruce trees in this habitat are at risk to removal by Christmas tree hunters and other users.

The Solitary Sandpiper, another bird of conservation concern, is known to use abandoned nests of Rusty Blackbirds for their nests (Moskoff 1995). Thus this habitat is important to multiple species of conservation concern.

### Eagle River Flats Bird Survey

Objectives:
Document bird species that use ERF (includes nesting, foraging, stopover).
Identify temporal variation in species composition and numbers.
Identify use by established areas (A,B, BTF, etc) including proposed target area.

The primary objective of this study is to obtain baseline data on the bird use of Eagle River Flats. These are pilot studies to gather initial use data and also to determine methods that work best and that are

statistically viable. The vegetation of ERF was documented during studies surrounding the white phosphorus remediation. This data will be used to compare species composition and habitat use based on the five generalized vegetation zones (Racine et al 1993, 1994). Species that are listed as priority in the INRMP will be the primary targets of this survey. Because there have been numerous aerial surveys for waterfowl over the past twelve years, those species will not be included as primary targets, however, they will be recorded when seen. All other species will be identified down to the lowest taxa level possible.

Method - Vantage Point Surveys

Because entering ERF is not permitted due to the number of unexploded ordinances, this study's method is based on the vantage point survey methods used in Armstrong et al (2004), Cain et al (1988), and Harh and Trapp (2004). This method utilizes set vantage points around the perimeter of the ERF. The ERF has been split into survey sections that will be scanned using binoculars and a spotting scope from the designated vantage points. The vantage points were chosen based on viewing ability determined by satellite photographs, but will be changed if more appropriate points are determined in the field. All species seen and heard while moving between the vantage points will be recorded. Species of concern will be identified to species and all other species will be identified to the lowest possible taxa level within a reasonable amount of time. The surveys will take place over two consecutive days; one includes observations two hours on either side of high tide and the other includes observations two hours on either side of low tide. This is in order to observe the greatest daily numbers of shorebirds (Colwell and Cooper 1993) and to determine if there is significant variation in the observation of birds on the flats. Surveys will begin the second week in May and continue until the end of the fall migration; they will be conducted twice a week on consecutive days (around high and low tide). The days of the surveys will be determined by tide times, but each set of weekly surveys must fall within 7-10 days of the previous week's surveys (Farmer and Durbian 2006).

Survey Conditions

Both the Vantage Point surveys will only be conducted in conditions with good visibility and little to no precipitation. Winds will be calm to light breeze.

## Loons

Common and Pacific Loons (and Trumpeter Swans) nest on the shore or on an island in freshwater lakes of 7 acres or larger that have an abundant fish population. Loons have been monitored by ADF&G, USFWS, and citizen science volunteers in south-central Alaska for decades. Loons on JBER are considered an indicator species for lowland lacustrine habitat. Nesting sites are susceptible to disturbance by recreational boaters and anglers.

### JBER-Elmendorf Breeding Loon Surveys

**Protocol.** Volunteer observer(s) visit installation lakes 1-4 times per month between May and September and record all observations of loons, documenting nesting location, chicks hatched, and chicks fledged (if known). Data are submitted to USFWS for inclusion into the Anchorage Loon-watch database.

**Summary of EAFB loon breeding and production as observed by USFWS Loon Watch Volunteers, 1985-2010.**

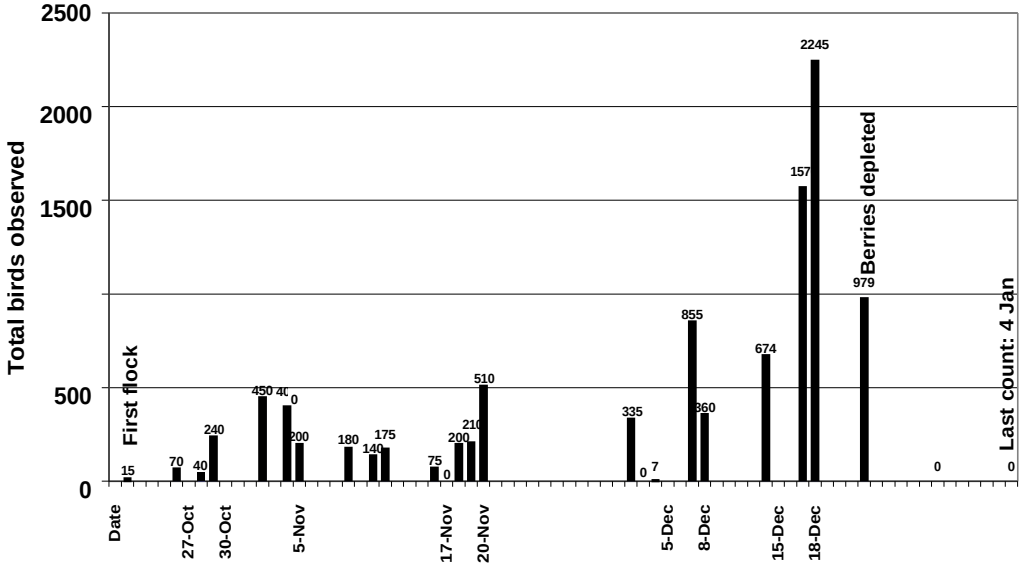
| | Common Loon | | | Pacific Loon | | | Total |
|---|---|---|---|---|---|---|---|
| Year | Pairs | Chicks | Fledged | Pairs | Chicks | Fledged | fledged |
| 1985 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |
| 1986 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| 1987 | 1 | 2 | 2 | 1 | 0 | 0 | 2 |
| 1988 | 1-3 | 0 | 0 | 1-2 | 1 | 1 | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1989 | 1-2 | 0 | 0 | 1-2 | 0 | 0 | 0 |
| 1990 | 2 | 3 | 2 | 1 | 1 | 1 | 3 |
| 1991 | 3 | 5 | 3 | 1 | 2 | 2 | 5 |
| 1992 | 3 | 2 | 1 | 0 | 0 | 0 | 1 |
| 1993 | 3-4 | 3 | 2-3 | 2 | 1 | 0-1 | 2-4 |
| 1994 | 2 | 3 | 1 | 1-2 | 0 | 0 | 1 |
| 1995 | 2 | 3 | 3 | 0 | 0 | 0 | 3 |
| 1996 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 1997 | 3 | 4 | 4 | 1 | 1 | 1 | 5 |
| 1998 | 2 | 1 | 0 | 1 | 0 | 0 | 0 |
| 1999 | 2-3 | 3 | 2 | 1 | 1 | 0 | 2 |
| 2000 | 3 | 4 | 1 | 1-2 | 0 | 0 | 1 |
| 2001 | 3 | 2 | 2 | 1-2 | 0 | 0 | 2 |
| 2002 | 3-4 | 4 | 4 | 1-2 | 2 | 2 | 6 |
| 2003 | 2-4 | 1 | 0 | 1 | 0 | 0 | 0 |
| 2004 | 3 | 2 | 2 | 1 | 0 | 0 | 2 |
| 2005 | 2-3 | 2 | 2 | 2 | 1 | 1 | 3 |
| 2006 | 2-3 | 1 | 0 | 1 | 0 | 0 | 0 |
| 2007 | 2 | 3 | 2 | 0 | 0 | 0 | 2 |
| 2008 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2009 | 2 | 2 | 2 | 0 | 0 | 0 | 2 |
| 2010 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |

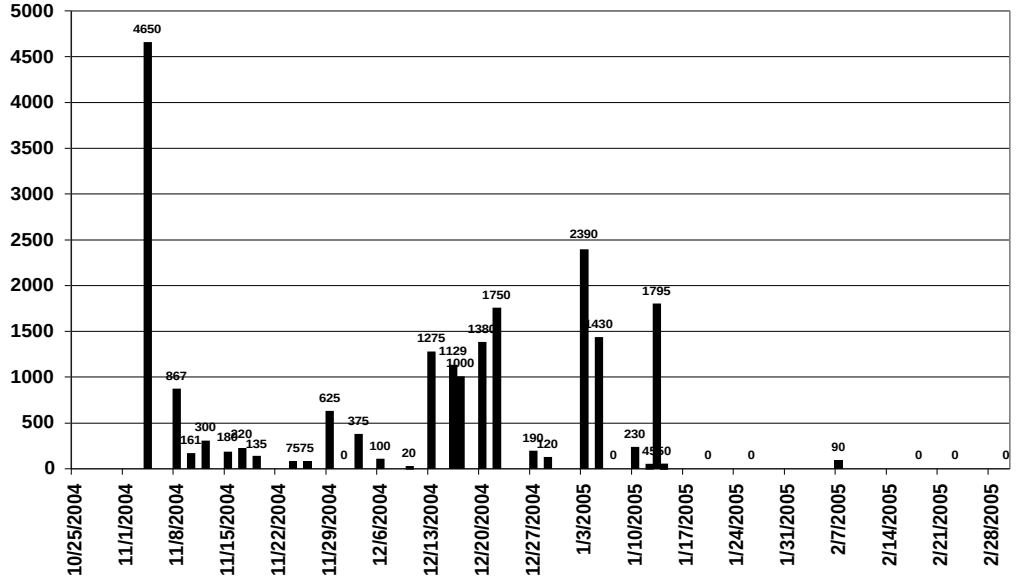
**JBER-Elmendorf Bohemian Waxwing Winter Surveys**

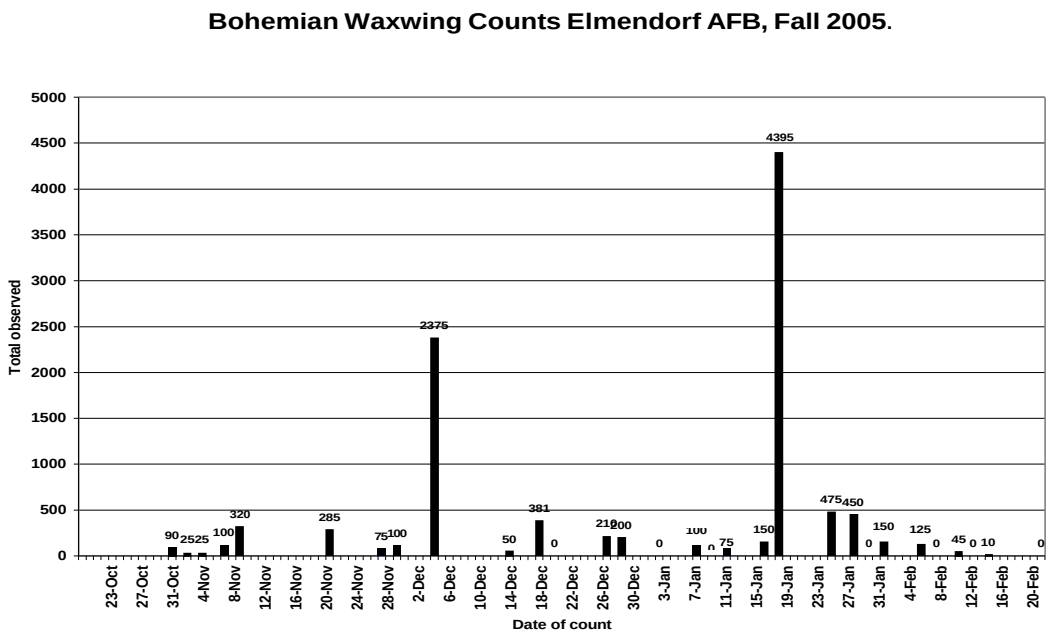
**Protocol.** A relatively consistent route that covers the JBER-Elmendorf cantonment area was surveyed 2-3 times each week during late October to mid-February in the years 2003 -2007. The observer traveled by vehicle and records location, number, behavior (feeding, resting, gritting, or flying) and species of berries being eaten for each group of waxwings.

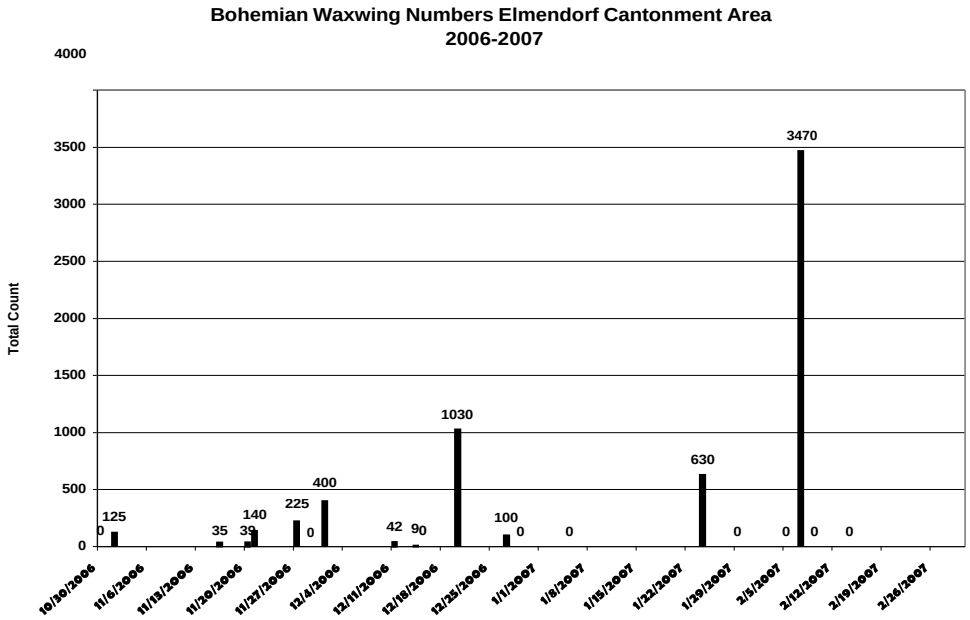
**Bohemian Waxwing Counts Elmendorf AFB, Fall 2003.**




**Bohemian Waxwing Counts Elmendorf AFB, Fall 2004.**






**Figures 1-4 Above - Daily Fall/Winter Counts of Bohemian Waxwings on EAFB, 2003-2007.**

## Bald Eagles, Owls, and Other Raptors

### Bald Eagle Productivity Monitoring

In 2012, USFWS was contracted to aerially locate occupied Bald Eagle (*Haliaeetus leucocephalus*) and Golden Eagle (*Aquila chrysaetos*) nests during late April 2012. The 8-hour aerial survey produced 26 Bald Eagle nests within the JBER boundary and ground survey efforts verified 3 additional nests. Of the 29 total nests, 17 were active and 12 were inactive. A nest was determined to be active if it had an adult on it in an incubating posture or adults were perched on the nest or nest tree. All nests were in black

cottonwood (*Populus trichocarpa*) trees. No evidence of nesting Golden Eagles within the JBER boundary during survey of cliff faces in alpine/sub-alpine areas was found.

Late summer (24 Jul-3 Aug) nest visits were made in order to estimate the number of fledglings at each nest. 15 of 17 active nests were visited and a minimum of 14 fledglings in 9 nests were identified. Six nesting pairs appeared unsuccessful. The 0.93 fledglings/active nest observed in 2012 compares to 1.07 fledglings per active nest found in 2011. Fifteen fledglings were observed in 14 active nests in 2011; only 3 nesting pairs appeared to be unsuccessful.

In 2013, thirty-three Bald Eagle nests were identified during the aerial survey. One additional inactive Bald Eagle nest was found during ground-truthing efforts, which was not identified during the aerial survey. One of the active nests was found west of the southwest corner of JBER-Richardson on Campbell Creek, but is outside the area of influence by JBER activities. Eight nests/nest trees identified during 2011 and/or 2012 surveys appeared to have been destroyed during 2013 wind storms or flooding events. Seven new nests were found and at least three were believed to be newly constructed to replace lost nest trees.

Of the 33 Bald Eagle nests within JBER boundaries, 18 were active and 15 were inactive. Following the protocol used by USFWS (Lewis) in 2012, all but one active nest had incubating adults on the nests. One active nest had both birds present near the nest and the nest appeared to have been recently improved but no eggs were visible. Inactive nests were those that had no adults near them and no apparent sign of activity. Seventeen active and five inactive Bald Eagle nests were visited and ground-truthed within the boundary of JBER.

Late summer (29 Jul-19 Aug) nest visits were made to estimate number of fledglings at each nest. 15 of 18 active nests were visited and a minimum of 13 fledglings in 10 nests were identified. Five nesting pairs appeared unsuccessful. 0.87 fledglings per active nest were observed in 2013 compared to 0.93 fledglings/active nest found in 2012.

In 2014, the aerial survey and subsequent ground-truthing identified 32 Bald Eagle nests on JBER and three outside of JBER boundaries. On JBER, 15 of the nests were active and 17 were inactive. All but one active nest had incubating adults on the nests. The active nest without incubating adults had both birds present on the nest tree during the aerial survey, but no eggs were visible. Another nest, located precariously on the Knik Arm bluff, was active during the aerial survey, but failed by the 9 May ground-truthing, dumping any eggs from the nest.

Five nests/nest trees from the 2013 survey were absent during the 2014 survey. Four new nests were found during the 2014 survey and two were believed to be newly constructed to replace lost or damaged trees. One newly discovered inactive nest has an unknown pre-2014 history. See the JBER 2014 Bald Eagle Nest Survey report for additional information (U.S. Army Corps District, Alaska. 2014).

Mid-summer (12 July-16 July) nest visits were made in order to estimate the number of fledglings at each nest. All 15 of the active nests were visited and a minimum of five fledglings in three nests were identified. A fledgling rate of 0.20 fledglings per active nest was observed in 2014, compared to 0.87 fledglings/active nest found in 2013. Many of the nests were already empty upon the site visit. Potentially due to the early spring, some of the eagle fledglings may have fledged earlier than in past years since, evidenced by fresh white-wash and prey feathers at six of the nests.

**Elmendorf Nocturnal Owl Monitoring**

**Protocol.** Using techniques described by Andres (2001) four separate routes of 11-13 stops each (no closer than 0.5 miles direct-line distance) were surveyed at least once during 15 February - 15 April. The goal was to survey each route (Figure 1 below) each month. Counts are conducted beginning two hours

after sunset until the route is completed. Listening at each stop occurs for eight minutes. Number and direction of owls heard or seen are recorded on maps; duplicate registrations from the same owl were not included in the results. Each route should be counted at least three times during the breeding season to ensure adequate coverage. Total counts are developed by eliminating duplication within routes and between counts to avoid double counting territorial birds. Maximum counts from each route were totaled.

**Summary of EAFB Owl Survey Results**

| Year | Dates | Routes Surveyed | Total Surveys | Max. Owls Heard (Observed) | | |
|---|---|---|---|---|---|---|
| | | | | GHOW | NSWO | BOOW |
| 2003 | 4 Mar -10 Apr | 4 | 7 | 4 | 9 | 0 |
| 2004 | 11-25 Mar | 3 | 3 | 3 | 4 | 0 |
| 2005 | 16 Feb-1 Mar | 4 | 4 | 4 | 2 | 4 |
| 2006 | 6-9 Apr | 2 | 2 | 1 | 0 | 0 |
| 2007 | 27 Feb-11Apr | 2 | 3 | 1 | 0 | 0 |
| 2008 | No Count | | | | | |
| 2009 | 9 Mar | 1 | 1 | 0 | 1 | 0 |

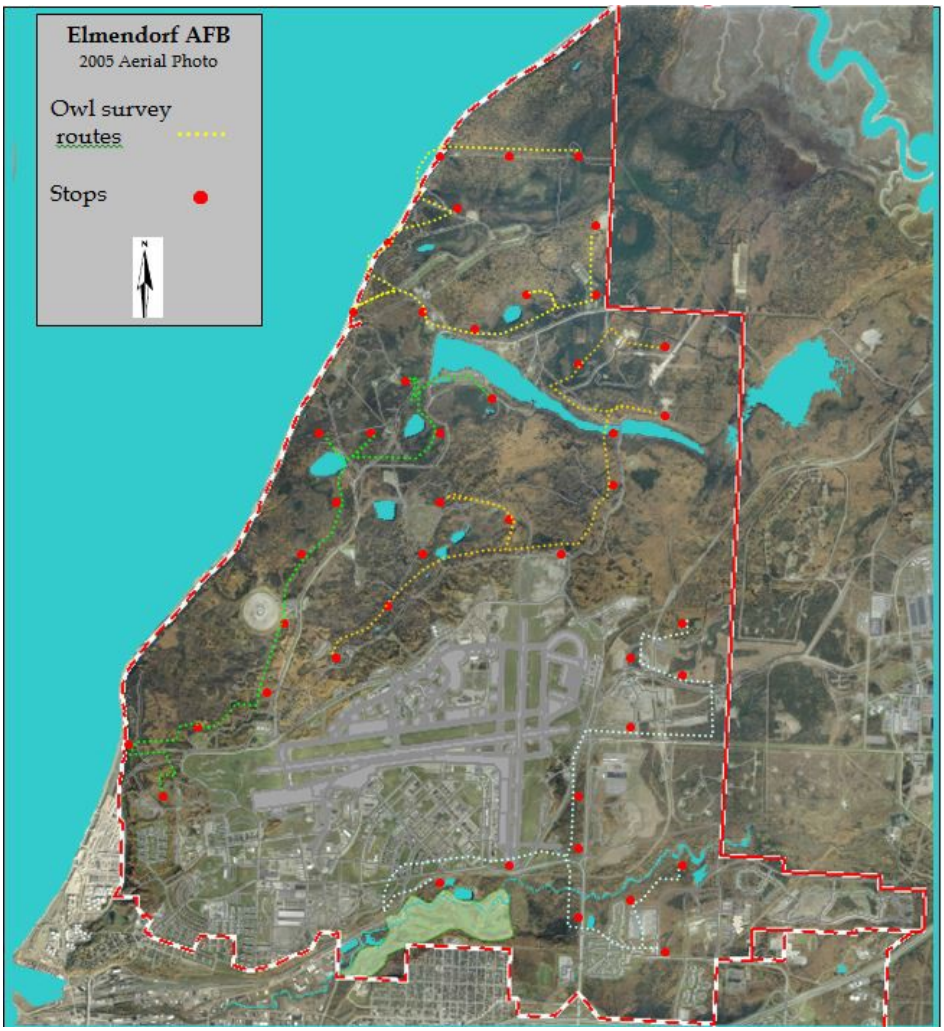



**Figure 1. Owl Call Survey Routes, EAFB, 2003-2009.**

**Raptors**

In 2006 an assimilation of historical information on raptors using EAFB was conducted. This included conducting migration and breeding season surveys to identify raptor perch attractions within the airfield's bird and waterfowl exclusion zones and to recommend appropriate actions to monitor raptor populations and to diminish BASH risks. Among the recommendations were: 1) converting as many grassland sites as allowed within the waterfowl exclusion zone to early successional shrub habitats to diminish attractiveness for hunting raptors; 2) conduct an extensive perch survey to identify and minimize electrocution risks; 3) monitor small mammals to identify distribution and abundance indices of prey species in the bird and waterfowl exclusion zones; 4) annually monitor the nesting efforts of northern goshawk and their prey populations to identify trends of this indicator species; 5) promote raptor nesting and hunting habitat well north of the airfield; 6) improve sampling protocol by recording search effort and add a column to the U.S. Department of Agriculture-Animal Plant Health Inspection Service data sheet that better describes behavior when raptors are first observed; and 7) seek USFWS approval to remove Bald Eagle nests currently adjacent to the runways or translocate these nests to areas away from the runways. ADF&G Conservation action plans for owls and raptors can be found at http://www.sf.adfg.state.ak.us/Static/ Statewide/NGplan/PDFs/Raptors.pdf.

**Raptor and Raptor Habitat Study**

In 2006 Environmental Compliance Consultants was contracted to assimilate historical information on raptors using EAFB, conduct migration and breeding season surveys, identify raptor perch attractions within the airfield's bird and waterfowl exclusion zones and recommend actions to monitor raptor populations and to diminish BASH risks (Anderson *et al*. 2008).

Environmental Compliance Consultants analyzed Wildlife Services raptor observations for 1999-2007 for patterns of perching and distribution and identified a preference by raptors for grassland habitat surrounding the airfield (Figure 1 below). Overall trends of raptor observations increased during the period (Figure 2 below), but numbers of raptors in flight increased, suggesting that removing perches during years of abundant prey species may have increased time in the air over the airfield. Trees and poles were most preferred perching sites by Red-tailed Hawks, while trees were primary perches for Bald Eagles, the two most common species.

**Figure 1. Total Number of Raptors Observed During BASH Operations, 1999-2007, on JBER-Elmendorf** (Anderson *et al*. 2008)

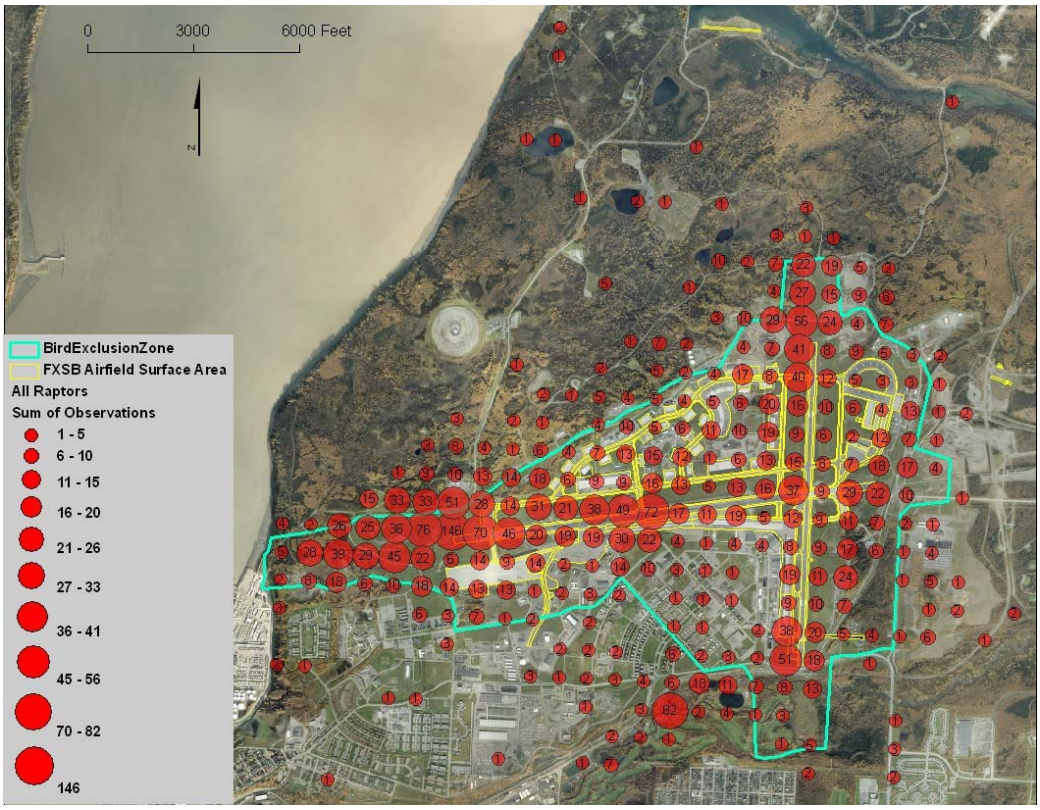
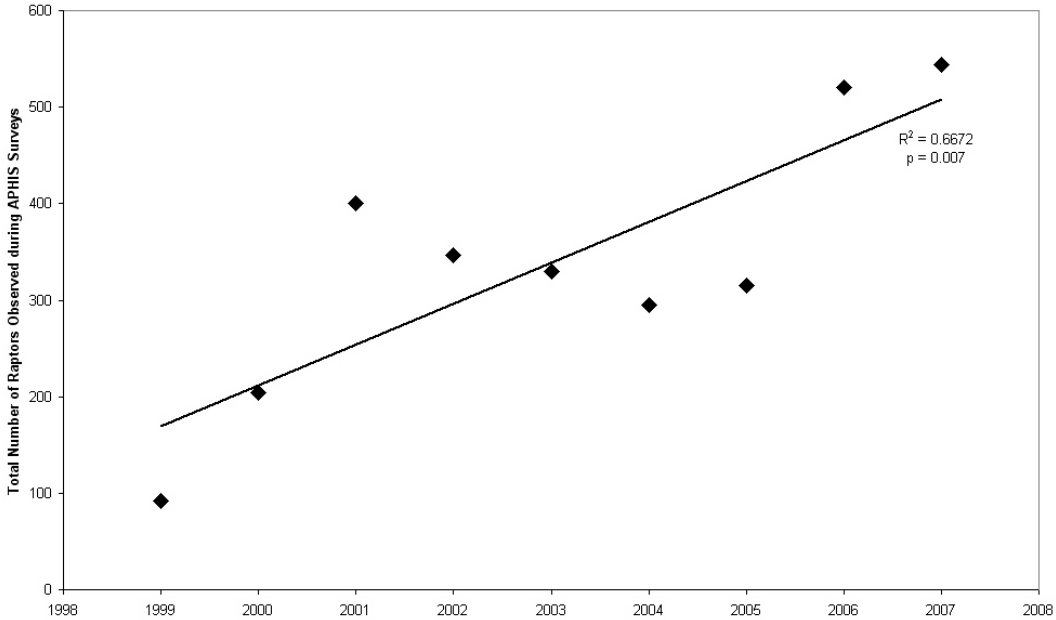

0
3000
6000 Feet
N
BirdExclusionZone
FXSB Airfield Surface Area
All Raptors
Sum of Observations
1 - 5
6 - 10
11 - 15
16 - 20
21 - 26
27 - 33
36 - 41
45 - 56
70 - 82
146

**Figure 2. Total Number of Raptors Observed During BASH Operations, 1999-2007, on JBER-Elmendorf** (Anderson *et al*. 2008)




Environmental Compliance Consultants conducted aerial and ground surveys of EAFB lands and found 25 active and 50 inactive nests. Active nests included 7 Bald Eagle, 2 Merlin, 3 Northern Goshawk, 1 Northern Harrier, 2 Osprey, 4 Red-tailed Hawk, and 6 Common Raven active nests. Inactive nests included 5 Bald Eagle, 24 Northern Goshawk, 2 Common Raven, 1 probable Red-tailed Hawk, and 16 nests from unknown species. All nests were entered in a GeoBase layer. Many nests were located near the airfield.

Environmental Compliance Consultants recommendations were:

1) convert as many grassland sites as allowed within the wildlife exclusion zone to early successional shrub habitats to diminish attractiveness for hunting raptors;
2) conduct an extensive perch survey to identify and minimize electrocution risks;
3) monitor small mammals to identify distribution and abundance indices of prey species in the bird and wildlife exclusion zones;
4) annually monitor nesting efforts of northern goshawk and their prey populations to identify trends of this indicator species;
5) promote raptor nesting and hunting habitat well north of the airfield;
6) improve sampling protocol by recording search effort and add a column to the USDA-APHIS Wildlife Services data sheet that better describes behavior when raptors are first observed; and
7) seek USFWS approval to remove Bald Eagle nests currently adjacent to runways or translocate these nests to areas away from the runways.

### Avian Radar (BIRDRAD) Study

CEIEC staff initiated a study to document avian migration patterns around the EAFB airfield. A portable bird radar system (BIRDRAD) was purchased by the U.S. Navy through the DoD Legacy program and made available to EAFB. The DoD Legacy objective was to provide a tool for improvement of BASH programs while adding to the understanding of avian movement during darkness. This study was intended

to continue a study contracted by EAFB to evaluate the efficiency of avian radar technology to identify BASH risks following the September 1995 Airborne Warning and Control System aircraft crash. That study determined the technology did not provide adequate real-time identification of low-flying birds, such as those that caused the crash.

The recent study was conducted primarily during peak migration periods between August 2003 and June 2005. Staff and volunteers operated the bird radar system a total of 284 hours, 183 hours during spring migration and 101 hours during fall migration. Significant findings included identification of high BASH risk periods during darkness during spring and fall bird migration. Risks reached peaks for 1-2 hours immediately after sunset and 1-2 hours preceding sunrise. Wind, clouds, and local freezing temperatures strongly influenced migration patterns. Study results were enlightening to flight operation planners, who modified night flight operations during peak migration periods to reduce BASH risks. Limitations of the system included lack of remote operation capabilities, manpower requirements, and limitations during precipitation events.

## *AMPHIBIANS AND REPTILES*

### Wood Frogs

**Protocol.** Roadside calling surveys were conducted at 10 sites on EAFB using US Geological Survey North American Amphibian Monitoring Program data sheets, which include date, start and end time of survey, name of observer, wind condition (Beaufort Scale), sky condition, # days since last rainfall, start time at each site, air temperature at each site, amphibian calling index at each site, check box if noise was a factor, check box if observer took a timeout (due to unexpected noise disturbance), optional check box if snow cover at site, optional check box for # cars that passed. At the start and finish of each 10-site run, the time, wind speed, and sky condition were recorded. At each site the observer would stop and listen for 5 minutes, then record the amphibian calling index and other information on the data sheet.

**Surveys Performed.**
2007 - Roadside calling surveys were conducted on May 6 and 7.
2008 - Roadside calling surveys were conducted on May 1, 3, 5, and 7.
2009 - No counts.
2010 - Survey results included below.

Note: The presence of wood frogs was also noted at almost every pond/lake on EAFB outside of the established 10-site roadside survey route.

**JBER-Elmendorf Wood Frog Survey 2010**

**Introduction**: Annual surveys are conducted on EAFB to document the number of wood frogs present and their abundance. Surveys are conducted using a calling scale to estimate the number of frogs at each site. Calling scale and other required information are provided on survey forms.

**Methods**: Between 28 Apr 2010 and 24 May 2010, each of the 11 sites were visited on 14 different days. At each site the surveyor would listen for 5 minutes of "quiet time." There are numerous causes of noise disturbance at most sites. Quiet time is defined as a time when frogs were not disturbed by heavy equipment, jet noise, automobile, train, or other noise. Estimated number of frogs calling was based on the calling scale available from EAFB wildlife personnel. Special Note: The best route to follow is to start at site 2, then 1, 3, 4, 5, 6, 7, 8, 9, 11, and 10.

**Results**: Wood frogs were heard at all sites except site 2 - Golf Course Site. EAFB personnel reported that this site has some contamination, and this may be the reason there were not frogs present. Sites 1 and 2 were the first sites to lose ice cover. Site 3 was being filled in, and frogs are losing habitat and are constantly disturbed by heavy equipment. Site 6 had the most frog calls, and many frogs were observed during the warmest period crossing the dirt road in the direction of the lake. Site 11 could not be accessed during the first part of the counts due to road conditions. Although there are not sufficient data to do statistical correlation, calling appears to be highly correlated with air temperature (Figure 1 below). Also of note, Site 6, Hillberg-Tuomi Lake peaked on the 4th of May while Site 7, Spring Lake, Site 8, Sixmile Lake Peninsula, and Site 9, Sixmile Lake Canoe Launch peaked on 10 May. Site 6, Hillberg-Tuomi Lake had the most total calls, followed by Sixmile Lake Peninsula (Figure 2 below).

**Conclusions and Recommendations**: Calls appear to be correlated with air temperature.

Recommendations include:
1). Data recorders be installed in lakes where possible to see if the calling also relates to water temperature. It is possible that there is an optimal water temperature that dictates where in the lake the

frogs deposit their eggs. It was noted that after several days of warming, frogs moved into deeper water. This could indicate that the near shore water temperature became too high.
2). Complete more detailed analysis of lake depth and percent cover of shallow edge environment and the relationship to the number of frogs.
3). Add ice cover observations to the survey worksheets to study the relation of frog calling to ice cover.
4). In the future, perform multiple observations on the same day to determine the best time to hear/observe frogs.

# *FISH*

## Current Anadromous Monitoring Efforts on JBER

### Sixmile

In 2008, National Marine Fisheries Service (NMFS) listed the Cook Inlet beluga whale (*Delphinapterus leucas*) as endangered (NMFS 2008). Beluga whales are predatory in nature and follow eulachon (*Thaleichtys pacificus*) into the Upper Cook Inlet during the spring, then switch to consuming salmon (*Oncorhynchus spp*.) as the eulachon numbers decline (NMFS 2009). In 2011, critical habitat was established within Cook Inlet, including Knik Arm in front of the mouth of Sixmile Creek (76 FR 20180, April 11, 2011). The Sixmile Drainage, located on Joint Base Elmendorf-Richardson (JBER), produces sockeye (*O. nerka*), coho (*O. kisutch*), chum (*O. keta*) and pink (*O. gorbuscha*) salmon and these salmon are likely food source for the beluga whales and are part of a small sport fishery. Thus, monitoring these populations is a necessity of JBER.

A fyke weir was used to enumerate smolt and a weir was used to enumerate adult salmon at the outlet of Lower Sixmile Lake, the same methodology that was used in 2013. Two stream surveys were also conducted below the weir location to get an index of the pink salmon and any other salmonids that might be spawning in the creek.

The estimated smolt out-migration for 2014 for sockeye was 13,760 and for coho smolts it was 3,996. The 95$^{th}$ percentile of sockeye smolt in the previous years' cumulative average was reached on 24 June while this year's 95$^{th}$ percentile of cumulative sockeye smolt was reached on 7 June. The 95$^{th}$ percentile of coho was reached on 7 June, which is 10 days earlier than the cumulative previous years' average.

There were 1,638 adult sockeye and 44 adult coho that were enumerated using the weir in 2014. For adult sockeye this is lower than the previous 15 year cumulative average of 1,768 salmon. While, the 2014 adult coho cumulative escapement was slightly lower when compared to the average for the last nine years.

Current recommendations are to 1) continue to monitoring the out-migrating smolt salmon and the adult salmon, 2) extend the adult salmon sampling length to ensure a more representative count of cohos occur, 3) keep monitoring the water temperature, and 4) replace the current fish ladder or create something different altogether.

**Summary of sockeye and coho smolt[1] out-migration counts at Sixmile Creek Weir, JBER**

| Year | Sockeye | Coho | Year | Sockeye | Coho |
|---|---|---|---|---|---|
| 2003 | 20,113 | 49 | 2010 | 4,037 | 42 |
| 2004 | 6,004 | 23 | 2012 | 23,644 | 107 |
| 2005 | 9,575 | 393 | 2013 | 20,469 | 250 |
| 2006 | 17,221 | 204 | 2014 | 13,760 | 3,996 |
| 2009 | 8,614 | 52 | | | |

[1] Coho smolts have not always been counted

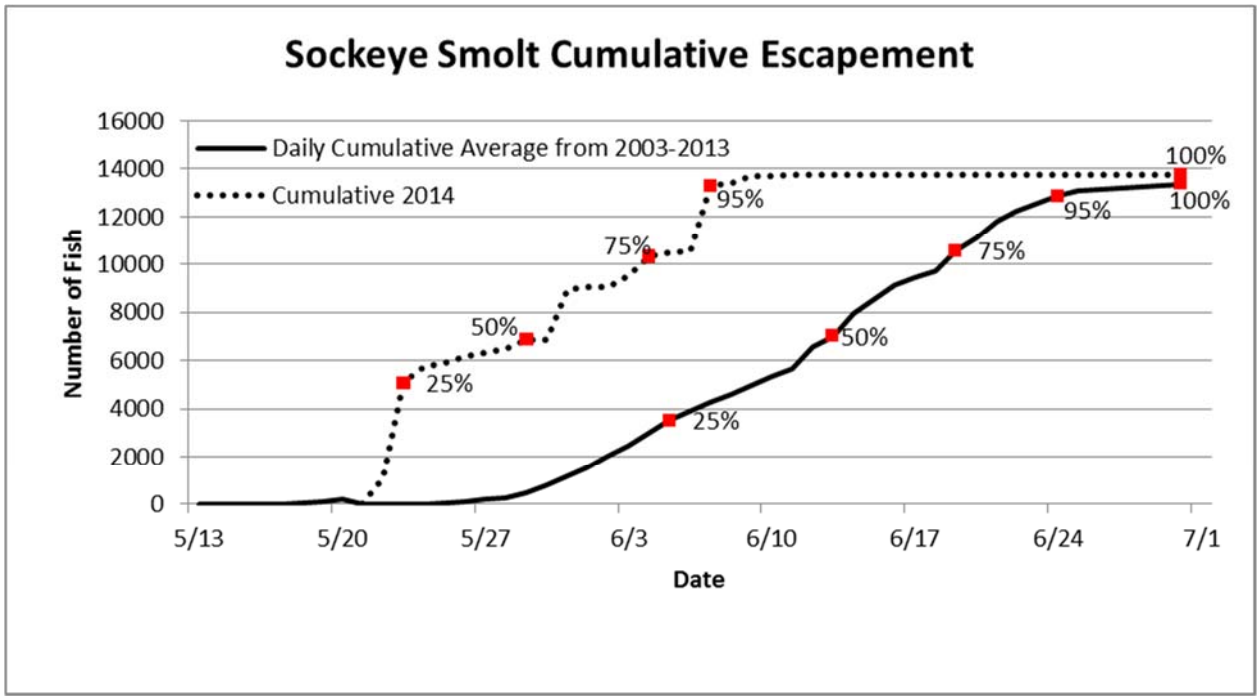



**Figure 1.** 2003-2012 Comparison of Sockeye Smolt out-migration at Sixmile Creek

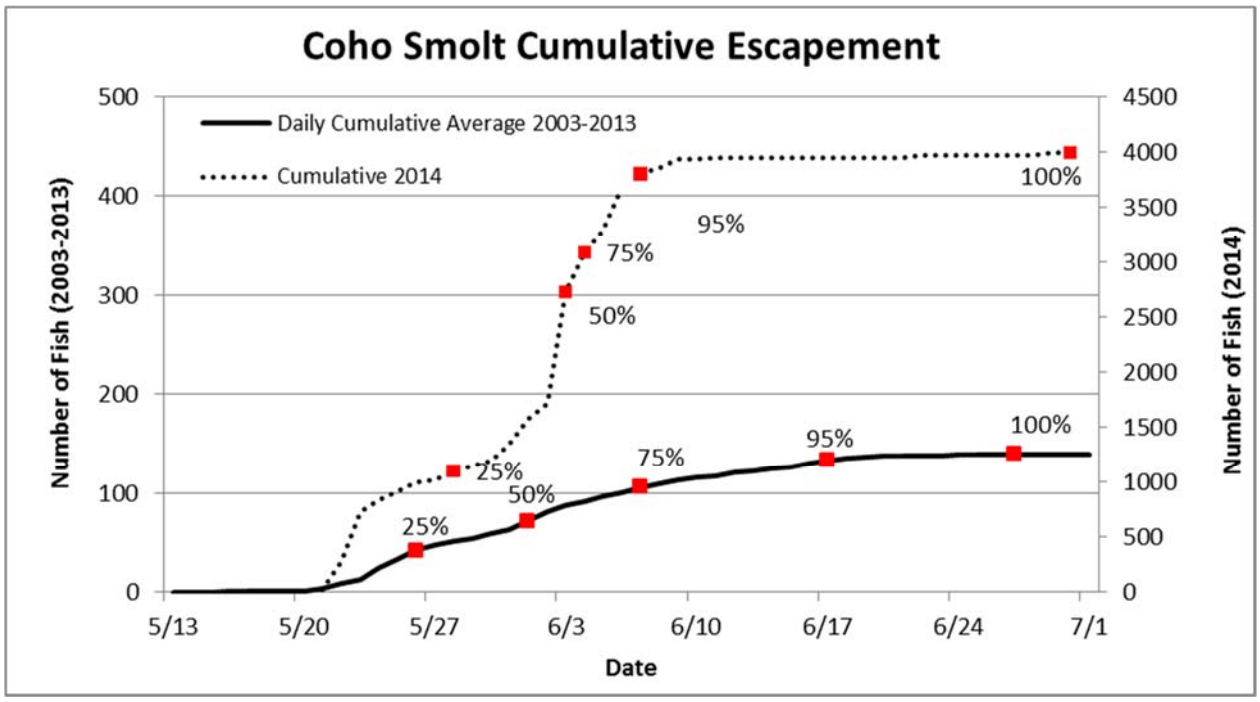



**Figure 2.** 2003-2013 Comparison of Coho Smolt Out-migration at Sixmile Creek

**Summary of adult salmon counts at Sixmile Creek Weir, JBER[2]**

| Year | Total Sockeye Count | Total Coho Count | Year | Total Sockeye Count | Total Coho Count |
|---|---|---|---|---|---|
| 1988 | 2107 | - | 2002 | 2580 | - |
| 1989 | 1115 | - | 2003 | 2778 | - |
| 1990 | 1450 | - | 2004 | 1611 | 1 |
| 1991 | 1974 | - | 2005 | 1341 | 16 |
| 1992 | 768 | - | 2006 | 1192 | 69 |
| 1993 | 3442 | - | 2007 | 903 | 17 |
| 1995 | 4282 | - | 2008 | 1463 | 27 |
| 1996 | 1593 | - | 2009 | 3342 | 178 |
| 1997 | 2240 | - | 2010 | 2533 | 18 |
| 1998 | 1662 | - | 2011 | 656 | 8 |
| 1999 | 663 | - | 2012[3] | 317 | 79 |
| 2000 | 1571 | - | 2013 | 1652 | 54 |
| 2001 | 4034 | - | 2014 | 1638 | 44 |

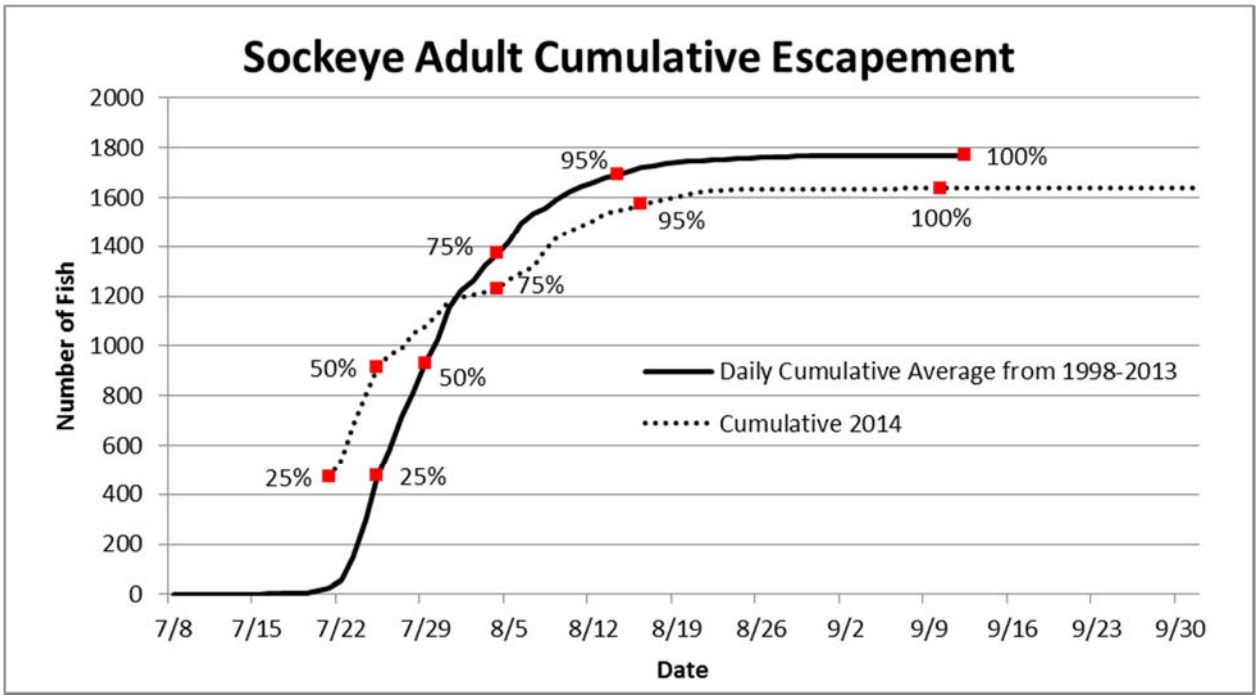



**Figure 8.** Comparison of cumulative for the 2014 sockeye run and the average cumulative from 1998-2013.

[2] Coho have not been historically recorded.
[3] A large hole was found in the weir during the peak run time.

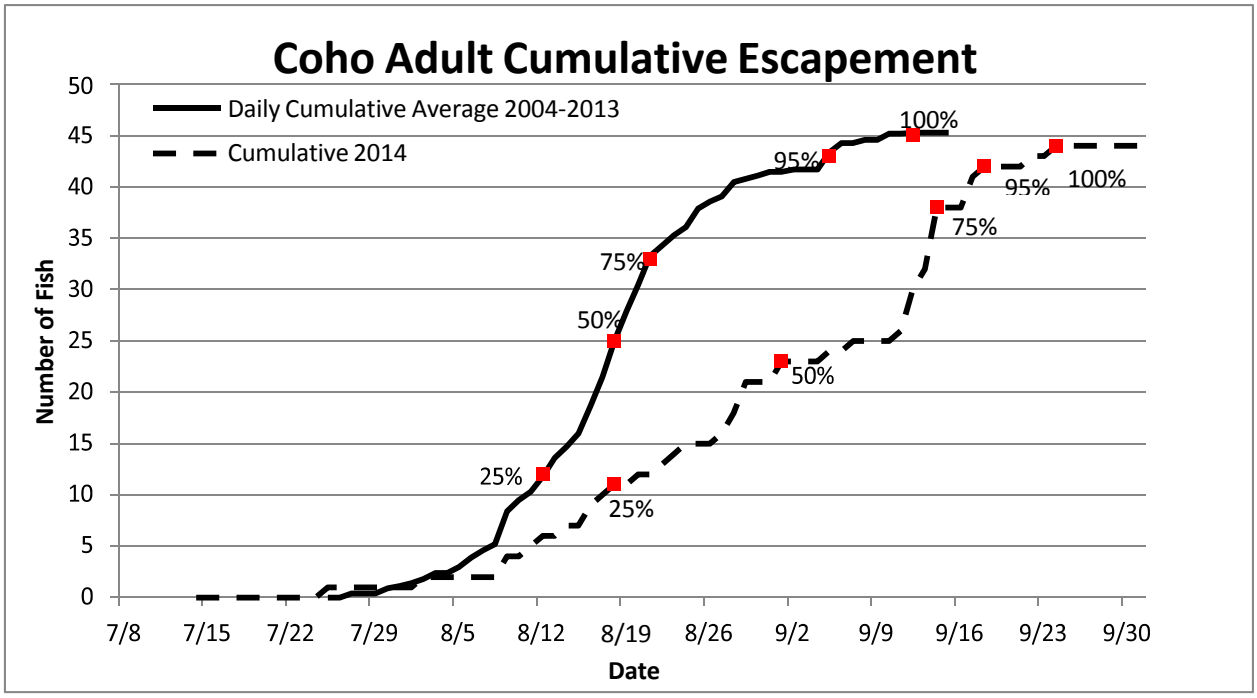



**Figure 9.** Comparison of cumulative for the 2014 coho run and the average cumulative from 2004-2013

For more information regarding salmon monitoring in the Sixmile Drainage on JBER please see the technical reports titled Abundance and Run Timing of Smolt and Adult Salmon in the Sixmile Creek drainage on Joint Base Elmendorf-Richardson.

**Eagle River Adult Salmon Monitoring**

The Eagle River salmon enumeration study located on the Joint Base Elmendorf-Richardson (JBER) began in 2012 and has completed its third season during 2014. The 2014 study was conducted from May 23 to September 24 lasting 124 days in total. The entire span of the study was successful at estimating the run timing, relative abundance, and species composition of all Pacific salmon (Onchorhyncus spp.) native to Eagle River, Alaska. In total 3,600 salmon were estimated to have passed a Long Range 300 m Dual Frequency Identification Sonar (DIDSON). Multiple data gaps exist due to frequent high water events that halted operations at the sonar site of which the largest gap existed from July 4 to July 22. During this interruption, a large number of sockeye are thought to have been missed. Both daily and seasonal apportionment methods were used to describe the species abundance based on catch-apportioned fish caught in a fish wheel that was equipped with a motion-triggered digital video recording camera system and a live box. In total, 135 salmon were captured in the fish wheel from its installation on June 20 and lasting to September 21. The seasonal apportionment method is most likely more representative of the actual abundance of all species counted in Eagle River, except for Chinook salmon. Chinook salmon daily apportionment is most likely more representative of their abundance. Chinook salmon (O. tshawytscha) abundance using the daily apportioned method was 755 and the seasonal apportionment was 330. Sockeye salmon (O. nerka), abundance using the daily apportioned method was 274 and the seasonal apportionment was 561. Chum (O. keta) abundance using the daily apportioned method was 269 and the seasonal apportionment was 594. Pink salmon (O. gorbuscha) abundance using the daily apportioned method was 439 and the seasonal apportionment was 528. Coho salmon (O. kisutch) abundance from the daily apportioned method was 1001 and the seasonal apportionment was 1585 and was found to be the most prolific salmon in Eagle River. The total 3,600 fish estimated to have passed the sonar are considered a minimum escapement and the number of salmon to have migrated upstream is likely higher.

**Table 1.** Number of fish captured in the fish wheel and the method used to identify the species from 2012.

| Species Captured | Count per Identification Method | | | Total | |
|---|---|---|---|---|---|
| | Live Box | Video | Live Box and Video | | |
| Chinook | 20 | 4 | 2 | 26 | 15% |
| Sockeye | 30 | 33 | 20 | 83 | 48% |
| Pink | 4 | 3 | 5 | 12 | 7% |
| Chum | 18 | 17 | 4 | 39 | 22% |
| Coho | 0 | 7 | 1 | 8 | 5% |
| Unidentified | 0 | 5 | 0 | 5 | 3% |
| Total | 72 | 69 | 32 | 173 | |
| | 42% | 40% | 18% | | |

**Table 1.** Number of fish captured in the fish wheel and the method used to identify the species from 2014.

| Species Captured | Count per Identification Method | | Total | |
|---|---|---|---|---|
| | Live Box | Video | | |
| Chinook | 5 | 5 | 10 | 7% |
| Sockeye | 9 | 8 | 17 | 12% |
| Pink | 13 | 3 | 16 | 12% |
| Chum | 8 | 10 | 18 | 13% |
| Coho | 24 | 24 | 48 | 36% |
| Unidentified | 0 | 26 | 26 | 19% |
| Total | 59 | 76 | 135 | |
| | 44% | 56% | | |

**Table .** Season Abundance Estimates

| Species | Daily Apportionment | | Seasonal Apportionment | |
|---|---|---|---|---|
| | 2012 | 2014 | 2012 | 2014 |
| Chinook | 487 | 755 | 497 | 330 |
| Sockeye | 711 | 274 | 1,592 | 561 |
| Chum | 1,226 | 269 | 730 | 594 |
| Pink | 555 | 439 | 232 | 528 |
| Coho | 282 | 1,001 | 166 | 1,585 |

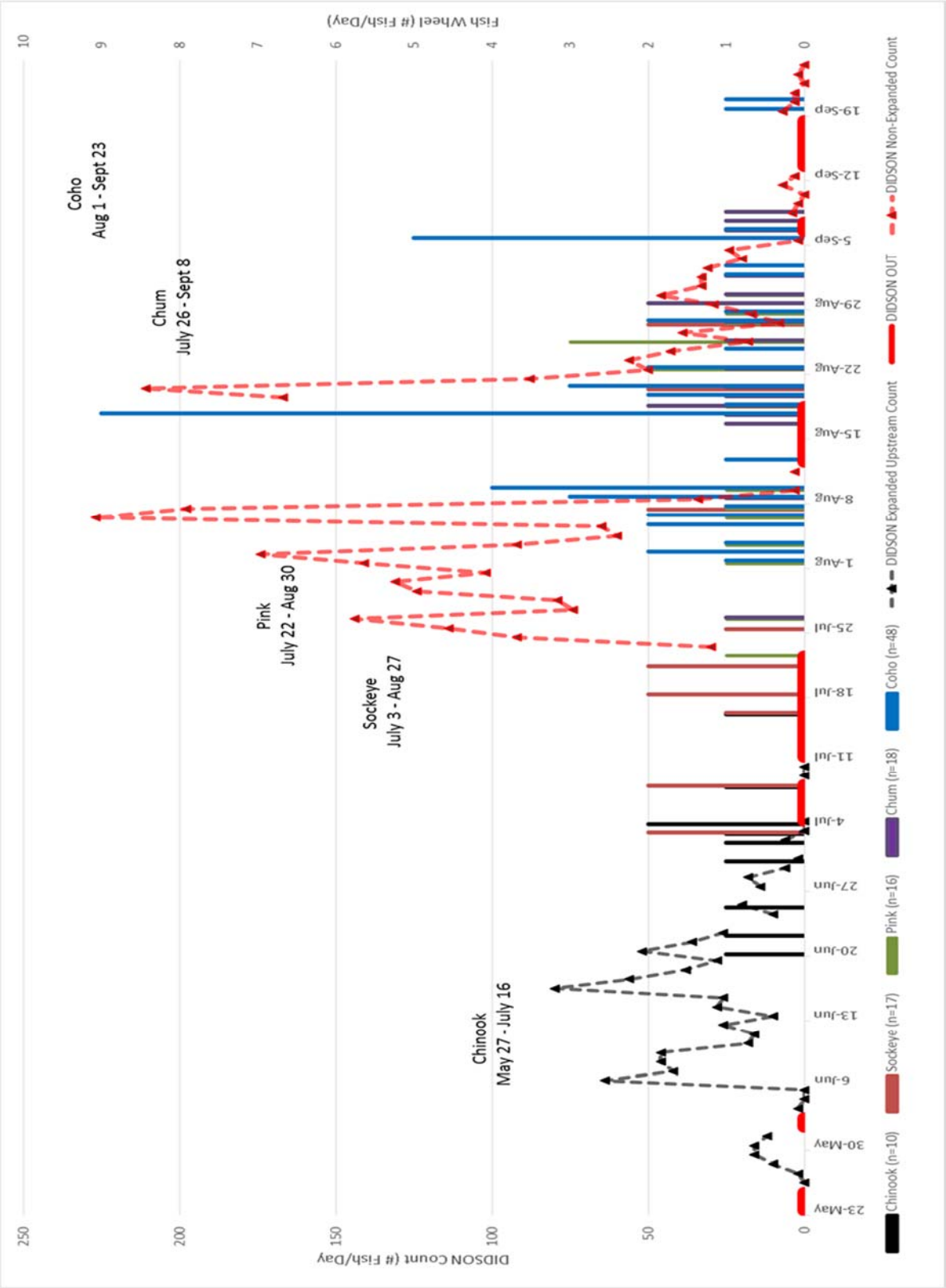



**Figure .** Daily Eagle River 2014 DIDSON expanded & non-expanded net upstream count (n=3,600) and fish wheel catch (n=105) by species.

For more information regarding salmon monitoring in Eagle River on JBER please see the technical reports titled Eagle River Adult salmon Monitoring on Joint Base Elmendorf-Richardson.

**Historical Anadromous Monitoring Efforts on JBER**

**Salmon Habitat Mapping**

Fish habitat locations and status were relatively unknown prior to 2000. Visual observations of salmon re-using spawning redds in Sixmile Lake suggested that habitat may be inadequate or limiting. A project to map and evaluate sockeye salmon spawning habitat in Sixmile Lake was conducted during 2001 and 2002 (Gotthardt 2003).

The Sixmile Lake Sockeye Salmon spawning study produced the following conclusions:

(a)Eighteen primary spawning sites were identified and GIS documented.

(b)The majority of spawning habitat is in Upper Sixmile Lake along the northwestern bank and in the roadside gravel footprint.

(c)The primary spawning habitat consisted of small to medium gravel areas of up-welling groundwater and/or feeder stream inlets where water temperatures were substantially cooler than the rest of the lake.

(d)Secondary spawning sites included areas with larger gravel, ample vegetative coverage, undercut banks and fallen logs, and in deep holes.

Overall, there appears to be sufficient, albeit patchy distributed, spawning habitat in the Sixmile lakes to maintain a salmon population of approximately 4,000 spawning adult sockeye salmon. Should escapement exceed 4,000 adults and priority Upper Sixmile Lake spawning sites are full, there appears to be ample additional spawning substrate in the lower lake, although most of these areas are in water deeper than two meters (Gotthardt 2003).

**Sixmile Lake Productivity Survey**

During summer 2003 a study of Sixmile Lakes was conducted to identify abundance and timing of sockeye smolt outmigration, age and length of smolt, and abundance and timing of other downstream migrants (Gotthardt 2006). Biological measurements (age and size) of smolt taken at outmigration during 2003 suggested healthy juvenile rearing conditions in the Sixmile Lake system. Sixmile smolts were average-sized compared to other runs in the Cook Inlet basin, and the majority was age-1, also similar to other Cook Inlet stocks. Limnological measurements from both lakes also suggest favorable conditions for juvenile rearing and were largely similar to those recorded 20 years previously by Rothe et al. (1983).

However, low smolt survival ratios reported here suggest that some factor or combination of factors within Sixmile Lakes is limiting sockeye fry productivity. This study did not assess whether competition or predation were significant factors in fry survival and suggests that they warrant further study. Zooplankton measurements taken during 2003 were inconclusive and should be repeated. Consideration should be given to reported low smolt survival ratios from Desire Lake on the Kenai Peninsula that were attributed to low zooplankton production with nutrient enhancement suggested to increase growth and survival potential. Temperature may also be a limiting variable to fry growth and production in the Sixmile system, mainly during summer when these shallow lakes heat up evenly throughout the water column. Continued monitoring of smolt outmigration is recommended.

Another factor that may limit juvenile survival is the density of sockeye fry themselves. The adult sockeye return, while variable between years, has remained at about 4,000 fish or less since 1988. It may be that the Sixmile Lake sockeye salmon stock is at carrying capacity and will not get any larger unless factors that are limiting populations are identified and remediation efforts undertaken. That is, of course, if the goal of management is to increase the size of the adult run available to sport fishermen. Conversely,

if there is no management mandate to increase the strength of the sockeye run, current lake conditions appear capable of supporting a small, self-sustaining run and current levels of sport harvest.

The number of fry that out-migrated during 2003 is of concern. It is possible that these fish were confused or following the current and were swept out through the fish ladder accidentally. During summer 2001 and 2002 fry were observed trying to jump and/or swim up the concrete foot of the fish ladder to return to the lake without success. A fish ladder allowing fry/smolt passage into the lake was highly recommended.

**South Fork Chester Creek Streamside Salmon Surveys**

In 2004 and 2005 surveys where performed to determine timing and abundance of spawning coho in addition to delineation of important spawning areas along the stream. Streamside salmon surveys are often conducted in tandem with the collection of brown bear hair for the brown bear population estimation component of the brown bear telemetry project. Data generated from this survey have been used for a variety of management decisions and may serve as baseline data in support of salmon reintroduction efforts on Chester Creek.

Surveys were typically conducted weekly in August and September. The surveys employ a minimum of two observers, both equipped with wading equipment, polarized sunglasses, and global positioning system units. Surveys start at the bridge on Bulldog Trail and proceed both upstream and downstream for a distance of approximately 100 yards past the last observed adult salmon. Both upstream and downstream stretches of the creek are surveyed during the course of a single day when possible to minimize duplicate counts resulting from fish movement.

Observers proceed carefully along one bank of the creek with the lead observer scanning primarily for salmon and the trailing observer recording data and scanning primarily for bears. Data recorded include date, survey conditions, species, numbers and location of all fish observed. Also recorded are observations of bear activity. Every attempt is made to minimize disturbance to fish.

**Campbell Creek Adult Salmon Survey**

In 2004 and 2005 FRA and ADF&G personnel conduct streamside surveys along North Fork Campbell Creek on FRA to determine timing and abundance of spawning sockeye, coho, and Chinook salmon in addition to delineation of important spawning areas along the stream. Surveys start at the footbridge on Bulldog Trail and proceed upstream for approximately 100 yards past the last observed salmon and downstream to the installation boundary. Survey methodology follows that given above except that they are conducted weekly from June until October.

**Summary of Current Non-Anadromous Monitoring Efforts on JBER**

**Fish Stocking**

The stocking program is operated at no cost to JBER through an agreement with ADF&G. The lakes on JBER that are stocked include Clunie, Waldon, Gwen, Otter (has not been stocked since early 2000's due to pike), Fish, Triangle, Hillberg, Green, Upper Sixmile, and Spring. All lakes on JBER are stocked with rainbow trout. Clunie, Green, and Hillberg are also stocked with Chinook salmon in addition to rainbow and Clunie is also stocked with arctic char.

**Summary of Historical Non-Anadromous Monitoring Efforts on JBER**

**Northern Pike**

Monitoring for pike in FRA waters consisted of reviewing of annual ADF&G fish harvest reports, angler interviews, and visual surveys of the water bodies themselves. Fish harvest reports were reviewed annually for records of pike harvest in Otter, Clunie, and Gwen lakes (records from 1979-2004 indicate no reported pike harvests). Anglers are interviewed in the field as often as possible throughout the year and are queried for pike observations or harvest.

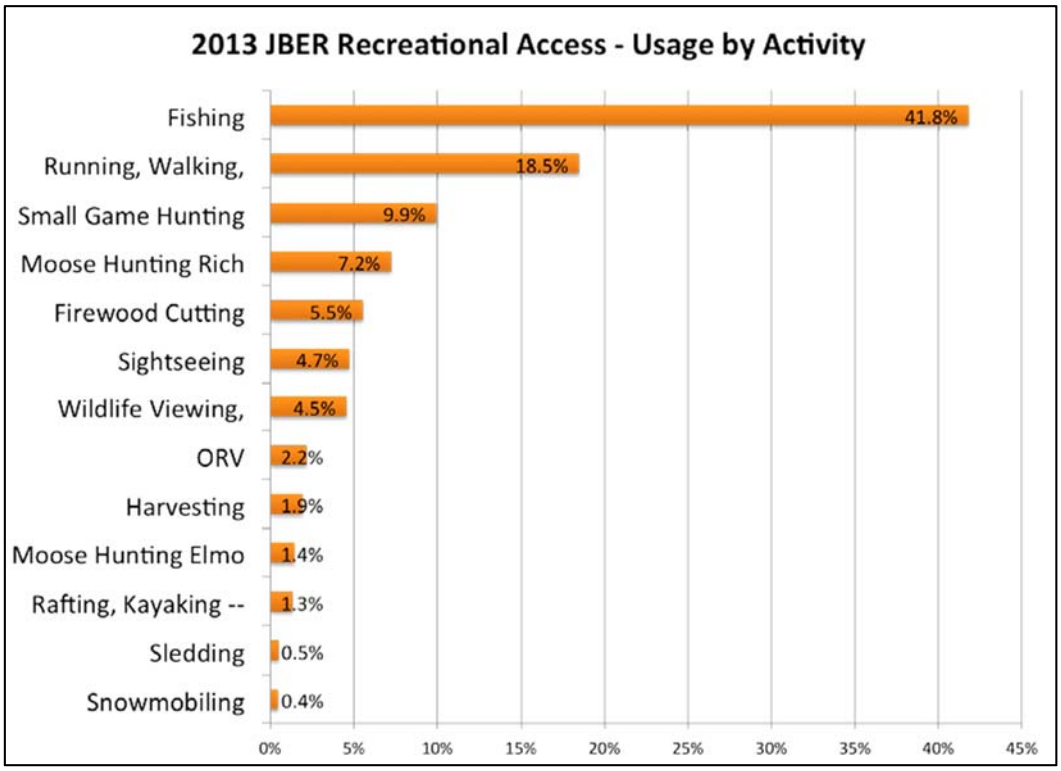
Visual surveys for pike in FRA lakes (Otter, Gwen, Thompson, Walden, Clunie) were conducted annually. Personnel circumnavigate each post lake by non-motorized boat or canoe at least once during the summer, searching for observable pike. Observers are equipped with polarized sunglasses for enhanced subsurface visual acuity and gps units to record exact locations of observations. Survey areas and patterns vary depending on the water body but in general are concentrated along the shoreline and around offshore patches of aquatic vegetation. In areas where shoreline vegetation makes visual detection of hiding pike difficult, personnel may employ electrofishing techniques if doing so can be accomplished safely and with a reasonable degree of certainty that non-target species will remain unaffected by the electrical pulses. Areas of likely spawning and rearing habitat are also noted during the water body surveys and are mapped to aid future monitoring and removal efforts.

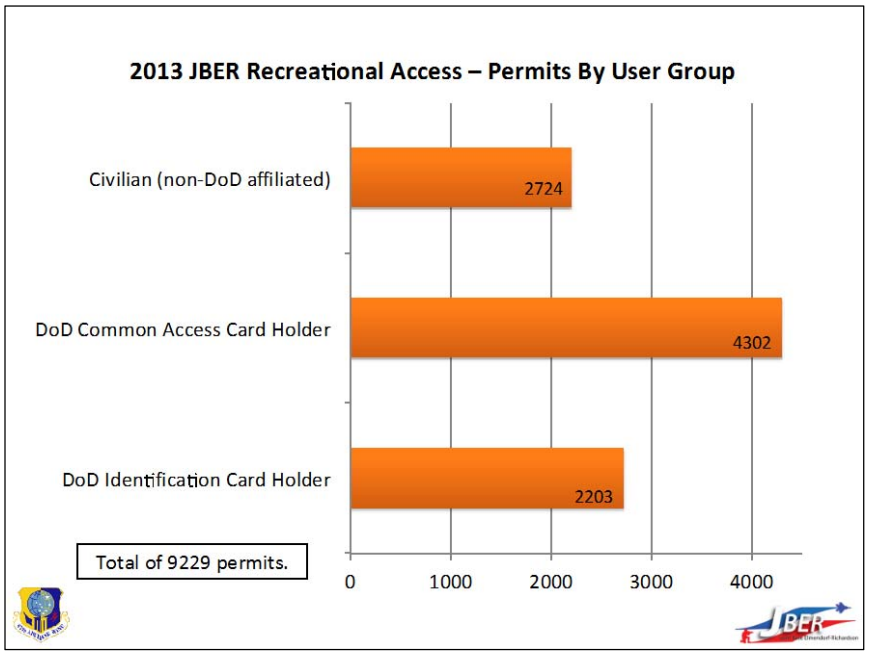
A pike removal program was carried out in Otter Lake on JBER-Richardson between 2004 and 2006. JBER personnel captured pike in variable mesh gill nets set in various locations around Otter Lake between May and August. The nets were manned continuously to minimize incidental capture of migratory birds. Harvested pike were quickly dispatched. The length, weight, sex, reproductive condition, and stomach contents were noted and entered into a datasheet. All other fish species were released immediately if alive and donated to a charity if deceased. All pike were either donated to a charity or school. A total of 100 pike ranging in size from 5 mm-914 mm were harvested during these three years. The average pike length decreased along with the percentage of pike greater than 406 mm (presumed to be sexually mature) (see Table ). In 2006, several pike harvested from Otter Lake were infected with the parasite Neascus metacercariae, a digenetic trematode whose meteacercaria encyst under the skin of fish, forming black spots around the infected area. Such infections are generally not harmful in fish at normal levels and present no known health concerns for humans.

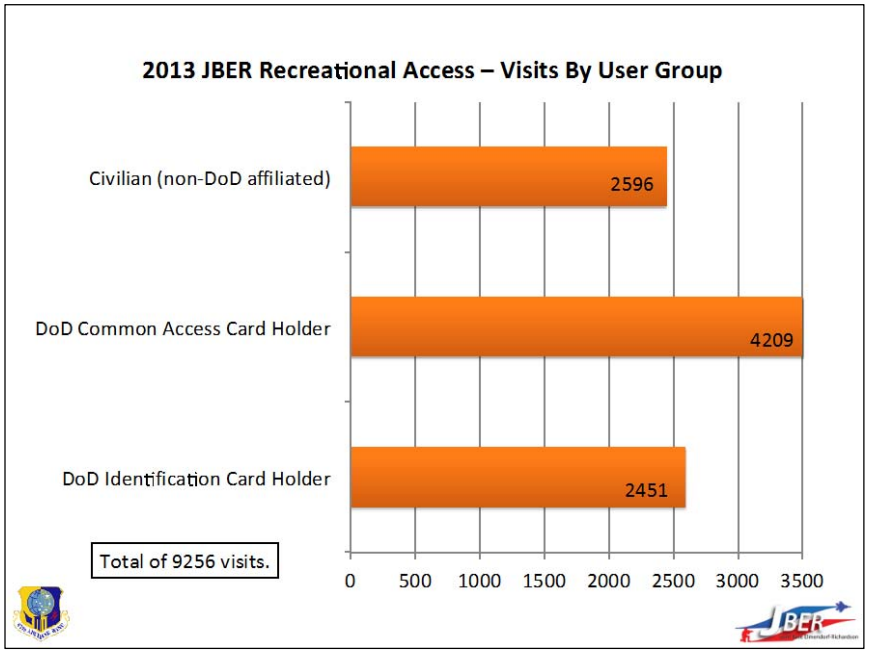
| Year | Pike | Rainbow | Net Hours | Catch per unit effort (pike/Net Hour) | Percentage of Total Incidental Catch | Range Pike Length inches (mm) | Average Pike Length inches (mm) | Percentage Pike w/ Length 16in (406 mm)+ |
|---|---|---|---|---|---|---|---|---|
| 2004 | 14 | 5 | 54 | 0.3 | 26 | 11-36 (279-914) | 21 (533) | 71 |
| 2005 | 38 | 7 | 43 | 0.9 | 16 | 5-24 (127-610) | 13 (330) | 26 |
| 2006 | 48 | 0 | 46 | 1.0 | 0 | 8-24 (203-610) | 13 (330) | 31 |

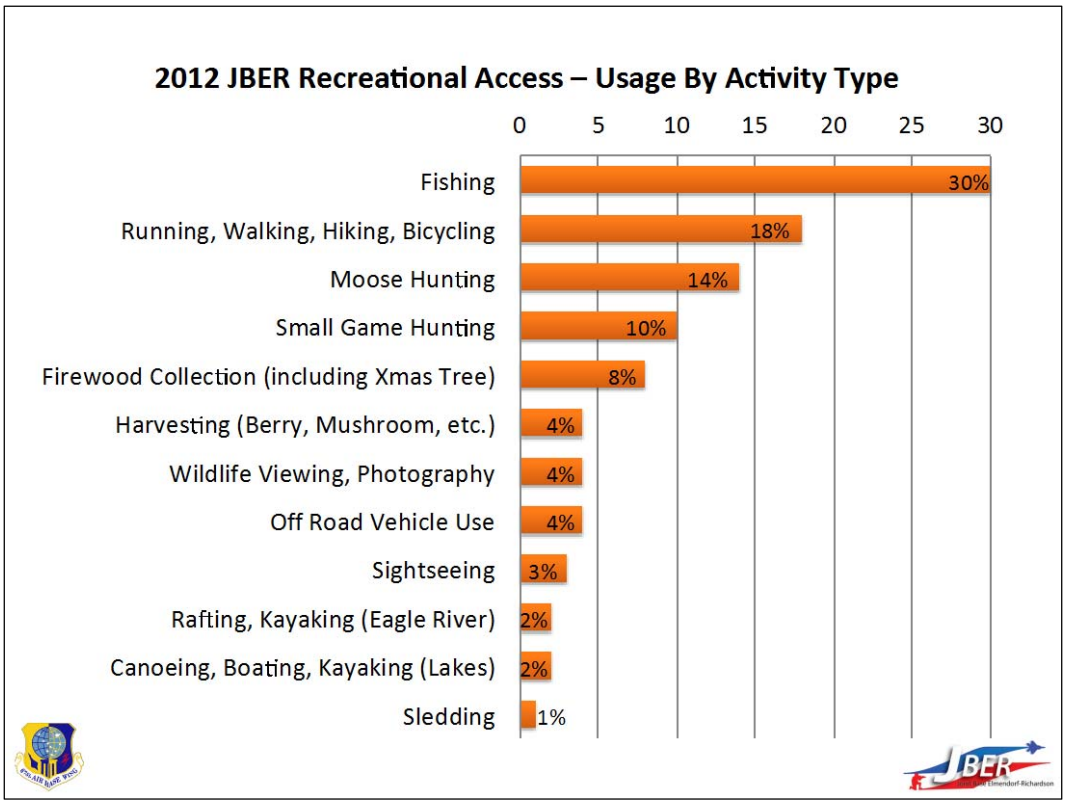
*Table 3. Comparison of pike removal efforts and results on Otter Lake, JBER, Alaska during 2004, 2005 and 2006.*

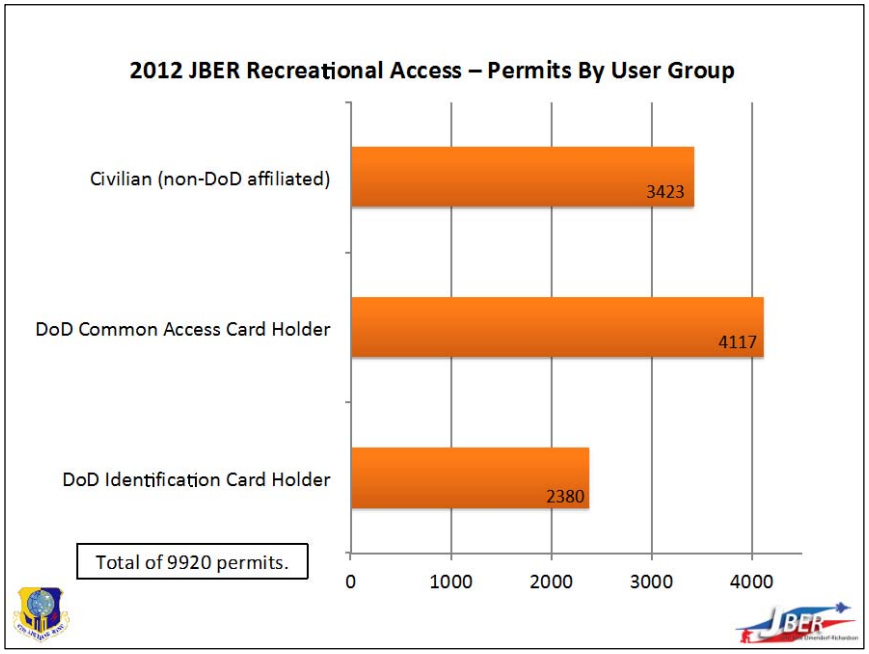
# RECREATION

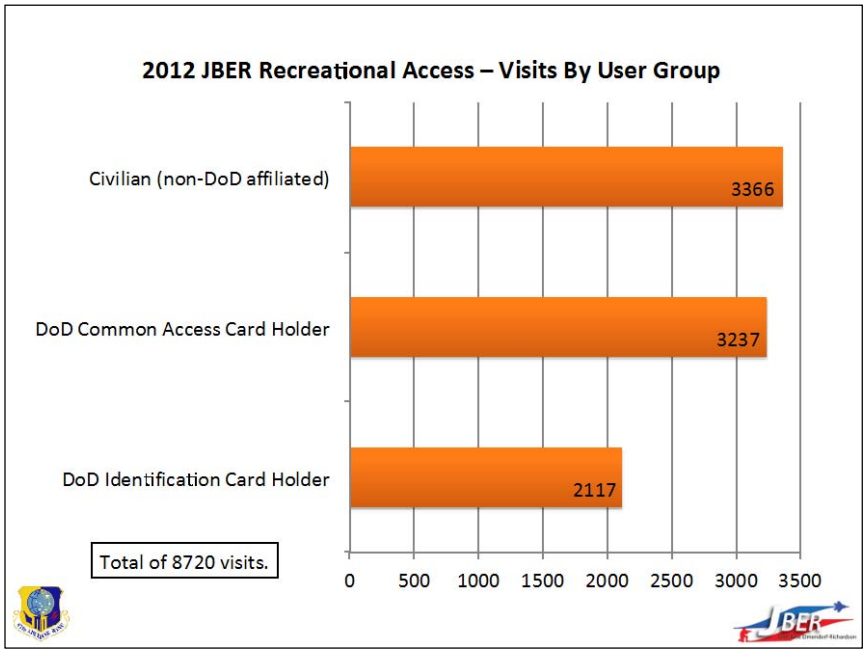

2013 JBER Recreational Access - Usage by Activity
Fishing
Running, Walking,
Small Game Hunting
Moose Hunting Rich
Firewood Cutting
Sightseeing
Wildlife Viewing,
ORV
Harvesting
Moose Hunting Elmo
Rafting, Kayaking --
Sledding
Snowmobiling
41.8%
18.5%
9.9%
7.2%
5.5%
4.7%
4.5%
2.2%
1.9%
1.4%
1.3%
0.5%
0.4%
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%


2013 JBER Recreational Access – Permits By User Group
Civilian (non-DoD affiliated)
DoD Common Access Card Holder
DoD Identification Card Holder
2724
4302
2203
Total of 9229 permits.
0
1000
2000
3000
4000


2013 JBER Recreational Access – Visits By User Group
Civilian (non-DoD affiliated)
2596
DoD Common Access Card Holder
4209
DoD Identification Card Holder
2451
Total of 9256 visits.
0
500
1000
1500
2000
2500
3000
3500


2012 JBER Recreational Access – Usage By Activity Type
0
5
10
15
20
25
30
Fishing
30%
Running, Walking, Hiking, Bicycling
18%
Moose Hunting
14%
Small Game Hunting
10%
Firewood Collection (including Xmas Tree)
8%
Harvesting (Berry, Mushroom, etc.)
4%
Wildlife Viewing, Photography
4%
Off Road Vehicle Use
4%
Sightseeing
3%
Rafting, Kayaking (Eagle River)
2%
Canoeing, Boating, Kayaking (Lakes)
2%
Sledding
1%


2012 JBER Recreational Access – Permits By User Group
Civilian (non-DoD affiliated)
3423
DoD Common Access Card Holder
4117
DoD Identification Card Holder
2380
Total of 9920 permits.
0
1000
2000
3000
4000


2012 JBER Recreational Access – Visits By User Group
Civilian (non-DoD affiliated)
3366
DoD Common Access Card Holder
3237
DoD Identification Card Holder
2117
Total of 8720 visits.
0
500
1000
1500
2000
2500
3000
3500

**Wildlife Habitat Management**

Habitat management efforts will be accomplished to conserve and enhance existing flora and fauna, consistent with the JBER goal to conserve, protect, and sustain biological diversity while supporting the accomplishment of the military mission. Activities will be directed towards management to maintain healthy ecosystems and restore degraded ecosystems to their historic functions and values.

**Forest Wildlife**

The moose, as the most numerous, large land mammal on JBER, is a key or featured species. Landscape-level management is particularly critical for moose. The northern Anchorage moose herd range includes JBER and portions of Chugach State Park, as well as most of the Anchorage Bowl in winter. Chugach State Park and the Municipality of Anchorage do not actively manage for moose habitat. It is critical that habitat management efforts on JBER are designed to complement and augment efforts in other jurisdictions within the range of the moose herd.

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

From the 1940s through the 1960s, FRA was used extensively for mechanized troop training, resulting in disturbance to many areas. This promoted the growth of early successional species, such as birch, aspen, alder, and willow. These species provided excellent moose habitat over large areas and caused the moose population to substantially increase. In the late 1960s there was a decrease in mechanized ground-training activities. Extensive areas of moose habitat eventually reverted to tall brush and timber. Both the quantity and quality of moose browse began to decline. Remaining prime moose habitat was over-browsed, and the moose population declined after moderately severe winters in the early to mid-1970s (U.S. Army, Alaska 1998).

Active habitat management utilizing a hydro-ax to clear mature brush and promote regeneration of browse was initiated on FRA in 1975. This habitat work continued regularly since that time, benefitting wintering moose on FRA.

Primary methods of manipulating habitat on FRA were prescribed burning and mechanical removal of vegetation. USAG-AK also utilized herbaceous and woody vegetation plantings in the cantonment area to improve habitat.

***Prescribed burning*** is beneficial to ecosystem maintenance because fire is an important component of the ecosystem's development. It is less complicated and a more natural means of vegetation removal than using timber harvest or other mechanical means.

***Mechanical means of habitat manipulation*** includes mechanical tools used to accomplish habitat management including commercial timber sales, timber stand improvement, firewood cutting, hydro-axing, and military maneuver training. Habitat improvement areas are then planted with desired herbaceous species or left to revegetate naturally.

***Wildlife habitat improvement plantings*** include management of the cantonment area that directly affects natural resources management. Natural resources personnel provide professional assistance for landscaping, particularly regarding species selection and care of the landscape.

**Browse Management**. Any manipulation of browse on BLM jurisdiction lands will be coordinated with BLM. Moose browse habitat can be improved using one or more of the following strategies (U.S. Army, Alaska 1998):

***Site conversion on disturbed areas***. The primary method used on JBER will be converting large stands of alder or blue joint grass to early seral stages of forest or shrubland through prescribed fire, hydro-axing, or other mechanical means, followed by broadcast seeding or planting of desirable browse species.

***Enhancing existing habitat areas that are growing out of reach***. This is usually done by hydro-axing these areas prior to spring bud-break or after growth has ceased in the fall. Rights-of-way and firebreak maintenance activities are good examples of this type of management activity. In 2013, 18 acres were cleared to rejuvenate browse areas previously cut 10-20 years ago.

***Converting forested areas to early seral stages***. Prescribed fires can accomplish this option best, but most often used are hydro-axing, blading and grubbing, commercial timber programs, and personal-use woodcutting programs. The prescribed burning window of opportunity for JBER is very narrow; thus, this method is rarely used. Personal-use timber sales are well adapted to creating small (less than five acres) forest openings for moose, snowshoe hare, and black bears.

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

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

**Forest Wildlife Habitat Management Considerations**

Design of treatment areas is critical. In general, treatment areas will be circular or square rather than long and narrow to maximize response to light and moisture regimes. Areas will usually range in size from 10 to 40 acres. If areas larger than 40 acres are treated, islands of vegetation will be left for resting areas and escape cover. Edges will be left irregular. All aspen will be felled as this will encourage coppice or root suckering. If birch is a desired regeneration species, 7-10 seed trees per acre will be left. A similar number of snag trees will be left for those wildlife species that require them. Residual trees will be left in small patches where possible to minimize wind-throw. Patches of forest should be left adjacent to ponds and wetlands as well as calving areas, and logging or other human disturbance should be minimized during calving season. No logging will be done within 1/4 mile of known, occupied bear or wolf den sites or within 300 feet of eagle or goshawk aeries. No logging will be done within 100 feet, and only selective logging will be done within 300 feet, of lakes or anadromous streams.

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

Forest wildlife habitat management on JBER focuses on the following strategies:

# Appendix J. History of JBER Natural Resources Management

Prior to 1950, the War Department managed current JBER land. There are limited records of land management or wildlife management activities occurring prior to 1950. On EAFB a Fish and Wildlife Conservation Committee of officers and non-commissioned officers initiated a *well rounded and comprehensive conservation program* in 1958 (5040th Air Base Wing 1960). In 1981 EAFB contracted with the USFWS to conduct a comprehensive inventory of natural resources. Rothe *et al*. (1983) summarized the inventory results and records of previous natural resource activities. The first EAFB INRMP (3 Civil Engineering Squadron 2001) was approved and signed by all cooperating parties in September 2001. The Air Force has managed EAFB's natural resources with a multi-use philosophy with the major uses being forest management, fish and wildlife management, land management, and outdoor recreation (Richmond 1993).

Forest management on FRA dates to 1955 when mapping of forest types was completed, which delineated forest stands for management purposes (Quirk 1990). Since the 1950s, firewood and Christmas trees have been harvested on a limited annual basis. Fish and wildlife management on FRA predates statehood, beginning in the mid-1950s when the first steps were taken toward fish management. In 1953 rainbow trout were stocked in a few lakes. Stocking has since continued annually. Two years later, a land management plan was drafted that included provisions for fish and wildlife management (Gossweiler 1984). In 1956 and 1957 wild rice was sown by helicopter on Eagle River Flats to improve waterfowl habitat. This was successful, and wild rice became established in the marsh (Fort Richardson 1963).

In 1972 FRA hired a civilian natural resources specialist as part of a new environmental team, which also was responsible for the other lands under the Alaska Command (Quirk *et al*. 1978). The first FRA wildlife management plan was completed in 1982 (Bennett 1982), followed by the first natural resource management plan in 1984 (Gossweiler 1984). By the early 1990s, waterfowl mortality in Eagle River Flats emerged as the most significant natural resources issue on FRA. A series of intensive evaluations and remedial investigations (CH2M Hill 1994, Racine *et al*. 1993) followed, and in 1994, the Environmental Protection Agency placed FRA on the National Priorities List.

The 1998-2003 INRMP (U.S. Army, Alaska 1998) was the first INRMP developed and implemented under new requirements of the 1997 Sikes Act Amendments. Subsequent FRA INRMPs for the planning periods 2002-2006 and 2007-2011 were prepared, and implementation of many of the proposed projects in these plans led to the enhancement of natural resources on FRA.

Numerous surveys and studies occurred on FRA since the 1950s. Traditionally, fish and wildlife management emphasized species popular for hunting and fishing, especially moose, salmon, and trout. USARAK and later USAG-AK focused on planning level surveys. Planning level fauna surveys were designed to determine trends in faunal diversity and to improve the accuracy of the faunal database. Fish and wildlife inventory comprehensive planning level surveys were designed to identify all fauna species on FRA lands. Monitoring focused on neotropical migratory birds, waterfowl, raptors, upland game birds, salmon, trout and other fish species, frogs, small mammals, furbearers, and large mammal species (including beluga whale).

### Moose

Moose habitat improvements on EAFB have come about through timber sales, rights-of-way clearing, gravel pit reclamation, and, in recent years, mitigation measures. The largest acreage involving mitigation measures were initiated by the Alaska Railroad during 2000. Approximately 25 acres were enhanced through hydro-axing and tree-grinding. In the previous 10 years on EAFB, less than 25 acres were treated to benefit moose and other beneficiaries of early succession forest habitat.

Moose habitat has been managed extensively on FRA. FRAs management focus has been on enhancing currently used moose habitat by mechanically cutting and recycling woody plants using a hydro-ax or by cutting the woody vegetation to ground level with a bulldozer. A second method of increasing winter moose range involves converting forested areas to early succession deciduous plant communities, again using a hydro-ax. A third method for increasing winter moose range uses plantings of willow shoots or bundles in areas desirable for this treatment (U.S. Army, Alaska 1998).

### Birds and BASH

Since the 1970s the population of Canada geese had risen significantly in the Anchorage area, causing an increase in the potential for deadly clashes between aircraft and geese (Crowley *et al*. 1997). In response to the 1995 aircraft accident and the increased geese population, the Air Force, in conjunction with other agencies, such as USFWS and ADF&G, developed the Bird Aircraft Strike Hazard (BASH) plan (3WI 91-212). Following this plan, the Air Force has allowed grasses around the airfield to grow higher, leveled airfields to remove standing water, controlled broad-leaf plants, removed edge effects, fertilized, and implemented other procedures outlined in the BASH Plan . In 2008 the BASH plan was revised to include a vegetation management plan that includes objectives for shrub habitat outside the airfield security fence line if not currently in lawn near buildings, sidewalks, or streets. The objective strives to minimize raptor feeding areas by replacing grass cover, attractive to rodents, with small trees and shrubs. This habitat conversion has offset some moose habitat lost to recent development trends.

Winter Christmas bird counts have been conducted since 2003. These counts also provide trends of winter bird presence around the airfield. When the EAFB portions of the Eagle River and Anchorage Christmas bird counts are compared to the remainder of the count areas, relative density and diversity of birds can indicate the attractiveness and relative effectiveness of the BASH program, and can add to the interpretation of activities recorded by Wildlife Services.

Habitat for cavity nesting ducks, such as common and Barrow's goldeneye was improved in 1987 through installing four nesting boxes around Sixmile Lake. In addition, boreal and saw-whet owl boxes have been placed in unrecorded locations. As needed, the boxes have been replaced or repaired, usually by volunteers. Five wood duck boxes were erected in 2009, all within ¼ mile of large water bodies north of Hilberg Lake to avoid conflicting with BASH objectives.

### Fish

Salmon habitat has been improved through adding spawning gravel and the removal of obstacles (*e.g*. beaver dams and flood debris) that occur in streams, mainly Sixmile Creek and Ship Creek. A splash pool on Sixmile Creek was installed on the advice of ADF&G to raise the water level on the downstream end to the lower lip of the culvert. A new culvert/fish ladder was installed in the summer of 1996. Prior to 1974 a fish ladder was installed at the point where Sixmile Creek exits Sixmile Lake.

Gill netting has been conducted occasionally to monitor fish populations since 1975 in the five managed lakes on FRA (Bennett 1982). The primary method FRA used for monitoring fish in lakes, rivers, and streams has been a statewide harvest survey performed by ADF&G.

**Fort Richardson Forest Timber Types**

**FRA Forest Timber Types**

| Forest Cover Type | Acres | Percent Forested Acres | Cubic Feet per Acre | Total Cubic Feet | Percent Volume Cubic Feet | Average Stems per Acre |
|---|---|---|---|---|---|---|
| **Sawtimber** | | | | | | |
| (1) White Spruce | 238 | 0.8% | 118 | 28,084 | 0.1% | 34 |
| (8) White Spruce-Birch-Aspen | 9,731 | 30.8% | 624 | 6,072,144 | 18.4% | 64 |
| Subtotal | 9,969 | 31.5% | | 6,100,228 | 18.5% | |
| **Poletimber** | | | | | | |
| (2) White Spruce | 646 | 2.0% | 421 | 271,966 | 0.8% | 102 |
| (6) Balsam Poplar | 227 | 0.7% | 1,867 | 423,809 | 1.3% | 193 |
| (9) White Spruce-Birch-Aspen | 7,182 | 22.7% | 1,065 | 7,648,830 | 23.1% | 231 |
| Subtotal | 8,055 | 25.5% | | 8,344,605 | 25.2% | |
| **Poletimber / Sawtimber** | | | | | | |
| (4) Other | 252 | 0.8% | 712 | 179,424 | 0.5% | 481 |
| (7) Birch-Aspen | 11,170 | 35.3% | 1,518 | 16,956,060 | 51.3% | 201 |
| (10) Black and White Spruce-Birch-Aspen | 1,432 | 4.5% | 957 | 1,370,424 | 4.1% | 246 |
| Subtotal | 12,854 | 40.6% | | 18,505,908 | 56.0% | |
| **Dwarf/Regeneration/Burned** | | | | | | |
| (22) Other Coniferous | 748 | 2.4% | 134 | 100,232 | 0.3% | 84 |
| Grand Total | 31,626 | 100.0% | | 33,050,973 | 100.0% | |

**History of Outdoor Recreation**

The outdoor recreation program on EAFB covered the northern one-third of the present JBER-Elmendorf, and most of JBER-Richardson.

***Fishing***

Fishing is one of the most popular year-round recreational activities on JBER, since the 1950s. To maintain the fishery on EAFB, 1950s managers restricted fishing to military female dependents and children under 16 years of age. These restrictions were removed in 1958 when ADF&G decided that the fish populations in Green and Sixmile lakes were sufficient to withstand increased fishing pressure. As the demand for fishing areas increased, more lakes were stocked. Fishing at Sixmile Creek for salmon

(pinks and sockeye) started in 1983. To improve the EAFB ice fishery, landlocked salmon were stocked in 1995, 1996, and 1997.

Rainbow trout were stocked in a few lakes on FRA as early as 1953, and stocking has since continued annually. Stocking schedules have been manipulated over the years on EAFB to alleviate pressure on the trout fishery. However, this was unsuccessful since stocking relies heavily on ADF&G hatchery scheduling. Some of the pressure was removed by changing the distribution of the stocking allotment among lakes, based on the fishing pressure identified through angler surveys.

To get a better understanding of the needs of those who fish the lakes on EAFB, surveys were taken using three different techniques. Natural resources staff and volunteer conservation agents conducted interviews with anglers to collect information. A survey was printed in the local newspaper, and the Wildlife Education Center had copies for people to fill out and send in. Lastly, creel surveys were taken from those fishing the lakes. The primary method FRA used for monitoring fish in lakes, rivers, and streams was a statewide harvest survey performed by ADF&G.

### *Hunting and Trapping*

An EAFB archery hunt for moose was undertaken on a trial basis in 1990. Normal permit hunts on FRA alone were not effective in reducing moose numbers because moose would move onto EAFB lands during hunting seasons. Fifteen permits were issued during the annual drawing for the state permit hunts, with 14 of the 15 moose being taken. Hunter control was maintained by the base security officers, who required hunters to sign on and off EAFB through the main gate. In addition to providing control, this procedure yielded excellent information on the time required for each hunter to successfully harvest a moose. Due to the success of the hunt, ADF&G established it as a permanent addition to drawing hunts, with the annual harvest averaging 12 animals from 1990 through 1997. During 2002-2009 the success rate ranged from 45 to 84 percent. This hunt is extremely popular with archers and boasts the highest archery success rate in the state.

Hunting has long been the most popular form of outdoor recreation on FRA. In 2005, for instance, FRA hunters logged 1,510 user days, or 58% of the total installation use, as compared to those engaged in fishing (8% of 2005 total), off-road recreational vehicle use (8% of 2005 total), and other activities, such as walking, hiking, biking, etc., (25% of 2005 total). Moose hunting, the only authorized big game hunt on FRA, has traditionally been the most popular form of hunting on the installation while small game and waterfowl hunting are pursued to a lesser degree. Hunting occurs on JBER-Richardson in areas that are open to public access and recreational use in State Game Management Unit 14C, Fort Richardson Management Area, per ADF&G regulations (U.S. Army Garrison, Alaska 2007).

Between 100 and 150 permits are normally awarded for the hunts collectively. The bag limit for these hunts is one moose, with legal animals (*i.e.*, bull only, either sex, antlerless) as determined by annual aerial census (U.S. Army Garrison, Alaska 2007).

### Reimbursable Conservation Program Funds

**Reimbursable Conservation Program Funds FY01-FY10, EAFB**

| FY | Receipts (Expenditures) | Program[1] | Number Permits | Notes |
|---|---|---|---|---|

| FY | Receipts (Expenditures) | Program[1] | Number Permits | Notes |
|---|---|---|---|---|
| FY01 | $9,340 | FW | 366 | 934 cords |
| | $1,200 | CT | 243 | |
| FY02 | $1,500 | FW | 141 | 150 cords |
| | $1,015 | CT | 203 | |
| FY03 | $1,180 | FW | 105 | 118 cords |
| | $970 | CT | 194 | |
| | $1,625 | MH | 13 | |
| FY04 | $1,200 | FW | 103 | 120 cords |
| | $745 | CT | 149 | |
| | $2,500 | MH | 20 | |
| FY05 | $870 | FW | 72 | 87 cords |
| | $975 | CT | 195 | |
| | $2,375 | MH | 19 | |
| FY05 | ($32,294) | | | Forestry truck purchase |
| FY06 | unknown | FW | unknown | |
| | unknown | CT | unknown | |
| | $2,500 | MH | 20 | |
| | ($4,000) | | | MCA equipment purchase |
| FY07 | $4,220 | FW | 212 | 422 cords |
| | $1,200 | CT | 240 | |
| | $2,625 | MH | 21 | |
| FY08 | $7,150 | FW | 411 | 715 cords |
| | $1,065 | CT | 213 | |
| | $2,750 | MH | 22 | |
| FY09 | $8,503 | FW | 334 | Unknown # cords, Fee increased to $30/cord |
| | $1,635 | CT | 164 | Fee increased to $10/tree |
| | $2,875 | MH | 23 | |

| FY | Receipts (Expenditures) | Program[1] | Number Permits | Notes |
|---|---|---|---|---|
| FY10 | $5,080 | FW | 210 | Partial year |
| | $980 | CT | 100 | |
| | $2,125 | MH | 17 | |

[1] FW - Firewood permits, CT - Christmas tree permits, MH - Moose hunting permits

**Off-Road Vehicle Use on JBER**

Off-road vehicle use is allowed on the All Terrain Vehicle trail. All other trails are for non-motorized use. Snowmachine trails are marked and maintained, and snowmachining is allowed on JBER-Elmendorf only.

On JBER-Richardson the use of privately-owned off-road recreational vehicles is allowed on a limited basis. Vehicles commonly used as off-road recreational vehicles must remain on designated trails and roads or stay within a designated recreational use area. Opening and closing dates for off-road recreational vehicle seasons are set in conjunction with Chugach State Park.

To determine the suitability of areas and trails for off-road recreational vehicles, each type of motorized off-road recreational vehicles will be considered separately, taking into account potential environmental impacts, the season, and opportunities to balance seasonal use with other recreational uses. If it is determined that off-road recreational vehicle use is causing or will cause considerable adverse effects to the soil, vegetation, wildlife, wildlife habitat, or cultural or historic resources, the use of the type of off-road recreational vehicle causing such effects will be immediately prohibited. If necessary, designated sites will be closed. Restrictions on off-road recreational vehicle use or closure of designated sites will remain in effect until such adverse effects have been eliminated, including site restoration if necessary, and appropriate measures implemented to prevent any such recurrence.

Environmental and related impacts of JBER off-road recreational vehicle use will be assessed; coordination with adjacent private and public landowners and managers will be included in the assessment process. Coordination will ensure all local, state, and federal requirements are met. Although many off-road recreational vehicle riders use established trails and roads, off-road recreational vehicles have the potential for damage to natural resources.

JBER lands may be designated for one or more types of off-road recreational vehicle use in response to a demonstrated need, provided that sufficient suitable areas are available. Lands that may not be designated for one or more types of off-road recreational vehicle use are as follows:

- Areas restricted for security or safety purposes, such as explosive ordnance impact areas.
- Areas containing geological and soil conditions, flora or fauna, or other natural characteristics of fragile or unique nature that would be subject to excessive or irreversible damage by use of off-road recreational vehicles.
- Areas where the use by a type or types of off-road recreational vehicles would cause unequivocal and irreversible damage or destruction as a result of such use, provided, however, that types of off-road recreational vehicles not causing such damage or destruction may be permitted to use such areas.
- Areas that are key fish and wildlife habitats, as identified under environmental considerations.

- Areas that contain archeological sites, historic sites, petroglyphs, pictographs, areas set aside for their scenic value, and areas in which noise would adversely affect other uses or wildlife resources.
- Areas in or adjacent to outdoor recreation areas where noise or vehicle emissions would be an irritant to users of the outdoor recreation area.
- Noise sensitive areas, such as housing, schools, churches, or areas where noise or vehicular emissions would be an irritant to inhabitants.
- Areas or trails set aside for non-motorized recreational uses.
- Areas where off-road recreational vehicle use would disturb nesting or breeding of wildlife, especially those protected under Endangered Species Act or Migratory Bird Treaty Act.

All land and water areas will be closed to off-road recreational use by motorized off-road recreational vehicles except those areas and trails that are determined suitable and specifically designated for such use by CEANC.

JBER-Richardson is managed for a number of different types of public recreational use. All areas that are determined open for recreational use may be closed temporarily during periods of military use. All users must daily check in to determine if areas are open to recreational use. JBER-Richardson uses the following classification system to describe recreation areas on the installation.

***Open Use Area*:** Open to all types of off-road recreational vehicles. Open to all other recreational activities year-round.

*Frozen* (12+ inches of snow cover)**:** No restrictions for any off-road recreational vehicles when soil is frozen.
*Unfrozen summer conditions:* During unfrozen conditions, off-road recreational vehicles over 1,500 lbs (road vehicles, dune buggies, Argos, small unit support vehicles etc.) must stay on existing roads and trails. No restrictions for off-road recreational vehicles under 1,500 lbs (all-terrain vehicles, snowmachines, dirt bikes etc.). Motorized watercraft must stay within existing open water channels.

***Modified Use Area***: Open to all types of off-road recreational vehicles. No restrictions for any off-road recreational vehicles when soil is frozen. All off-road recreational vehicles must stay on existing roads and trails during the summer. Motorized watercraft must stay within existing open water channels. Open to all other recreational activities year-round.

***Limited Use Area***: Open to all non-motorized recreation (hunting, fishing, hiking, skiing, and berry picking) year-round but not open to any type of off-road recreational vehicle at any time. Motorized watercraft must stay within existing open water channels.

***Special Use Management Area***: An area managed for recreational use under specific rules that apply only to that area.

***Closed Area***: Closed to all recreational activities year-round. Closed areas include, but are not limited to, airfields, landfill, small arms ranges, impact areas, ammunition storage points, etc.

**History of Cultural Resources**
The *Integrated Cultural Resources Management Plan, 2008-2012, Elmendorf Air Force Base, Alaska* (Verhaaren and Kullen 2008) and the *Integrated Cultural Resources Management Plan, 2002-2006, Fort Richardson, Alaska, United States Army, Alaska* (Center for Environmental Management of

Military Lands and Gene Stout and Associates 2001) contain details about the history of cultural resources management on EAFB and FRA. It is anticipated that a JBER Integrated Cultural Resources Management Plan, expected to be completed in 2012, will also include similar historical information.

# Appendix J. Cook Inlet Beluga Whale Monitoring Protocol and Results

## Beluga Whale Usage of Eagle Bay and Eagle River

Overall, the Eagle Bay/Eagle River area appears to be an important area for a substantial portion of the Cook Inlet beluga population during the unfrozen months. McGuire *et al.* (2013) found that 78% of the 307 CIB in their photographic catalogue, representing most (if not all) of the CIB population, had visited Eagle Bay at least once between 2005 and 2011. Large groups of belugas, occasionally exceeding 100 animals at once, move into Eagle Bay/Eagle River where they travel, mill, feed[1] and socialize. Beluga groups in Eagle Bay usually consist of a mixture of white (presumably adults), gray (some adult and some juveniles/calves), calves and newborn calves with a large number of animals presumed to be reproductive females[2]. McGuire *et al.* (2013) found that 39% of the belugas identified in Eagle Bay in 2011 were accompanied by calves.

The most intensive use of Eagle Bay/Eagle River by belugas occurs between August and November (see Figure  and Figure  below). Belugas are usually first detected in Eagle Bay in June or July with sporadic detections [3]until August at which time daily presence is usually constant through September. Belugas maintain a gradually decreasing presence in Eagle Bay and the mouth of Eagle River during October and November but are much less consistent than during the peak period of August and September.

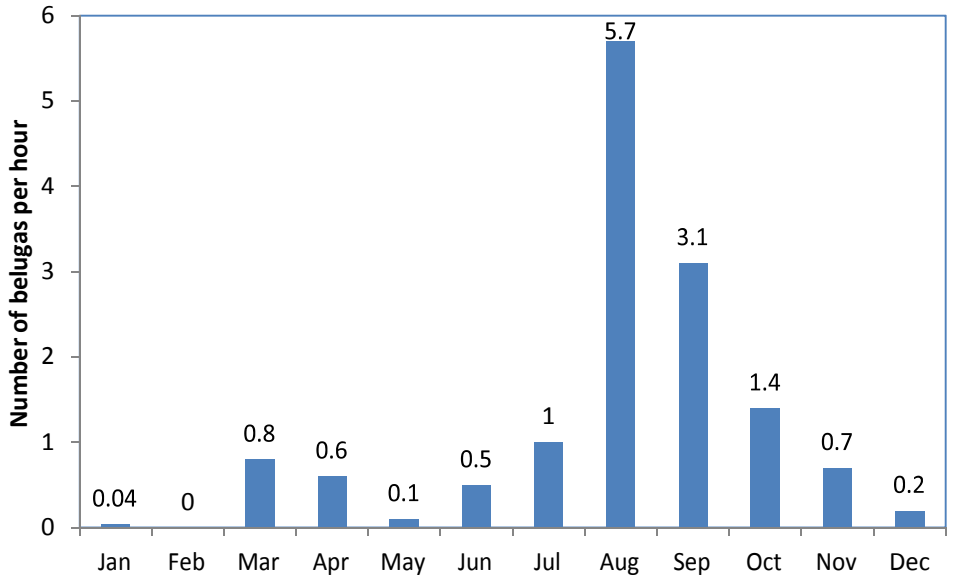



**Figure 1.** Monthly sighting rates of Cook Inlet belugas in Knik Arm in whales per hour. Rates from Dec-July are adapted from Funk et al., (2005) and represent data from several positions along the Arm near Eagle Bay. Rates from Aug-Nov are from visual observational studies conducted by JBER at the mouth of Eagle River from 2008-2012.

[1]Records of confirmed feeding events are rare due to the extreme turbidity of the water. Presumed feeding events, however, are much more common. A presumed feeding event is one in which belugas are observed pursuing salmon, often with the result of a salmon leaving the water to "swim" onto the bank just in front of a pursuing beluga.
[2]Photo identification surveys indicate that the majority (58%) of whales identified in Eagle Bay/Eagle River during 2011 were reproductive females based on sighting records between 2005 and 2011. (McGuire et al., 2013)
[3]With the exception of 2012 in which whales were detected on the majority of days in June and multiple days in July

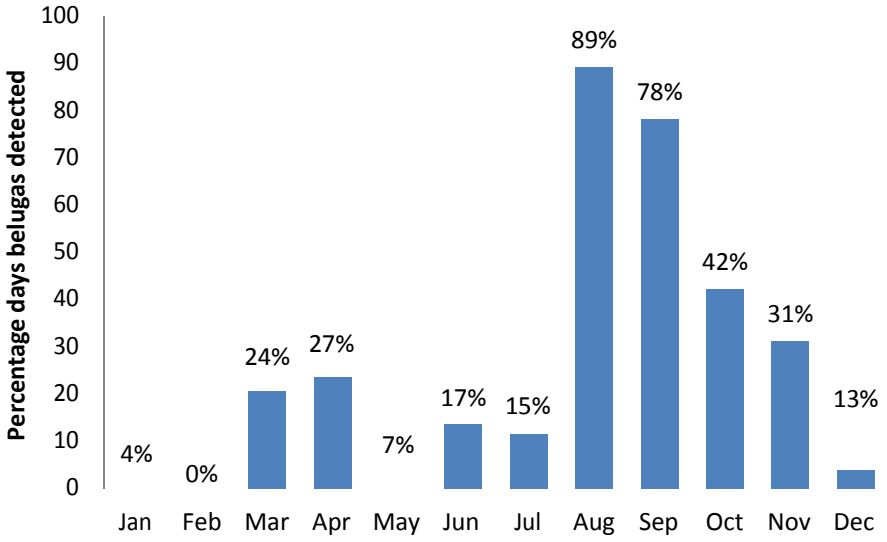



**Figure 2.** Percent observation/monitor days with positive presence of Cook Inlet belugas in Knik Arm in or near Eagle Bay. Percentages from Dec-May are adapted from Funk et al. (2005) and represent data from several positions along the Arm near Eagle Bay. Rates from June-Nov are from a combination of visual observational studies and passive acoustic monitoring conducted by JBER at the mouth of Eagle River and in Eagle Bay from 2009-2012.

Belugas tend to move with the tide through Eagle Bay, concentrating movement through a relatively deep channel (10-60 feet depending on location and tidal state) that hugs the shoreline from the northern tip of Eagle Bay to the southern bank of Eagle River (see **Error! Reference source not found.**), although when water depth permits, belugas occasionally travel across the large mud flat located in the center of the Bay. Movement northward through Eagle Bay occurs during the flood with belugas typically traversing the length of Eagle Bay by 2-4 hours prior to actual high tide with the result that belugas are rarely detected in Eagle Bay during the later stages of the flood. The subsequent ebb tide usually results in southward movement of belugas from areas north of Eagle Bay into Eagle Bay via the main channel beginning at the northernmost tip of the bay. Belugas moving with the ebb are typically first observed entering Eagle Bay from 1-3 hours after the actual change in water direction at the mouth of Eagle River.

Intensive usage of Eagle River by belugas begins in August and continues through September. When in the river, belugas are often observed engaged in prey pursuit events during which salmon are driven against and sometimes onto (i.e. out of the water) the steep banks of the river by pursuing whales. Fish sampling efforts at the mouth of Eagle River suggest that the salmon species composition in the river during August is a mixture of primarily coho and sockeye with some chum and pink mixed in. Beluga usage of the river begins to decrease gradually around the second week in September and is thought to coincide with a decreasing availability of salmon.

Usage of Eagle River appears to be concentrated between the mouth and about 1.5 km (river distance) upstream in Eagle River. While belugas do occasionally venture as far up as 4.2 km (river distance) upstream in Eagle River, these far-reaching forays appear to occur infrequently and only from August through mid-October.

## Beluga Whale Monitoring in Eagle Bay and Eagle River

The Army has historically taken an interest in the beluga whale and has recorded sightings over the past two decades. In recent years more intensive field surveys for beluga whales have been conducted from

June through October of each year. In 2005, USAG FRA developed standard operating procedures and protocols for monitoring beluga whales in and around ERF Impact Area. In 2008 the survey methodology was modified to allow the capture of more statistically rigorous data.

Beginning in 2009, the Army began to employ various passive acoustic monitoring (PAM) techniques to gain a more thorough picture of beluga presence in Eagle Bay and Eagle River. Unlike human observers, PAM can be deployed during all periods of the day and during all types of weather. Additionally, PAM, does not rely on visual cues for detection of whales and thus the persistent turbid conditions in Knik Arm do not appear to hinder acoustic detections under most circumstances. The use of PAM, while proving effective at gathering beluga presence/absence data and showing promise for future monitoring of specific behavioral states, is not fool-proof, however. The Knik Arm is extremely dynamic with widely varying bathymetry, huge tidal variation, strong currents, heavy ice cover in the winter, and a heavy burden of silt leading to rapid sedimentation in certain areas. Many instruments, and thus much data, have been lost in Eagle Bay and Eagle River from a combination of bank failures, ice entrainment, sedimentation, ice scour, physical damage from debris and other unknown causes. Additionally, deployment locations must be carefully chosen relative to bathymetry to avoid acoustic shadowing by hidden bottom features like bars and channels.

## Survey Methodology

### Visual observations 2005-2007

Field surveys for beluga whales took place from June through October at Cole Point (training area 415) or Observation Point Fagen (training area 407). When whales were observed from the observation points, survey personnel requested clearance from JBER-Richardson Range Control to enter the ERF Impact area. Once clearance was granted, survey personnel proceeded to a pre-cleared area overlooking the mouth of the Eagle River and commenced data collection. Information collected included date, time, observer, location, optics used, environmental conditions, bearing to whale group, number of whales, activity, grid position of group, direction of travel, and notes on other wildlife present, aircraft, or general comments on beluga behavior, etc. In addition to observations, photographic or video-graphic documentation was obtained when feasible.
While this approach did provide valuable observations on beluga presence and behavior, it did not provide a means for rigorous statistical analysis of the data collected. Thus, in 2008 the methodology was modified in an attempt to capture more statistically meaningful data.

### Visual Observations 2008-2012

Standard Observations:
Whale observations were carried out using a systematic sampling design consisting of a group follow protocol and focal group sampling method. Observers followed a group of whales over the course of a 20 minute sampling round using binoculars and/or high powered spotting scopes. Group activity was defined as what most (>50%) of a whale group is engaged in during the course of the sampling round. The various categories of whale behaviors were strictly defined prior to sampling to minimize any ambiguities and variation between observers. Whales were classified as white, gray or calf and the location of whale groups at the start and end of each sampling round is classified using a grid superimposed on a map of Eagle Bay and Eagle River. Behavioral categories for this method included the following: travelling, milling, diving, prey-pursuit, feeding, side-scanning, spy-hopping and snorkeling.

Use of the modified sampling protocol contained several limitations that should be mentioned. The quantification of whales into color classes was always biased towards “white” animals due to easier detectability, and was heavily influenced by prevailing survey conditions (e.g. visibility, precipitation, light conditions). Calves may have been underrepresented due to difficulty in distinguishing between

young and "gray" animals, especially at long distances. Because calves frequently surface in very close contact with the cow, often on the side opposite from the observer, they were sometimes difficult to observe. Group follow protocol may have also been biased towards more obvious behaviors or more visible animals. Moreover, behavioral sampling was limited to activities above the water line due to the extreme turbidity of Knik Arm. Finally, military training on nearby ranges occasionally prevented access to ERF Impact Area, thus disrupting the distribution of summer and fall observations.

Fine-scale Observations:
During the 2011 field season, the beluga observation protocol was expanded for whales that entered Eagle River. Specifically, a fine-scale behavioral component, or "event", defined as a discrete behavior, such as "side-scanning", that occurs at a certain point in time (Martin and Bateson, 2007) was added. When an individual whale performed an event in the river, observers recorded the type of event, the time and the state of the majority of the whales in the river at that time. Events were only recorded for whales in Eagle River up to the first turn in the river because of their proximity to observers, while states continued to be recorded for whales in both Eagle River and Eagle Bay. Surface behaviors were categorized into states, types of surfacing and events. The behaviors noted under each category included the following:

| **States:** | **Types of surfacing:** | **Events:** |
|---|---|---|
| Milling | Normal diving | Prey pursuit |
| Travelling | Snorkeling | Feeding |
| Socializing | Fast diving | Social interaction |
| Unknown | Other | Side scanning |
| | | Bubbling |
| | | Other |

Remote Camera:
Starting in 2008, USAG FRA supplemented its visual observation data by deploying remote, color, motion-sensitive cameras with infrared illumination at low light to collect presence/absence data on belugas during times when observers are not present. A minimum of two cameras were deployed on the north bank of Eagle River – one at the mouth facing SSW (perpendicular to water flow) and one approximately 200 meters upstream from the mouth (facing west). Cameras were set on time-lapse mode with a one minute time increment between shots and with the motion-detection feature also enabled. Camera times were synched with each other and all other devices used to record time during the observational period (watches, video cameras, etc). Each camera was checked for obvious external problems (alignment change, lens fouling, etc.) daily when possible, and serviced (change card and batteries) every two weeks.

USAG FRA technicians downloaded the data from the camera cards onto a dedicated external hard drive and back up on a redundant drive. Upon removal of a camera from the field, images from each card were analyzed as soon as possible, within two weeks at maximum. Analyses were performed by either one experienced team member who has analyzed at least one full season's worth of camera data (or at least 30,000 images), or alternatively by two team members who had as individuals analyzed less than 30,000 images each. In analyzing the data, team members scrolled through a series of photos looking primarily for presence of beluga whales and harbor seals in the river. They then compiled data indicating camera number, folder name, starting time and date of the folder, presence of beluga(s) or other marine mammals, any other unusual event (e.g. boat passage, other mammalian presence, etc.), and the date and end time of each folder. Entries regarding the presence of a beluga included notations of date, time, image number, number of whales, color of whales and tidal state. Analysts also noted whether observers were present on

the flats during the dates covered in a folder, and if so, during which times. All data collected was entered into a Microsoft Access database and saved on the two external drives mentioned above.

## Passive Acoustic Monitoring 2009-2012

Introduction

In 2009, the DoD joined a recently formed multi-agency[4] group, the Cook Inlet Beluga Acoustics team, whose goal was to use passive acoustic monitoring to investigate year-round seasonal presence of belugas across Cook Inlet, killer whale presence in CIB habitat, seasonal background noise level and diversity across Cook Inlet and detection of beluga foraging activity. Team CIBA, as the group was later dubbed, deployed moorings in 10 locations throughout Cook Inlet, to include north Eagle Bay, Eagle River mouth and South Eagle Bay. Aside from the main objectives mentioned above, CIBA strove to develop a mooring that could withstand the extreme conditions presented by the upper inlet, particularly Knik Arm through the winter period. The team is currently on its fourth mooring design and has successfully overwintered moorings as far north as Cairn Point in Knik Arm, although only locations south of Knik Arm have yielded successful overwinter deployments across multiple years.

Moorings (EAR/CPOD)

Each mooring housed two passive acoustic monitoring instruments: an Ecological Acoustic Recorder[5] (EAR) and a Click POrpoise Detector[6] (C-POD). The EAR is a low power, microprocessor-based, bottom-moored acoustic recorder that records ambient sounds at frequencies up to 30 kHz. The EAR was employed to record beluga and killer whale calls, whistles and buzzes. It samples the ambient sound field on a programmable duty cycle and stores the recordings on a 160 GB hard disk drive. An informal test conducted at two upper Cook Inlet sites using an artificial 10-12 kHz tonal signal at a source level of 140 dB re 1μPa yielded a conservative EAR detection range of 1.5-2.5 km (Lammers et al, 2013).

EARs deployed by Team CIBA were programmed to record at a 10% duty cycle (30 sec/5 min) and a sample rate of 25 kHz, such that recordings could be obtained for ~18-22 weeks without changing batteries (Lammers et al, 2013). The EAR can also respond to transient acoustic events that meet specific criteria, such as high amplitude sounds. Recordings obtained by the EAR were post-processed using automated Matlab™ algorithms that calculate measures of acoustic energy, such as Root Mean Square sound pressure level (RMS SPL), and search the recordings for evidence of signals of interest, such as tonal calls and buzzes produced by CIB.

The C-POD is a self-contained battery powered echolocation logger with a hydrophone connected to a digital waveform characterization to identify cetacean clicks and log the time, center frequency, intensity and bandwidth of each click. The C-POD, set to continuously log sound energy between 20-160 kHz, was employed to log the echolocation click trains produced by odontocete cetaceans like the beluga, killer whale and harbor porpoise. The detection range of the CPOD in upper Cook Inlet was estimated to be ~700m in summer and ~900 m in winter (pers. comm., Castellote, 2013) The associated software (CPOD.exe) filters the recorded click-time data to find 'click trains', sequences of clicks with a degree of similarity between adjacent inter-click intervals. Random clicks generating a train by chance are rejected using a model that calculates the probability of the train arising by chance if clicks were arriving at the prevailing rate from non-train sources. Click trains are assigned by this method to a probability level of being from beluga whales.

[4] Team CIBA includes members from the Alaska Department of Fish and Game, National Marine Mammal Laboratory, U.S. Air Force, University of Alaska-Fairbanks, Alaska Sealife Center and the Hawaii Institute of Marine Biology
[5] Produced by Oceanwide Science Institute, USA
[6] Produced by Chelonia Ltd., Cornwall, U.K

The CIBA moorings were deployed and retrieved from a boat (see Table 1 for acoustic coverage per year). Each mooring was equipped with a Push Off ReleaseTransponder[7] (PORT) attached to a heavy anchor. An acoustic signal sent to the PORT from a deck unit on the retrieval boat caused the buoyant housing containing the EAR, C-POD and PORT to decouple from the anchor, allowing the housing to float to the surface where it was retrieved by a waiting boat.

| | Location | Start Date | No acoustic coverage | | | End date | Total # days covered |
|---|---|---|---|---|---|---|---|
| | | | Start | End | # Days | | |
| **2009** | **Eagle Bay (North/South)** | 6 Jun, 2009 | -- | -- | *0* | 7 Jul, 2009 | **32** |
| | **Eagle River mouth** | 7 Jul, 2009 | -- | -- | *0* | 16 Sep, 2009 | **72** |
| **2010** | **Eagle Bay (North/South)** | 30 May, 2010 | *21 Jun* | *3 Aug* | *44* | 2 Dec, 2010 | **101** |
| | | | *28 Sep* | *8 Nov* | *42* | | |
| | | | | *Total* | ***86*** | | |
| | **Eagle River mouth** | 30 May, 2010 | *21 Jun* | *21 Jun* | ***1*** | 9 Oct, 2010 | **132** |
| **2011** | **Eagle Bay (North/South)** | 26 May, 2011 | *11 Jun* | *16 Jun* | *6* | 30 Sep, 2011 | **118** |
| | | | *30 Jul* | *2 Aug* | *4* | | |
| | | | | *Total* | ***10*** | | |
| | **Eagle River mouth/ER1** | 24 May, 2011 | *17 Jun* | *5 Jul* | *19* | 3 Nov, 2011 | **131** |
| | | | *20 Jul* | *27 Jul* | *8* | | |
| | | | *21 Sep* | *26 Sep* | *6* | | |
| | | | | *Total* | ***33*** | | |
| **2012** | **Eagle Bay (North/South)** | -- | -- | -- | -- | -- | **0** |
| | **Eagle River mouth/ER1** | 1 Jun, 2012 | -- | -- | -- | 9 Oct, 2012 | **131** |

**Table 1.** Acoustic coverage in Eagle Bay and the mouth of Eagle River, Alaska, 2009-2012. The moorings for North and South Eagle Bay were combined to represent acoustic coverage of Eagle Bay overall. For 2011 and 2012, coverage at the mouth of the Eagle river was augmented by the CPOD at station ER1.

<u>CPOD</u>

[7] Produced by EdgeTech, West Wareham, MA

In addition to the CIBA moorings described above, Team CIBA deployed C-PODs upstream in Eagle River in 2011 and 2012 and overwintered at the mouth in 2013 (see

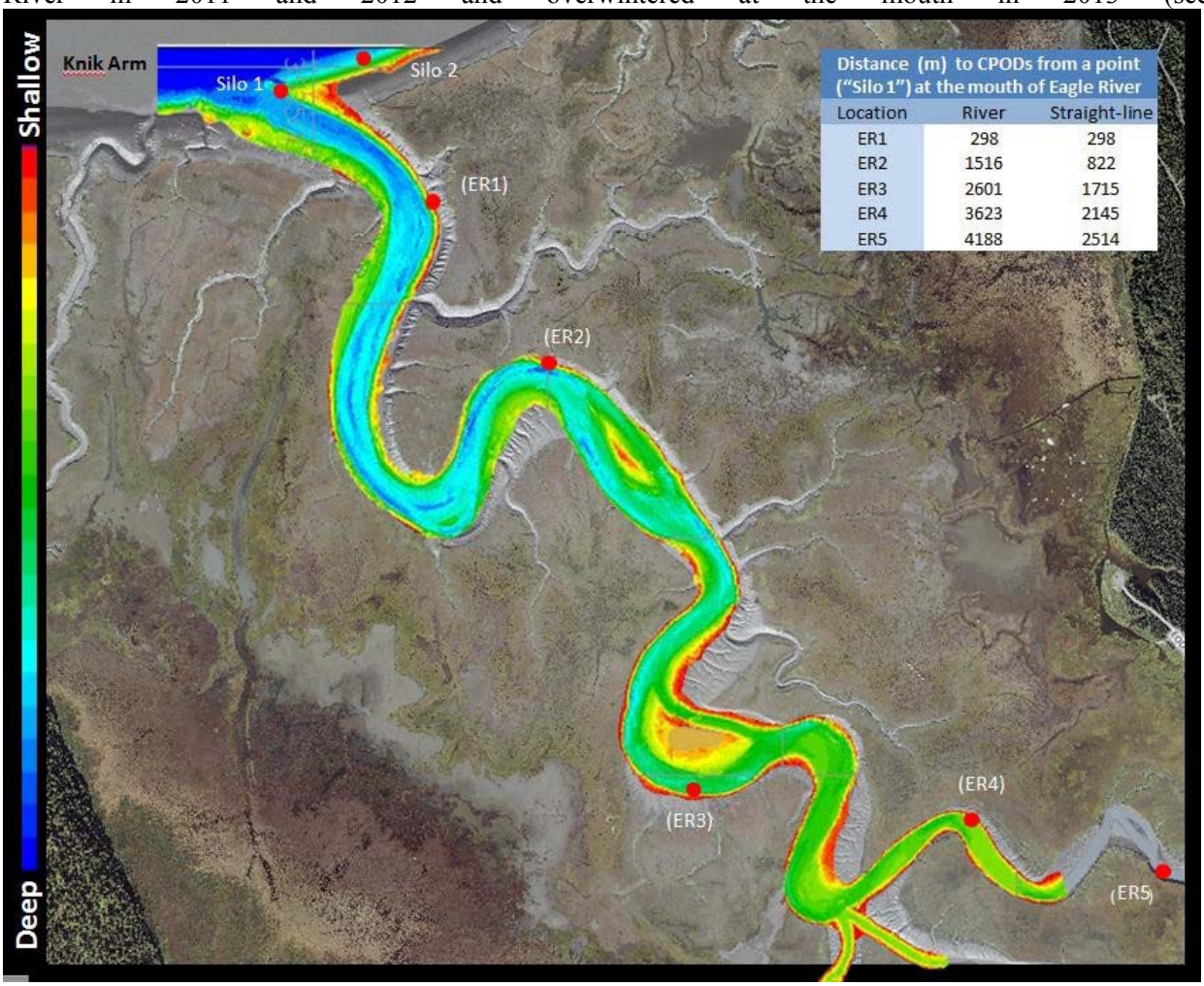



Figure ) with the goals of learning the extent of upstream beluga forays in Eagle River as well as augmenting beluga presence data. CPODs (with the exception of the silos) were attached to a bottom-deployed line and were serviced every 2-4 weeks. Data from the silos will be analyzed in late 2015. The instruments were deployed during the ice-free season from late May/early June to the first week in November (Table 1).

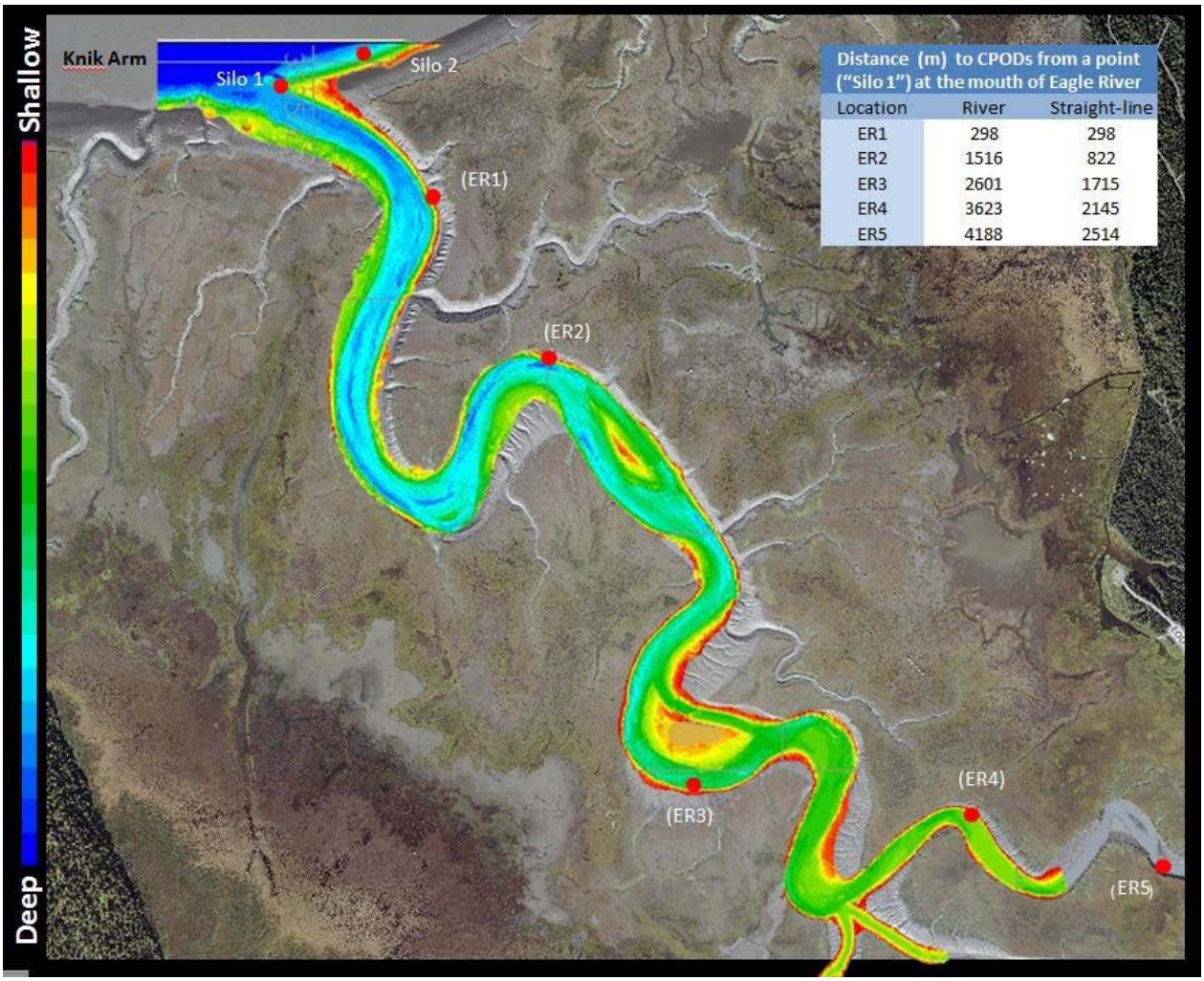



**Figure 3.** Map of Eagle River and the location of CPODs in 2012. Locations ER1-ER4 were also monitored in 2011. ER5 was added in 2012.

| Location | | Date Coverage | | # Days | Notes |
|---|---|---|---|---|---|
| | | Start | End | | |
| 2011 | ER1 | 24 May, 2011 | 16 Jun, 2011 | 24 | |
| | | 6 Jul, 2011 | 19 Jul, 2011 | 14 | |
| | | 28 Jul, 2011 | 11 Aug, 2011 | 15 | CPOD removed due to sedimentation |
| | | 27 Sep, 2011 | 3 Nov, 2011 | 38 | Data from CPOD in CIBA mooring used for 3,4 Aug and 27 Sep-3Nov |
| | | | Total | **91** | |
| | ER2 | 29 Jun, 2011 | 5 Jul, 2011 | 7 | |
| | | 27 Jul, 2011 | 13 Sep, 2011 | 49 | |
| | | | | **56** | |
| | ER3 | 29 Jun, 2011 | 15 Aug, 2011 | 79 | |
| | | 18 Sep, 2011 | 7 Nov, 2011 | 51 | Lost but later found |
| | | | Total | **130** | |
| | ER4 | 15 Jun, 2011 | 5 Jul, 2011 | 21 | |
| | | 27 July, 2011 | 4 Sep, 2011 | 40 | |
| | | 13 Sep, 2011 | 30 Sep, 2011 | 18 | |
| | | | Total | **79** | |
| 2012 | ER1 | 1 Jun, 2012 | 9 Oct, 2012 | **131** | CPOD at ER1 failed to log after 16 July resulted in no data after that date. Data was used from the nearby CIBA mooring to augment this mouth location. |
| | ER2 | -- | -- | -- | POD deployed but no data |
| | ER3 | 1 Jun, 2012 | 27 Sep, 2011 | **119** | Lost |
| | ER4 | 1 Jun, 2012 | 3 Aug, 2012 | **64** | Lost |
| | ER5 | 29 Jun, 2012 | 14 Sep, 2012 | **78** | Lost |

**Table 2.** CPOD deployment history in Eagle River Alaska, 2011-2012. Date ranges include only those dates when a CPOD was logging properly with the exception of ER1 during both years which were augmented by data from the nearby CIBA mooring.

DMON (Digital acoustic Monitor):

In August and September of 2011, CIBA made calibrated acoustic recordings at the mouth of Eagle River (north bank of the river 200m upstream from the mouth) as a part of a beta test of a new passive acoustic recorder, the DMON, from Woods Hole Oceanographic Institution. The instrument was deployed daily and retrieved by hand, attached to a line anchored in the bank by a screw anchor and a Danforth anchor. To maintain instrument stability and avoid line strumming and displacement due to currents, several 4 lbs weights were attached to the line above and below the DMON.

The instrument was set to record continuously at a sample rate of 120 kHz with a configuration including a 2 pole high pass filter was set at 100 Hz (-40 dB at 10 Hz). This rate allowed sampling of beluga echolocation and social signals between 0 and 60 kHz. System frequency response was flat ± 3dB for the range 100 Hz - 10 kHz. System sensitivity, frequency response and total gain were accounted for in the

analysis, using the calibration and compensation functions in SpectraLAB (Sound Technology Corporation).

Sound recordings were manually scanned to identify beluga acoustic events. Echolocation signals where classified as one of the following three subtypes: (1) normal echolocation, (2) fast click-trains termed "buzzes", and (3) "terminal buzzes" for buzzes that occurred at the end of normal echolocation sequences. Date, time and type of acoustic events were logged for each acoustic detection. For echolocation signals, counts were based on detections bound on either side by a detection-free time period of at least 10 seconds as an arbitrary period since the analysis window had a duration of 10 seconds, and the duration of echolocation signals was also calculated and logged.

Behavioral observations of belugas by JBER personnel located on the bank adjacent to the DMON deployment site were concurrently conducted.

PAMBuoy®

In August of 2012, CIBA teamed with the Sea Mammal Research Unit out of the University of Scotland and Marine Instruments Ltd, also of Scotland, to investigate the use of real-time passive acoustic monitoring for Cook Inlet belugas. A PAMBuoy® detection system was deployed in the mouth of the Eagle River, Alaska between 12 and 31 August 2012, close to the point at which the river flows out into Eagle Bay. The system was configured to detect both the echolocation clicks and the whistles of beluga whales. Data were collected using Pelicase, shore based version of PAMBuoy®. This was connected to a hydrophone (Cetacean Research Technology C75) mounted in a frame sat in the mud of the river bank. The analogue signal from the hydrophone was routed up the river bank to the PAMBuoy® unit, on which data were processed in real time. Detection data (candidate clicks, whistles and background noise measurements) were then transmitted a short distance using a 2.4GHz wireless modem to a "Base Station" comprising a receiving modem and laptop computer. For convenience of operation through most of the trial, the base station was positioned a few meters from the PAMBuoy® box.

The monitor base station used a modified version of the PAMGuard software (Gillespie et al., 2008; www.pamguard.org) to view data in real time. PAMGuard was also used to review files offline during data analysis. Figure shows the click detector display during a typical beluga encounter. On the upper display panels, each click is represented by a colored symbol on a plot of amplitude vs. time. Different classes of clicks are shown using different symbol types and colors. The only difference between the two upper displays is their duration, one being set to 15 minutes and the other to 10s. Both displays have the start time, to the detailed amplitude modulation of the received click amplitude in the right hand display is in fact the burst of clicks

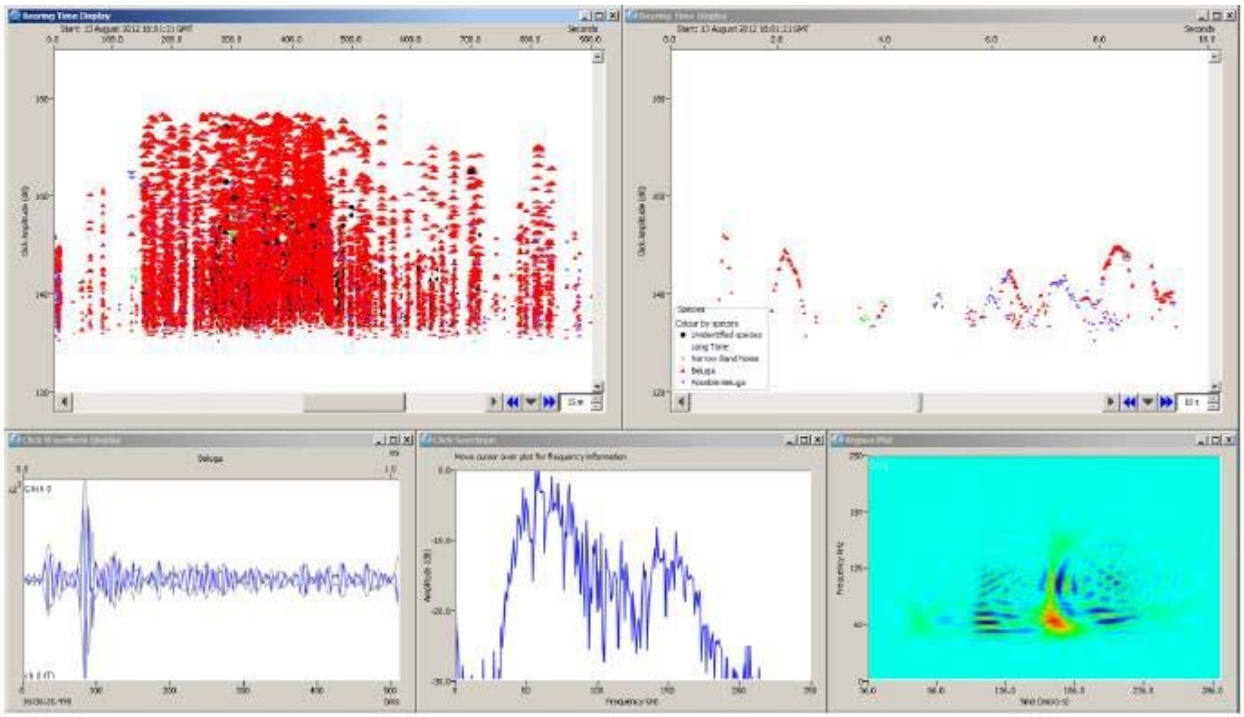


**Figure 4.** Click detector display during a beluga encounter. The top two displays show the amplitude of single clicks over 15 minute and 10 second intervals respectively. Clicks classified as beluga are shown in red. The lower plots show the waveform, power spectrum and Wigner plot of single clicks selected from the upper displays using the mouse.

Prior to digitization, signals were filtered with a 100Hz high pass filter. Digitization was at a sample rate of 500kHz, giving a system bandwidth of 100Hz to 250kHz which covers the full range of beluga communication and echolocation. The click detector was configured to process the raw rata at its full 500kHz sample rate, however, for whistle detection, the signal is first decimated (down-sampled) to a rate of 50kHz prior to the system calculating the spectrogram of the data and searching for tonal vocalizations between 1kHz and 20kHz using the algorithms described in Gillespie et al., (2013b). On several days during the trial, raw data were also recorded as wav files, which were retrieved from the device at the end of each day. Detected clicks, whistles and background noise measurements were both stored on the device and also sent via a wireless network link for real time monitoring at the base station laptop.

The type of data stored or transmitted was different for each detector or background noise measurement. The click detector saves / sent a short waveform clip for each detected click (typically a few hundred samples). The whistle detector saved / sent the time frequency contour of each detected call and the background noise monitor output rms and peak signal levels in dB re.1µPa. Generally, the output of the whistle detector is very robust, it having been shown to have a recall of 79.6% for calls with a signal to noise ration of 10dB or over and a precision of 88%. While it is possible to perform additional classification of detected whistles in order to identify groups of whistles to species (Gillespie et al., 2013b), that is not necessary for this application where only a single species is present (harbour porpoises have rarely been sighted in the area, but this species do not emit whistles). The first stage of the click detector, on the other hand, generally runs at quite a high false alarm rate, generating many candidate clicks which do not originate from the target species. The number of false positive detections from the first stage of the click detection was therefore reduced by running an additional click classifier in order to pick out beluga clicks with a higher degree of confidence.

Clicks were classified according to parameters extracted both from the waveform and from the power spectrum of each click. Click length was measured by first calculating the envelope (or outline) of the click waveform. This was then smoothed using a 5 point moving average filter. The maximum of the smoothed envelope was taken and points 6dB down from that maximum found on either side of the maximum position. The length was then taken as the time between those -6dB points. Clicks with a length greater than 50µs were rejected. From the power spectrum of each click, the energy was summed in two bands, the first from 30 to 120kHz and the second from 10 to 25kHz. Clicks were rejected if the energy in the 30-120kHz band did not exceed the energy in the other band by at least 10dB. Clicks were also required to have both a peak and a mean frequency somewhere between 25 and 80kHz. This upper limit is lower than the peak frequencies of some beluga echolocation clicks (Au et al., 1985; Castellote et al., 2012; Lammers and Castellote, 2009). It was however found that raising the upper limit to 120kHz allowed false triggers caused by a vessel's echo-sounder.

Sighting data were collected and processed by JBER and NMML and provided to SMRU Ltd to be incorporated into the analysis.. Visual observations were made from an observation point close to the buoy deployment site at the mouth of Eagle River. One of two JBER marine mammal technicians experienced with beluga observations and distance estimation at the study site, made observations for 13 days during the trials for a total of 91 hours. The following data were gathered on a standard datasheet: Time of observation to the minute (gps), magnetic bearing (changed to true bearing in excel) from the observer to the closest whale, estimated distance of the closest whale from the observer, behavioural state of the whale (s), direction of movement of the whale (s) (either up or down river- referring to Eagle River), indication of a split or merge event among a group or groups, number of groups within 1 km distance of the observer and other notes pertinent to the observation. In Excel, a projected location of the closest whale in the group was determined per observation time. This projected location was determined using scripts created by Chris Veness (http://www.movable-type.co.uk/scripts/latlong.html). These scripts were integrated into an Excel spreadsheet as follows:

**Estimated latitude of the whale (lat2):**
=ASIN(SIN(lat1)*COS(d/R) + COS(lat1)*SIN(d/R)*COS(θ))

**Estimated longitude of the whale (lon2):**
=lon1 + ATAN2(COS(d/R)-SIN(lat1)*SIN(lat2), SIN(θ)*SIN(d/R)*COS(lat1))

*Where lat1 is the latitude of the observation point in radians[8] clockwise from north, lon2 is the longitude of the observation point (radians), θ is the bearing (radians), d is the estimated distance to the whale, and R is the earth's radius[9] (d/R is the angular distance, in radians).*

Using the resulting coordinates, the bearing and distance from the PAMBuoy® hydrophone was derived using the following scripts from Chris Veness:

**Bearing to whale from the PAMBUoy hydrophone:**
=ATAN2(COS(lat1)*SIN(lat2)-SIN(lat1)*COS(lat2)*COS(lon2-lon1), SIN(lon2-lon1)*COS(lat2))

*Where lat1 is the latitude and lon1 is the longitude of the hydrophone in radians and lat2 is the latitude and lon2 is the longitude of the whale in radians.*

**Distance of the whale from the hydrophone:**
=ACOS(SIN(lat1)*SIN(lat2)+COS(lat1)*COS(lat2)*COS(lon2-lon1))*6371000

[8] To convert from degrees to radians the coordinates were first converted to decimal degrees and then multiplied by π/180. Conversely, to convert from radians to degrees for the output, the coordinates in radians were multiplied by 180/π.
[9] A value of 6371 km was used for the earth's mean radius. This was converted to meters (6371000) to remain consistent with scale of this study, which used meters rather than km.

*Where lat1 is the latitude and lon1 is the longitude of the hydrophone in radians and lat2 and lon2 are the latitude and longitude, respectively, of the whale.*

The two parameters which best describe the performance of a detector are its efficiency (how many of the things it's supposed to detect it does actually detect) and it's false alarm rate (how many things it detects which it shouldn't have done). These can be expressed in terms of:

**Recall**: The percentage of visual or human detected events which were also detected by the automatic detector

**Precision**: The percentage of automatic detections which were indeed detections and not false alarms.

The automatically detected events were compared with both the Human Detections and with the visual data in order to assess Precision and Recall for the beluga event detector. When comparing Automatic Acoustic Detections (AAD's) with the Human Acoustic Detections (HAD's), a HAD was said to have been detected automatically if there was an AAD within 10s of the HAD. Conversely, an AAD was said to be a false detection only if it occurred more than 15 minutes from any HAD. This allowed for the fact that as animals moved out of the vicinity of the PAMBuoy®, there would often be a period of a few feint clicks which would still be detected on the PAMBuoy® system but may not have been marked by the human operator.

When comparing with visual data, a 15 minute time window was allowed between the sighting time and the AAD to allow for the fact that the animals may not be vocalizing continuously. Similarly, to allow for animals not being spotted immediately they entered the river, AAD were only considered to be a false detection if they occurred at least 30 minutes before or after the closest sighting time. All sightings data were used in the comparison, irrespective of the number of groups present at any one time.

The different criteria used for comparing the AAD's with HAD's and with the sightings are necessary since the two acoustic methods (Automatic and Human) were operating on the same data, so the two types of detection should be expected to be well correlated in time. The sightings on the other hand should be expected to match less precisely with the acoustic detections, so for comparing acoustic and visual data, wider time windows were used when comparing data sets.

## Results of Beluga Whale Monitoring Efforts on JBER-Richardson, 1988 – 2012

### Opportunistic sightings 1988-1991

The Army has historically taken interest in the beluga whale and has recorded opportunistic sightings at various times over the past 25 years. Table 3 lists incidents of beluga whale sightings by former USAG FRA personnel from 1988 to 1991 when surveys were conducted sporadically. Observations were not recorded by Army personnel between 1992 and 2005.

| Date | Location[1] |
|---|---|
| September, 1988 | Drainage slough northwest corner of Eagle River Flats |
| 18 June 1991 | Eagle Bay |
| 26 June 1991 | Knik Arm near Goose Bay |
| 13 July 1991 | Eagle Bay and mouth of Fire Creek |
| 5 August 1991 | Eagle Bay/Eagle River mouth |
| 9 August 1991 | Approximately 1 km up Eagle River |
| 20 August 1991 | Knik Arm near Eagle Bay |
| 23 August 1991 | Eagle Bay (about 20-25) and approximately 2 km up Eagle River |
| 29 August 1991 | Eagle Bay and approximately 1 km up Eagle River |
| 31 August 1991 | 2 km up the Eagle River[2] |
| 21 September 1991 | Mouth of Eagle River |
| 11 October 1991 | Eagle Bay near mouth of Eagle River |
| 21 October 1991 | Approximately ½ km up Eagle River |
| 12 November 1991 | Mouth of Eagle River |

**Table 3.** Beluga Whale Sightings In or Near Eagle River Flats from 1988 to 1991 (Gossweiler, 1991)

[1]All but one sighting was from either fixed wing aircraft or helicopter.
[2]Ground observation.

### Visual Observations 2005-2007

In more recent years, the Army has conducted more intensive field surveys. In 2005, former USAG FRA developed standard operating procedures and protocols for monitoring beluga whales in and around ERF. Observers generally use military observation points such as Cole Point or Fagen to survey for whales in Eagle Bay or Eagle River. Former USAG FRA biologists conducted beluga whale monitoring surveys in and around ERF on ten occasions during the 2005 field season from June through October. No whales were observed during any of these surveys (

Table **4**). Four additional aerial surveys conducted in August, September, and October of 2005, however, resulted in multiple beluga whale sightings in the Knik Arm adjacent to the ERF Impact Area (Clevenger 2006).

During 2006, the Army conducted surveys on 19 days from May through October. Beluga whales were observed during three of these surveys, each occurring during late August and early September. Observed beluga activity in Eagle Bay was predominantly traveling (86 percent of observations noted), while milling accounted for the remaining 14 percent of observations. Observed beluga activity in Eagle River included traveling (58 percent of observations noted), milling (32 percent of observations), feeding or suspected feeding (7 percent) and other activities including one incident of spyhopping (coming out of the water vertically and momentarily staying out of the water) and one interaction with a harbor seal (2 percent). A maximum of eight belugas were sighted at one time in the river itself while a maximum of 15

to 20 belugas were sighted in Eagle Bay. Feeding activity was suspected if fish were observed in close proximity to a whale or if an unusual amount of subsurface activity was observed. The majority of beluga activity in Eagle River occurred within the first 0.3 miles of river (river miles) upstream from Eagle Bay, although two whales were observed traveling up to 0.75 miles upstream (river miles; Garner 2007).

| Date | Location |
|---|---|
| 22 August 2005 | Adjacent to Eagle River Flats[1] |
| 6 September 2005 | Adjacent to Eagle River Flats[1] |
| 4 October 2005 | Adjacent to Eagle River Flats[1] |
| 14 October 2005 | Adjacent to Eagle River Flats[1] |
| 29 August 2006 | Eagle Bay, Mouth of Eagle River, Eagle River |
| 30 August 2006 | Eagle River |
| 7 September 2006 | Mouth of Eagle River |

**Table 4.** Beluga Whale Sightings in Eagle Bay or Eagle River During 2005 and 2006 (Clevenger, 2006 and Garner, 2007)
[1]Beluga whales were sighted in Knik Arm outside of Eagle Bay.

Former USAG FRA conducted additional beluga whale surveys in Eagle River and Eagle Bay from May through October 2007. The results are shown below in **Table 5**. Beluga whales were sighted on 43 percent of all observation days and the mean number of whales counted over the course of the field season was 7.5 individuals.

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 15 June 2007 | 2 | Travelling | 1 mile northeast of Eagle River mouth |
| 16 June 2007 | 2 | Travelling | Eagle Bay |
| 18 July 2007 | 1 | Feeding | Eagle River |
| 3 August 2007 | 12 | Milling | 1 mile northeast of Eagle River mouth |
| 7 August 2007 | 30 | Milling | Mouth of Eagle River |
| 8 August 2007 | 27 | Milling | Mouth of Eagle River |
| 9 August 2007 | 31 | Feeding | Mouth of Eagle River |
| 10 August 2007 | 33 | Travelling | North end of Eagle Bay |
| 11 August 2007 | 20 | Milling | Mouth of Eagle River |
| 13 August 2007 | 35 | Travelling | Moving from Eagle River into Eagle Bay |
| 15 August 2007 | 15 | Milling | Eagle River |
| 17 August 2007 | 22 | Milling | Eagle River |
| 20 August 2007 | 10 | Milling | Near mouth of Eagle River |
| 21 August 2007 | 6 | Travelling | 1/2 mile southwest of Eagle River mouth |
| 24 August 2007 | 26 | Milling | 1 mile northeast of mouth of Eagle River |
| 27 August 2007 | 23 | Milling | 1/2 mile north of Eagle River mouth |
| 30 August 2007 | 11 | Travelling | Moving out of Eagle River to the south |
| 10 September 2007 | 21 | Milling | 300 yards out from Eagle River mouth |
| 14 September 2007 | 12 | Milling | Near mouth of Eagle River |
| 16 September 2007 | 7 | Milling | 1 mile north of Eagle River mouth |
| 23 October 2007 | 14 | Travelling | 1 mile southwest of Eagle River mouth |

**Table 5.** Beluga Whale Sightings in Eagle Bay or Eagle River During 2007

## Visual Observations 2008

Former USAG FRA wildlife biologists conducted ground-based visual observations from June through November 2008, sighting beluga whales on 38 percent of all observation days. The mean number of whales observed during the field season was 13.6 individuals. Table 6 below lists the results of these surveys.

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 28 July 2008 | 12 | Milling | Eagle Bay |
| 29 July 2008 | 15 | Travelling | Eagle Bay |
| 30 July 2008 | 24 | Travelling | Eagle Bay |
| 31 July 2008 | 8 | Milling | Eagle Bay |
| 4 August 2008 | 13 | Diving | Eagle Bay |
| 11 August 2008 | 34 | Travelling | Eagle River |
| 12 August 2008 | 24 | Diving | Eagle River |
| 13 August 2008 | 36 | Milling | Eagle River Mouth |
| 18 August 2008 | 66 | Milling | Eagle River |
| 19 August 2008 | 33 | Travelling | Eagle River |
| 20 August 2008 | 68 | Travelling | Eagle River |
| 21 August 2008 | 4 | Travelling | Eagle Bay |
| 29 August 2008 | 45 | Travelling | Eagle River Mouth |
| 1 September 2008 | 18 | Diving | Eagle Bay |
| 7 September 2008 | 8 | Diving | Eagle River |
| 8 September 2008 | 15 | Diving | Eagle River |
| 9 September 2008 | 18 | Milling | Eagle River |
| 10 September 2008 | 16 | Milling | Eagle River |
| 11September 2008 | 28 | Diving | Eagle River |
| 13 September 2008 | 17 | Milling | Eagle River |
| 15 September 2008 | 38 | Travelling | Eagle River |
| 17 September 2008 | 12 | Travelling | Eagle River |
| 18 September 2008 | 17 | Milling | Eagle River |
| 25 September 2008 | 28 | Travelling | Eagle River Mouth |
| 29 September 2008 | 8 | Travelling | Eagle River |
| 30 September 2008 | 15 | Travelling | Eagle River |
| 8 October 2008 | 10 | Milling | Eagle Bay |
| 9 October 2008 | 6 | Milling | Eagle Bay |
| 28 October 2008 | 23 | Travelling | Eagle River |
| 30 October 2008 | 21 | Travelling | Eagle Bay |
| 6 November 2008 | 14 | Travelling | Eagle Bay |
| 13 November 2008 | 2 | Diving | Eagle River Mouth (Garner 2013c) |

**Table 6.** Beluga Whale Sightings in Eagle Bay and Eagle River During 2008

## Visual Observations and Passive Acoustic Monitoring-2009

Former USAG FRA wildlife biologists conducted ground-based visual observations from 1 June through 28 October 2009, sighting beluga whales on 29 percent of all observation days. The mean number of whales observed during the field season was 8.8 individuals.

Team CIBA deployed three acoustic moorings (in the action area) in 2009, one in North Eagle Bay, one at the mouth of Eagle River and one in South Eagle Bay. The Eagle Bay moorings (combined North and South) acoustically monitored from 6 June, 2009 to 7 July, 2009 for a total of 32 days of coverage (Table 1). During that time period no belugas were acoustically detected in Eagle Bay. A mooring was deployed at the mouth of Eagle River from 7 July-16 Sept, 2009 for a total of 72 days of acoustic coverage (Table 1). During that time period belugas were acoustically detected on 40 days.

The results of both the visual observations from the mouth of Eagle River and the acoustic monitoring in Eagle Bay and at the mouth of Eagle River are shown in Figure and Table 7 below. Note that detections on the same day and in the same location from multiple studies (visual observations and acoustic) are only indicated once in Table 7. For Figure , acoustic data from all locations (North and South) in Eagle Bay and at the mouth of Eagle River were combined. The metric used for the acoustic detections was Detected Positive Hours (DPH). Every hour in which there was at least one detection was counted as a positive hour. For instance, if whales were detected at 0805 and 0930 on a given date, the DPH for that day would be two (one in the 8-9 bin and one in the 9-10 bin). The highest DPH out of the three locations per day was used as the combined acoustic entry for that day in the figure below. Thus if the DPHs at North Eagle Bay, South Eagle Bay and the mouth of the Eagle River were 1, 3, and 9, respectively, then the DPH for that day would be entered as 9.

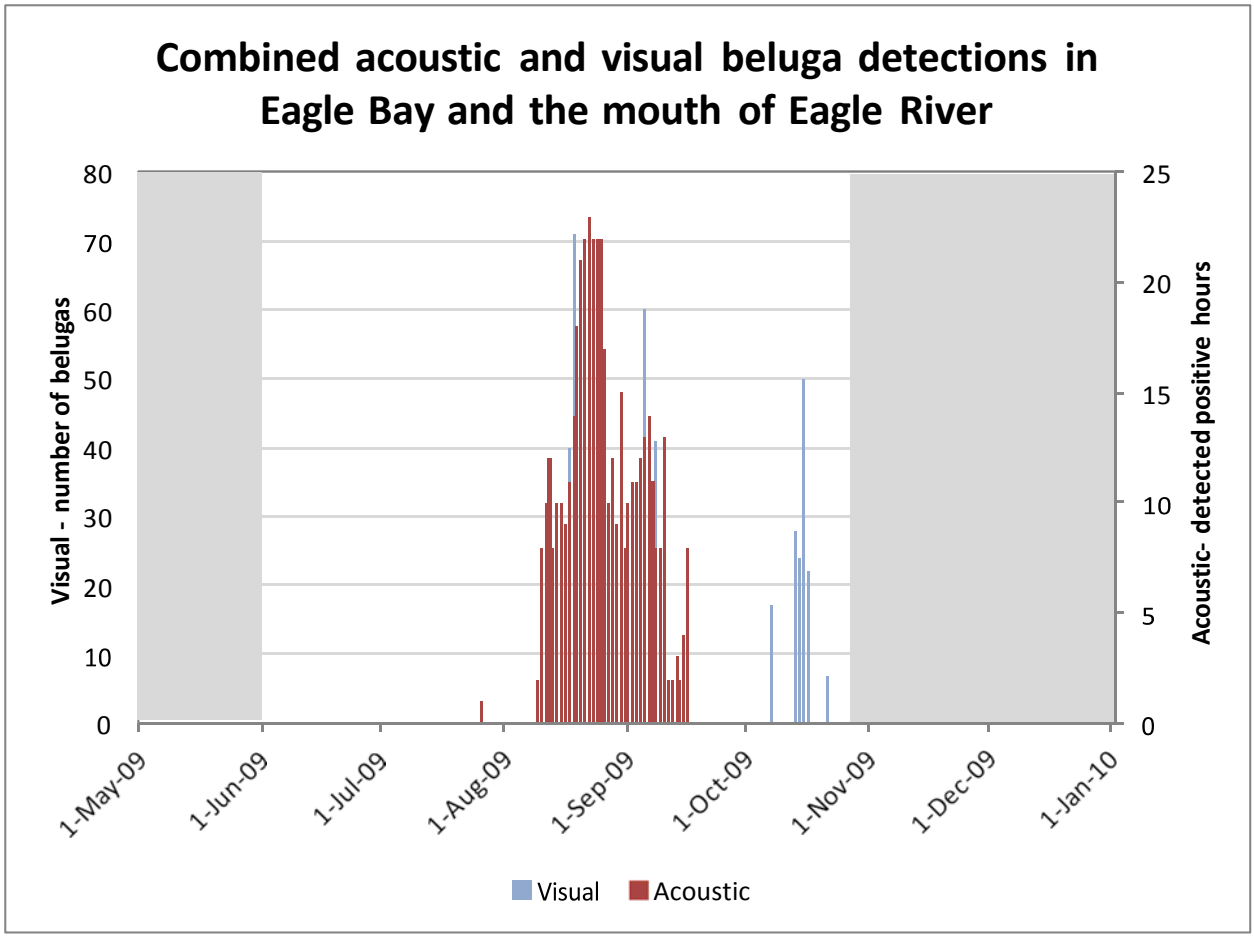



**Figure 5.** Combined Acoustic and Visual Beluga Whale Detections in Eagle Bay and the Mouth of the Eagle River During 2009. Acoustic detections are a combination of EAR and CPOD data from North Eagle Bay, South Eagle Bay and the mouth of the Eagle River. The gray areas indicate periods with neither visual nor acoustic coverage.

The first beluga detection in 2009 occurred in late July with the majority of detections occurring from early August through late October (see Table 7 below for details).

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 26 July 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 9 August 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 10 August 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 11 August 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 12 August 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 13 August 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 14 August 2009 | 8 | Diving | Eagle Bay |

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 15 August 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 16 August 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 17 August 2009 | 40 | Milling/Travelling | Eagle Bay |
| 18 August 2009 | 71 | Milling | Eagle Bay/Eagle River |
| 19 August 2009 | 43 | Milling | Eagle Bay/Eagle River |
| 20 August 2009 | 47 | Travelling/Prey Pursuit | Eagle Bay/Eagle River |
| 21 August 2009 | 35 | Milling | Eagle Bay/Eagle River |
| 22 August 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 23 August 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 24 August 2009 | 26 | Milling | Eagle Bay/Eagle River |
| 25 August 2009 | 24 | Milling/Travelling | Eagle Bay/Eagle River |
| 26 August 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 27 August 2009 | 14 | Travelling | Eagle Bay/Eagle River |
| 28 August 2009 | 19 | Diving/Milling/Travelling | Eagle Bay/Eagle River |
| 29 August 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 30 August 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 31 August 2009 | 21 | Milling/Travelling | Eagle Bay/Eagle River |
| 1 September 2009 | 30 | Milling | Eagle Bay/Eagle River |
| 2 September 2009 | 34 | Diving | Eagle Bay |
| 3 September 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 4 September 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 5 September 2009 | 60 | Travelling | Eagle Bay/Eagle River |
| 6 September 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 7 September 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 8 September 2009 | 41 | Milling | Eagle Bay/Eagle River |
| 9 September 2009 | 23 | Travelling | Eagle Bay/Eagle River |
| 10 September 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 11 September 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 12 September 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 13 September 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 14 September 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 15 September 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 16 September 2009 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 7 October 2009 | 17 | Travelling | Eagle Bay/Eagle River |
| 13 October 2009 | 28 | Travelling | Eagle Bay |
| 14 October 2009 | 24 | Milling/Travelling | Eagle Bay/Eagle River |
| 15 October 2009 | 50 | Milling | Eagle Bay |
| 16 October 2009 | 22 | Travelling | Eagle Bay |
| 21 October 2009 | 7 | Travelling | Eagle Bay |

**Table 7**. Beluga Whale Detections in Eagle Bay and Eagle River During 2009. Acoustic detections are a combination of EAR and CPOD data.

## Visual Observations and Passive Acoustic Monitoring-2010

Since the formation of JBER in 2010, JBER wildlife biologists have continued to conduct observations initiated by former USAG FRA.

JBER wildlife biologists conducted ground-based visual observations from 9 June through 16 November 2010, sighting beluga whales on 48 percent of all observation days with a range of 3 to 140 whales (when whales were observed) at a sighting rate of 2.7 whales per hour. The mean number of whales observed over all observation days during the field season was 15.6 individuals. Table 8 below lists the results of these surveys.

In comparison to other years, more recorded sightings and greater numbers of belugas, in a single day, where documented for 2010.

Team CIBA deployed three acoustic moorings (in the action area) in 2010, one in North Eagle Bay, one at the mouth of Eagle River and one in South Eagle Bay. The Eagle Bay moorings (combined North and South) acoustically monitored from 30 May, 2010 to 2 December, 2010 (see Table 1) for a total of 101 days of coverage (there were periods with interrupted coverage). During that time period, belugas were acoustically detected in Eagle Bay on 63 days. A mooring was deployed at the mouth of Eagle River from 30 May, 2010 to 9 October, 2010 for a total of 132 days of acoustic coverage (Table 1). During that time period belugas were acoustically detected on 61 days.

The results of both the visual observations from the mouth of Eagle River and the acoustic monitoring in Eagle Bay and at the mouth of Eagle River are shown in Figure and Table 8 below. Note that detections on the same day and in the same location from multiple studies (visual observations and acoustic) are only indicated once in Table 8. For Figure , acoustic data from all locations (North and South) in Eagle Bay and at the mouth of Eagle River were combined. The metric used for the acoustic detections was Detected Positive Hours (DPH). Every hour in which there was at least one detection was counted as a positive hour. For instance, if whales were detected at 0805 and 0930 on a given date, the DPH for that day would be two (one in the 8-9 bin and one in the 9-10 bin). The highest DPH out of the three locations per day was used as the combined acoustic entry for that day in the figure below. Thus if the DPHs at North Eagle Bay, South Eagle Bay and the mouth of the Eagle River were 1, 3, and 9, respectively, then the DPH for that day would be entered as 9.

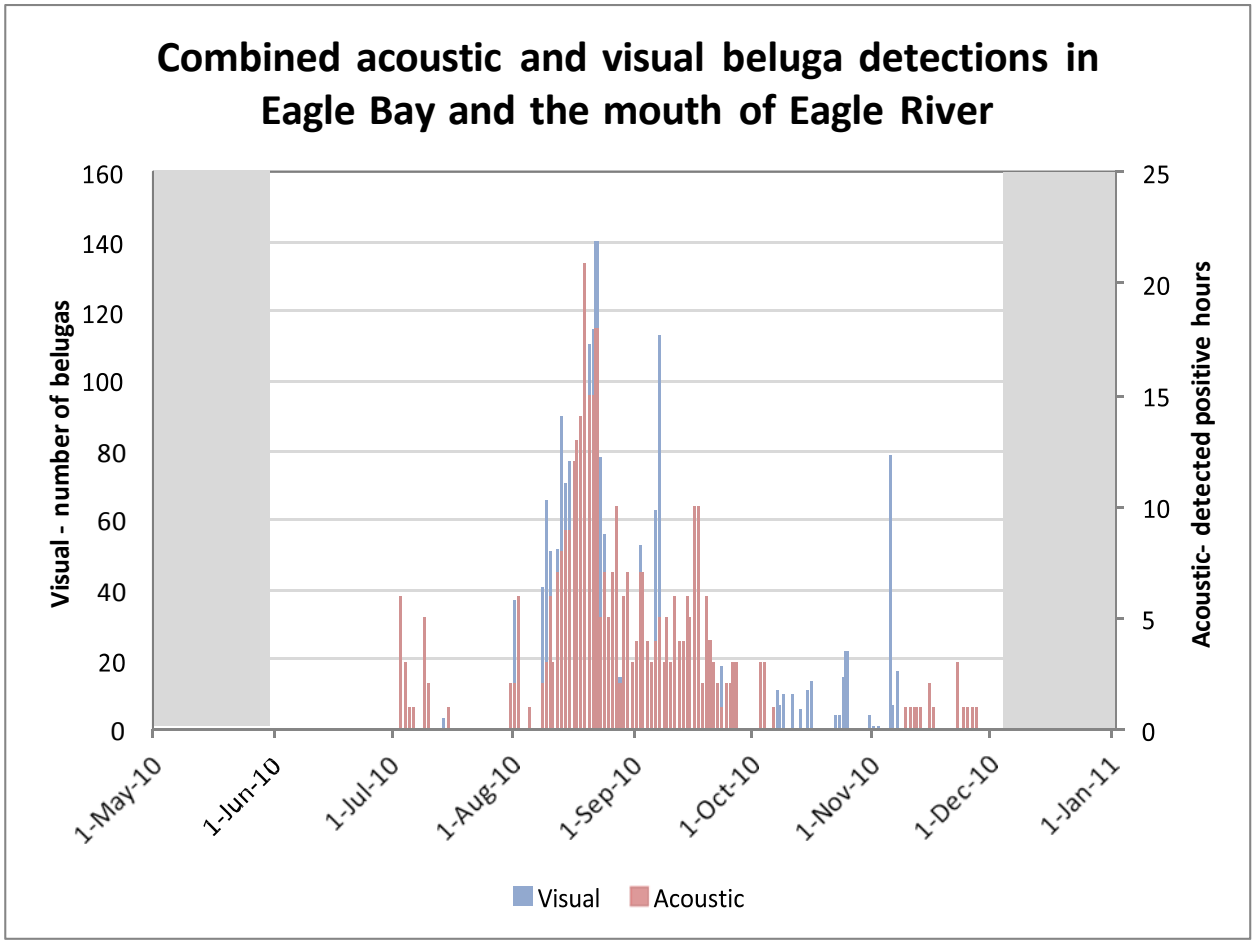



**Figure 6.** Combined Acoustic and Visual Beluga Whale Detections in Eagle Bay and the Mouth of the Eagle River During 2010. Acoustic detections are a combination of EAR and CPOD data from North Eagle Bay, South Eagle Bay and the mouth of the Eagle River. The gray areas indicate periods with neither visual nor acoustic coverage.

As in 2009, the majority of detections in 2010 occurred in the fall from August through October (see Table 8 below for details). In 2010, however, whales were first detected in July (on 9 days) and then continued to visit the area through late November.

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 3 July 2010 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 4 July 2010 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 5 July 2010 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 6 July 2010 | 3 | Travelling | Eagle Bay |
| 9 July 2010 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 10 July 2010 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 14 July 2010 | 3 | Travelling | Eagle Bay |
| 15 July 2010 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 31 July 2010 | 1 | Travelling | Eagle Bay |
| 1 August 2010 | 37 | Travelling/Milling | Eagle Bay/Eagle River |
| 2 August 2010 | 18 | Travelling/Milling/Diving | Eagle Bay/Eagle River |
| 5 August 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 8 August 2010 | 41 | Travelling/Milling | Eagle Bay/Eagle River |
| 9 August 2010 | 66 | Travelling/Milling | Eagle Bay/Eagle River |
| 10 August 2010 | 51 | Travelling/Milling | Eagle Bay/Eagle River |
| 11 August 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 12 August 2010 | 52 | Travelling/Milling | Eagle Bay/Eagle River |
| 13 August 2010 | 90 | Travelling/Milling | Eagle Bay/Eagle River |
| 14 August 2010 | 71 | Travelling/Milling | Eagle Bay/Eagle River |
| 15 August 2010 | 77 | Travelling/Milling | Eagle Bay/Eagle River |
| 16 August 2010 | 9 | Travelling/Milling | Eagle Bay/Eagle River |
| 17 August 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 18 August 2010 | 49 | Travelling/Milling | Eagle Bay/Eagle River |
| 19 August 2010 | 53 | Travelling/Milling | Eagle Bay/Eagle River |
| 20 August 2010 | 111 | Travelling/Milling | Eagle Bay/Eagle River |
| 21 August 2010 | 115 | Travelling/Milling | Eagle Bay/Eagle River |
| 22 August 2010 | 140 | Travelling/Milling | Eagle Bay/Eagle River |
| 23 August 2010 | 78 | Travelling/Milling | Eagle Bay/Eagle River |
| 24 August 2010 | 56 | Travelling/Milling | Eagle Bay/Eagle River |
| 25 August 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 26 August 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 27 August 2010 | 19 | Travelling/Milling | Eagle Bay/Eagle River |
| 28 August 2010 | 15 | Travelling/Milling | Eagle Bay/Eagle River |
| 29 August 2010 | 15 | Travelling/Milling | Eagle Bay/Eagle River |
| 30 August 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 31 August 2010 | 9 | Travelling/Milling | Eagle Bay/Eagle River |
| 1 September 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 2 September 2010 | 53 | Travelling/Milling | Eagle Bay/Eagle River |
| 3 September 2010 | 39 | Travelling/Milling | Eagle Bay/Eagle River |
| 4 September 2010 | 23 | Travelling/Milling | Eagle Bay/Eagle River |
| 5 September 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 6 September 2010 | 63 | Travelling/Milling | Eagle Bay/Eagle River |
| 7 September 2010 | 113 | Travelling/Milling | Eagle Bay/Eagle River |

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 8 September 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 9 September 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 10 September 2010 | 9 | Milling | Eagle Bay |
| 11 September 2010 | 31 | Travelling/Milling | Eagle Bay/Eagle River |
| 12 September 2010 | 14 | Travelling/Milling | Eagle Bay/Eagle River |
| 13 September 2010 | 10 | Travelling/Milling | Eagle Bay/Eagle River |
| 14 September 2010 | 31 | Travelling/Milling | Eagle Bay/Eagle River |
| 15 September 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 16 September 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 17 September 2010 | 35 | Travelling/Milling | Eagle Bay/Eagle River |
| 18 September 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 19 September 2010 | 12 | Travelling/Milling | Eagle Bay |
| 20 September 2010 | 8 | Travelling/Diving | Eagle Bay |
| 21 September 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 22 September 2010 | 8 | Travelling/Milling | Eagle Bay |
| 23 September 2010 | 18 | Travelling/Milling | Eagle Bay |
| 24 September 2010 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 25 September 2010 | 5 | Diving | Eagle Bay |
| 26 September 2010 | 13 | Travelling/Milling | Eagle Bay/Eagle River |
| 27 September 2010 | 4 | Travelling/Milling | Eagle Bay |
| 3 October 2010 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 4 October 2010 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 5 October 2010 | 12 | Travelling | Eagle Bay |
| 6 October 2010 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 7 October 2010 | 11 | Travelling | Eagle Bay |
| 8 October 2010 | 7 | Travelling | Eagle Bay |
| 9 October 2010 | 10 | Travelling | Eagle Bay |
| 11 October 2010 | 10 | Travelling | Eagle Bay |
| 13 October 2010 | 6 | Travelling | Eagle Bay/Eagle River |
| 15 October 2010 | 11 | Travelling | Eagle Bay |
| 16 October 2010 | 14 | Travelling | Eagle Bay |

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 22 October 2010 | 4 | Travelling | Eagle Bay/Eagle River |
| 23 October 2010 | 4 | Travelling | Eagle Bay/Eagle River |
| 24 October 2010 | 15 | Travelling | Eagle Bay/Eagle River |
| 25 October 2010 | 22 | Travelling | Eagle Bay/Eagle River |
| 31 October 2010 | 4 | Travelling | Eagle Bay |
| 01 November 2010 | 1 | Travelling | Eagle Bay |
| 02 November 2010 | 1 | Milling | Eagle Bay |
| 5 November 2010 | 79 | Travelling/Milling | Eagle Bay/Eagle River Mouth (Garner 2013c) |
| 6 November 2010 | 7 | Travelling | Eagle Bay |
| 7 November 2010 | 17 | Travelling | Eagle Bay |
| 9 November 2010 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |
| 10 November 2010 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |
| 11 November 2010 | 1 | Travelling | Eagle Bay |
| 12 November 2010 | 4 | Travelling | Eagle Bay |
| 13 November 2010 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |
| 15 November 2010 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |
| 16 November 2010 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |
| 22 November 2010 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |
| 24 November 2010 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |
| 25 November 2010 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |
| 26 November 2010 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |
| 27 November 2010 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |

**Table 8.** Beluga Whale Detections in Eagle Bay and Eagle River During 2010. Acoustic detections are a combination of EAR and CPOD data.

## Visual Observations and Passive Acoustic Monitoring-2011

JBER wildlife biologists conducted ground-based visual observations of belugas from 14 June through 14 December in 2011, sighting beluga whales on 38 percent of all observation days with a range of 1 to 108 whales (when whales were observed) at a sighting rate of 1.8 whales per hour. The mean number of whales observed per day over all observation days during the field season was 9.4 individuals. Table 10 below lists the results of these surveys.

Team CIBA deployed three acoustic moorings (in the action area) in 2011, one in North Eagle Bay, one at the mouth of Eagle River and one in South Eagle Bay. The Eagle Bay moorings (combined North and South) acoustically monitored from 26 May, 2011 to 30 September, 2011 (see Table 1) for a total of 118 days of coverage (there were periods with interrupted coverage). During that time period, belugas were acoustically detected in Eagle Bay on 46 days. A mooring was deployed at the mouth of Eagle River from 26 May, 2011 to 3 November, 2011 (Table 1). Additionally, a separate CPOD was deployed at station ER1 (near the CIBA mooring) from 24 May, 2011 to 3 November, 2011. Together, these instruments at the mouth of the Eagle River acoustically covered a total of 131 days (there were periods with interrupted

coverage) between 24 May and 3 November. During that time period belugas were acoustically detected on 43 days

In addition to the CIBA moorings, four CPOD's were deployed in Eagle River (see

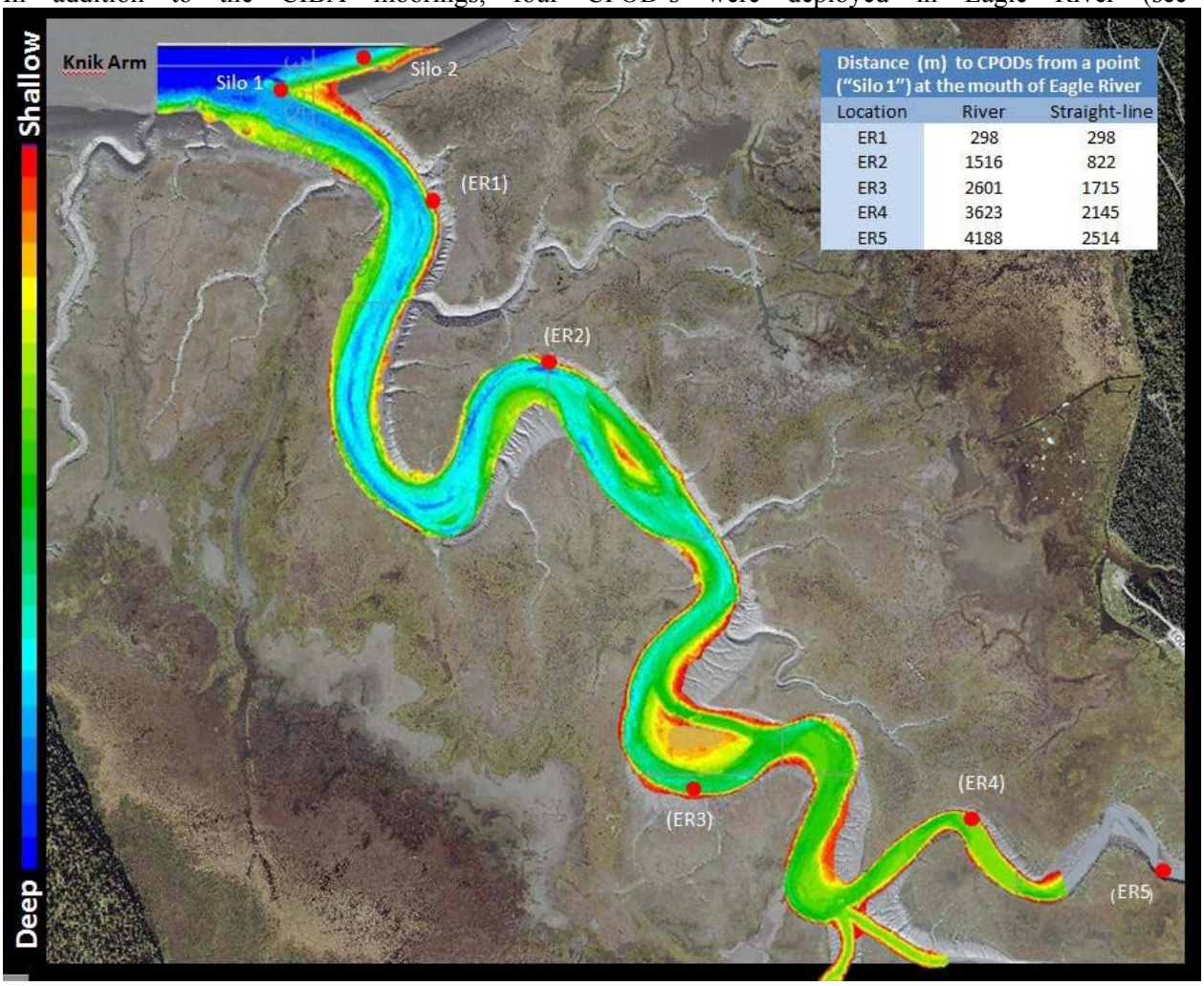



Figure above) from May 24, 2011 to November 7, 2011 (this is the max deployment range- see Table 2 for deployment dates per station). The uppermost POD (ER4) was located 3.6 km (river distance) upstream from the mouth of Eagle River (straight-line distance 2.1 km ) and approximately 340 m (river distance) upstream from the confluence of Eagle River and Otter Creek. Belugas were detected on 37 days at one or more stations between 5 August and 3 November (see Table 9). Whales reached the uppermost station (ER 4) on August 18, 19, 27 and again on September 3.

| Location | First detection | Last detection | # days whales detected | Notes |
|---|---|---|---|---|
| ER1 | 5 Aug, 2011 | 3 Nov, 2011 | 43 | Removed from field due to excess sedimentation. Data from 3,4 Aug and 27 Sep-3 Nov is from CIBA mooring |
| ER2 | 5 Aug, 2011 | 13 Sep, 2011 | 21 | Stopped logging properly on 14 Sep,2011 |
| ER3 | 5 Aug, 2011 | 21 Sep, 2011 | 7 | Removed from field 7 Nov, 2011 |
| ER4 | 18 Aug, 2011 | 3 Sep, 2011 | 4 | Stopped logging properly on 1 Oct, 2011 |

**Table 9**. First and last dates of beluga acoustic detections per CPOD location in Eagle River, Alaska, 2011. Also indicated are the number of days at each station with at least one beluga detection.

The results of both the visual observations from the mouth of Eagle River and the acoustic monitoring in Eagle Bay and at the mouth of Eagle River are shown in Figure and *Table 10* below. Note that detections on the same day and in the same location from multiple studies (visual observations and acoustic) are only indicated once in *Table 10*. For Figure , acoustic data from all locations (North and South) in Eagle Bay and at the mouth of Eagle River were combined. The metric used for the acoustic detections was Detected Positive Hours (DPH). Every hour in which there was at least one detection was counted as a positive hour. For instance, if whales were detected at 0805 and 0930 on a given date, the DPH for that day would be two (one in the 8-9 bin and one in the 9-10 bin). The highest DPH out of the three locations per day was used as the combined acoustic entry for that day in the figure below. Thus if the DPHs at North Eagle Bay, South Eagle Bay and the mouth of the Eagle River were 1, 3, and 9, respectively, then the DPH for that day would be entered as 9.

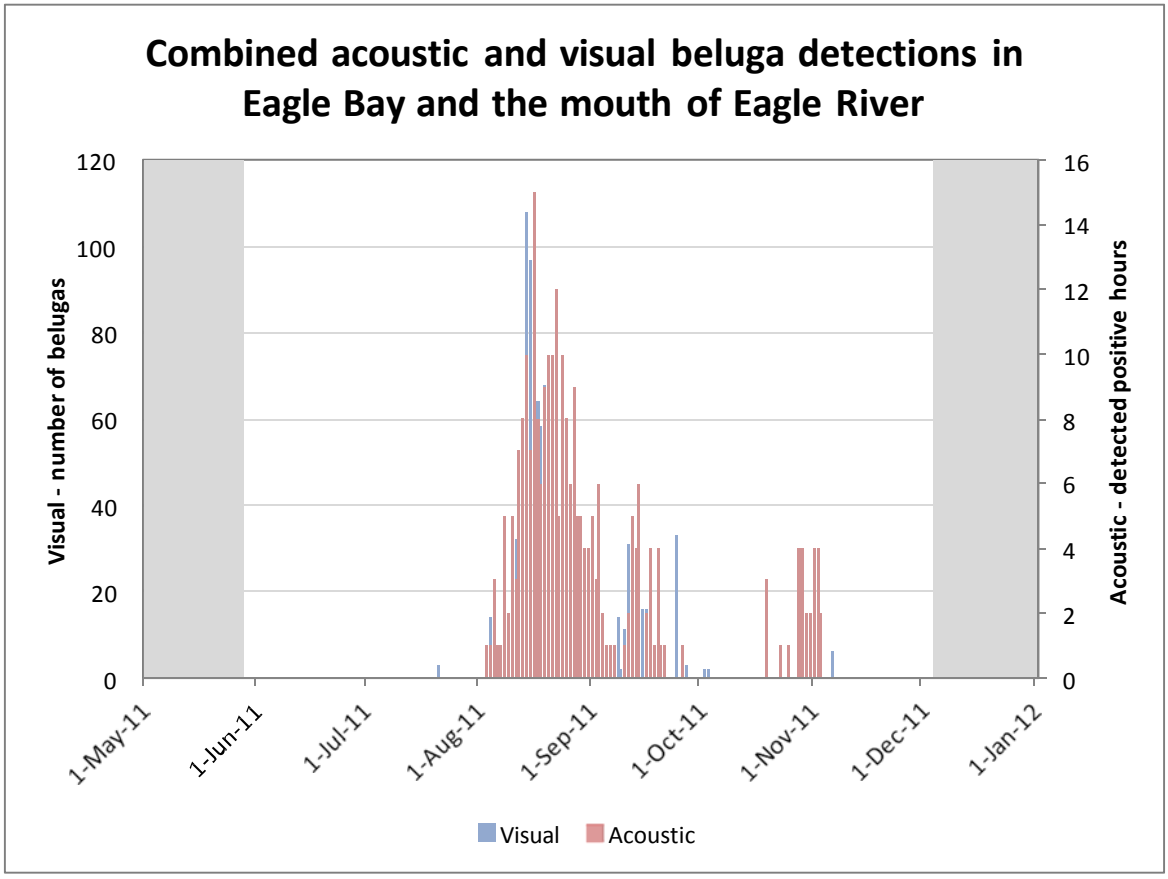



**Figure 7.** Combined Acoustic and Visual Beluga Whale Detections in Eagle Bay and the Mouth of the Eagle River During 2011. Acoustic detections are a combination of EAR and CPOD data from North Eagle Bay, South Eagle Bay and the mouth of the Eagle River. The gray areas indicate periods with neither visual nor acoustic coverage.

As in the previous two years, the majority of detections in 2011 occurred in the fall from August through October (see Table 10 below for details). In 2011, whales were first detected in late July and then continued to visit the area through the first week of November (see Table 10 for details).

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 21 July 2011 | 3 | Travelling | Eagle Bay |

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 3 August 2011 | 1 | Travelling | Eagle Bay |
| 4 August 2011 | 14 | Travelling | Eagle Bay |
| 5 August 2011 | 17 | Travelling/Milling | Eagle Bay/Eagle River |
| 6 August 2011 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |
| 7 August 2011 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |
| 8 August 2011 | 16 | Travelling/Milling | Eagle Bay/Eagle River |
| 9 August 2011 | N/A | N/A | Acoustic detection in Eagle River and Eagle Bay (no visual data) |
| 10 August 2011 | 28 | Travelling | Eagle Bay |
| 11 August 2011 | 32 | Travelling/Milling | Eagle Bay |
| 12 August 2011 | 47 | Travelling/Milling | Eagle Bay/ Eagle River |
| 13 August 2011 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 14 August 2011 | 108 | Travelling/Milling | Eagle Bay/ Eagle River |
| 15 August 2011 | 97 | Travelling/Milling | Eagle Bay/ Eagle River |
| 16 August 2011 | 35 | Travelling/Milling | Eagle Bay/ Eagle River |
| 17 August 2011 | 64 | Travelling/Milling | Eagle Bay/ Eagle River |
| 18 August 2011 | 58 | Travelling/Milling | Eagle Bay/ Eagle River |
| 19 August 2011 | 68 | Travelling/Milling | Eagle Bay/ Eagle River |
| 20 August 2011 | 41 | Travelling/Milling/ Diving | Eagle Bay/ Eagle River |
| 21 August 2011 | 37 | Travelling/Milling | Eagle Bay/ Eagle River |
| 22 August 2011 | 55 | Travelling/Milling | Eagle Bay/ Eagle River |
| 23 August 2011 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 24 August 2011 | 31 | Travelling/Milling | Eagle Bay/ Eagle River |
| 25 August 2011 | 29 | Travelling/Milling | Eagle Bay/ Eagle River |
| 26 August 2011 | 41 | Travelling/Milling | Eagle Bay/ Eagle River |
| 27 August 2011 | 23 | Travelling/Milling | Eagle Bay/ Eagle River |
| 28 August 2011 | 17 | Travelling/Milling | Eagle Bay/ Eagle River |
| 29 August 2011 | 15 | Travelling/Milling | Eagle Bay/ Eagle River |
| 30 August 2011 | 17 | Travelling | Eagle Bay |
| 31 August 2011 | 15 | Travelling/Milling | Eagle Bay/ Eagle River |
| 1 September 2011 | 21 | Travelling/Milling | Eagle Bay/ Eagle River |
| 2 September 2011 | 1 | Travelling | Eagle River |
| 3 September 2011 | 1 | Travelling | Eagle Bay |
| 4 September 2011 | 1 | Travelling | Eagle Bay |
| 5 September 2011 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |
| 6 September 2011 | N/A | N/A | Acoustic detection in Eagle River and Eagle Bay (no visual data) |
| 7 September 2011 | N/A | N/A | Acoustic detection in Eagle River (no visual data) |
| 8 September 2011 | 14 | Travelling/Milling | Eagle Bay/ Eagle River |
| 9 September 2011 | 2 | Travelling/Milling | Eagle Bay/ Eagle River |
| 10 September 2011 | 11 | Travelling/Milling | Eagle Bay |
| 11 September 2011 | 31 | Travelling/Milling | Eagle Bay/ Eagle River |
| 12 September 2011 | 14 | Travelling/Milling | Eagle Bay/ Eagle River |

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 13 September 2011 | 30 | Travelling/Milling | Eagle Bay/ Eagle River |
| 14 September 2011 | 21 | Travelling/Milling | Eagle Bay/ Eagle River |
| 15 September 2011 | 16 | Travelling/Milling | Eagle Bay/ Eagle River |
| 16 September 2011 | 16 | Travelling/Milling | Eagle Bay/ Eagle River |
| 17 September 2011 | 20 | Milling | Eagle Bay/ Eagle River |
| 18 September 2011 | N/A | N/A | Acoustic detection in Eagle Bay and Eagle River (no visual data) |
| 19 September 2011 | N/A | N/A | Acoustic detection in Eagle River (no visual data) |
| 20 September 2011 | N/A | N/A | Acoustic detection in Eagle Bay (no visual data) |
| 21 September 2011 | 5 | Travelling/Milling/Diving | Eagle Bay/ Eagle River |
| 24 September 2011 | 33 | Travelling/Milling | Eagle Bay |
| 26 September 2011 | 4 | Travelling | Eagle Bay |
| 27 September 2011 | 3 | Travelling | Eagle Bay |
| 2 October 2011 | 2 | Travelling | Eagle Bay |
| 3 October 2011 | 2 | Travelling/Milling | Eagle Bay |
| 19 October 2011 | N/A | N/A | Acoustic detection in Eagle River (no visual data) |
| 23 October 2011 | N/A | N/A | Acoustic detection in Eagle River (no visual data) |
| 25 October 2011 | N/A | N/A | Acoustic detection in Eagle River (no visual data) |
| 28 October 2011 | N/A | N/A | Acoustic detection in Eagle River (no visual data) |
| 29 October 2011 | 14 | Travelling/Milling | Eagle Bay |
| 30 October 2011 | N/A | N/A | Acoustic detection in Eagle River (no visual data) |
| 31 October 2011 | 2 | Travelling | Eagle Bay |
| 1 November 2011 | N/A | N/A | Acoustic detection in Lower Eagle River (no visual data) (Garner 2013c) |
| 2 November 2011 | N/A | N/A | Acoustic detection in Lower Eagle River (no visual data) (Garner 2013c) |
| 3 November 2011 | N/A | N/A | Acoustic detection in Lower Eagle River (no visual data) (Garner 2013c) |
| 6 November 2011 | 6 | Travelling/Milling | Eagle Bay |

**Table 10.** Beluga Whale Detections in Eagle Bay and Eagle River During 2011. Acoustic detections are a combination of EAR and CPOD data both from CIBA moorings and CPODs in Eagle River.

Notes: N/A – not available.

## Relationship between surface and acoustic beluga behavior in Eagle Bay and Eagle River-2011

Concurrent visual and passive acoustic monitoring at the mouth of the Eagle River between 21 Aug and 21 September, 2011, allowed CIBA to investigate the relationship between observable beluga behaviors

(i.e. those seen on the surface and recorded using the fine-scale methodology mentioned above) and the acoustic signals recorded (using DMON) at the same time.

In total, 2101 acoustic signals were detected and classified in six types from the 11 days of data analyzed from 2011. Acoustic detections were always found within time intervals specified in the visual observation logs for the subsampled days, however in many occasions, there were considerable gaps in acoustic detections while belugas where in sight or no visual data when belugas were acoustically detected. Pulsed and tonal signals were the two predominant acoustic types detected, followed by mixed, echolocation, buzz, and noisy types (Figure ). Terminal buzz signals were absent in the subsample dataset analyzed to date.

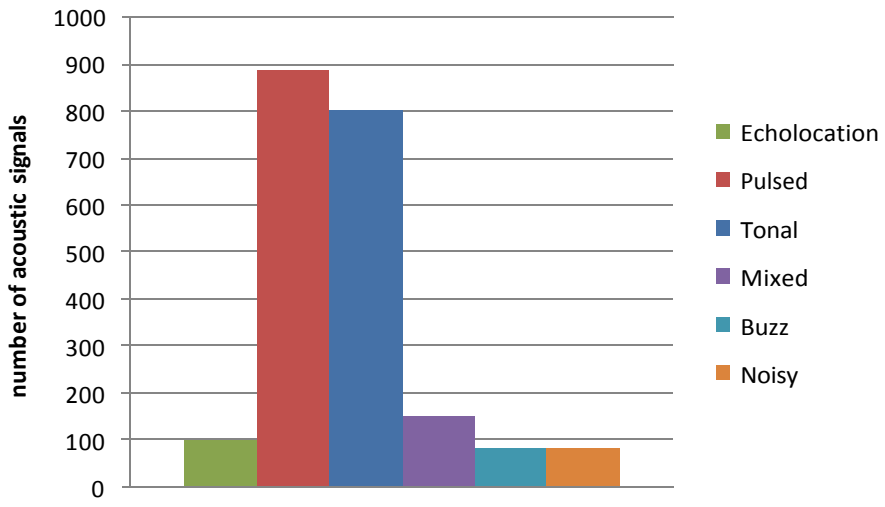



**Figure 8.** Total number of beluga acoustic signals by type from 2011 subsampled data

Acoustic signals were compared between only two behavioral states, milling and traveling. Echolocation was not the predominant acoustic signal for either traveling or milling and there was more echolocation during travelling than during milling (Figure). Tonal and pulsed signals were the predominant types during both travelling and milling, with tonal slightly more common than pulsed when traveling, and the reverse for milling. Mixed, buzzes, and noisy signal types are present in both behavioral states but remain in low percentages.

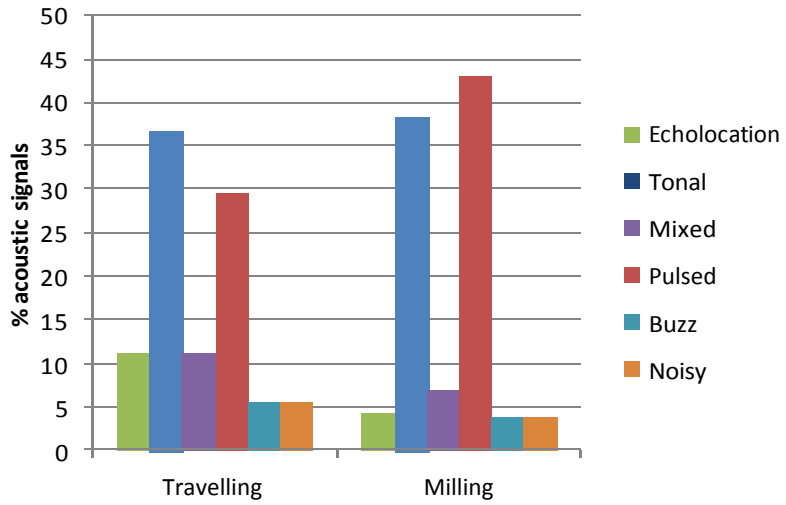



**Figure 9.** Percentage of beluga acoustic signal types for two behavioral states from 2011 subsampled data.

Despite the fact that the number of echolocation signals was lower than many of the other acoustic signals as observed in Figure , echolocation activity was, in actuallity, by far the most common signal detected in all days analyzed. The low proportion of echolocation signals compared to other signal types is a result of the analysis method. For echolocation signals, counts were based on detections bound on either side by a detection-free time period of at least 10 seconds as an arbitrary period since the analysis window had a duration of 10 seconds. Thus, since echolocation signals were rarely interrupted by periods of at least 10 seconds of silence, a long period of uninterrupted echolocating would be logged as a single signal. Echolocation activity was almost continuously present in the subsampled days, which is reflected in the log as a low number of click trains because there were few time intervals between click trains of more than 10 seconds. Therefore, the most abundant acoustic signals detected in the subsampled days were echolocation click trains.

Pulsed, tonal and mixed signal types, which compose the majority of the repertoire of beluga social signals, were present in all the behavioral states. Therefore, presence or absence of any of these three types of signals was not a useful analysis to differentiate among behavioral states.

Results from this study identify echolocation signals as the most suitable target for real-time beluga monitoring in Eagle River and Eagle Bay. An important benefit of targeting echolocation signal for real-time monitoring is that background noise is much lower at the frequency range of these signals than the one present at the lower frequency range of social signals. This enhances the signal to noise ratio of the automatic detection proceses allowing more robust and trustable real-time applications.

During the course of this study, several anthropogenic noise events were opportunistically recorded by the DMON. One of these events, a series of four explosions attributed to the Elmendorf Demo range occurred while there were belugas in Eagle River and observers on effort.

Two different measurements were completed for these explosions including: 1) Spectrum analysis in dB re 1 µPa/Hz with a time resolution equal to the duration of the explosion, broadband computed received level (RL) of the explosion and difference with background noise level in RMS dB re 1 µPa just prior to the event; and 2) 1/3 octave band analysis of the event to identify peak energy band and its RL in RMS dB re 1 µPa and also in peak to peak dB re 1 µPa. These values were then compared to the background

noise level and the hearing threshold of belugas for that frequency band. The results of these analyses are show below in Figure  and Figure .

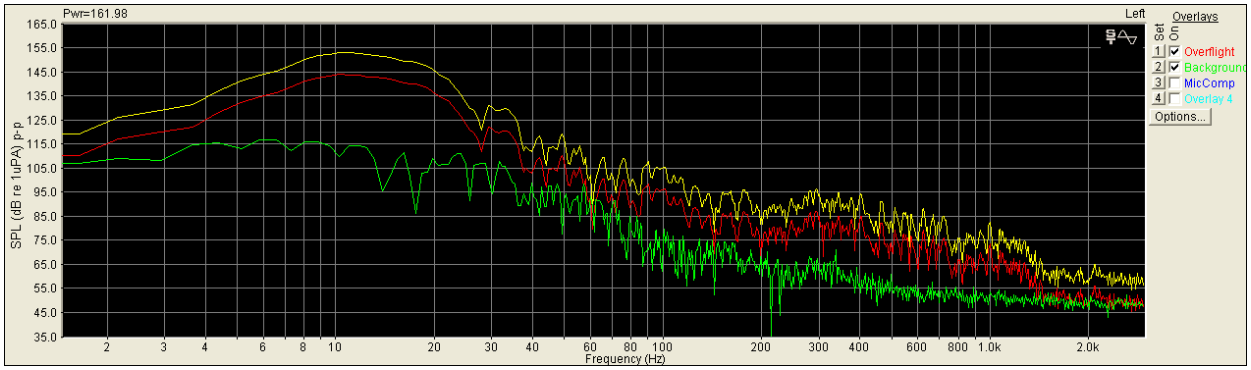



**Figure 10.** Spectrum analysis of explosion 1 captured opportunistically on 1 September 2011, using a DMON at the mouth of Eagle River, Alaska. Red line = explosion; Green line = background noise; Yellow line = explosion in peak to peak

Explosion duration: 0.13 seconds
Broadband SPL (rms dB re 1 µPa):: 122.66 dB
Broadband RL (rms dB re 1 µPa):  background: 95.82 dB
dB above background noise level: 27.46 dB

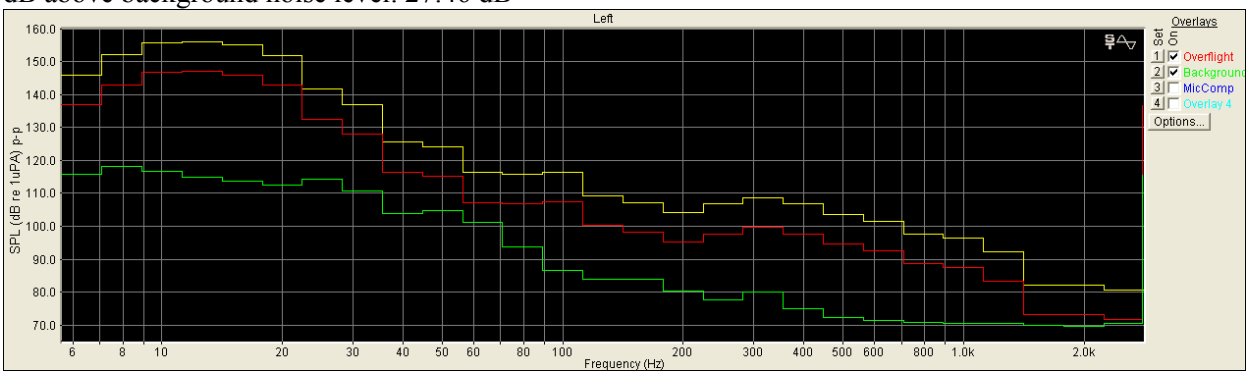



**Figure 11.** 1/3 octave band analysis of explosion 1 captured opportunistically on 1 September 2011, using a DMON at the mouth of Eagle River, Alaska. Red line = explosion; Green line = background noise; Yellow line = explosion in peak to peak

Peak band: 10-12.5 Hz
Peak level (p-p dB re 1 µPa): 156.34 dB
Peak level (rms dB re 1 µPa): 147.26 dB
Background RL at peak band(rms dB re 1 µPa): 116.77 dB
Beluga hearing threshold at 10-12.5 Hz: n/a as belugas not thought to be able to hear that low
dB difference to beluga hearing threshold in peak band: n/a

This explosion was of unknown size and was the largest of a series of four explosions, all occurring within the span of a minute and presumed to have occurred on the Elmendorf Demo Range (3.2 km distant). A group of 10 belugas (4 whites, 3 grays and 3 calves) were present in the mouth of the river during the event. No overt behavioral reactions noted to the explosions. Before the explosions, the whales

exhibited normal, with some cryptic[10] (snorkeling) surfacing while milling at the mouth. Several bubble bursts were noted. After the explosions, whales were noted to surface cryptically (snorkeling) while travelling and milling in the mouth. Bubble bursts and side-scanning events were noted.

The acoustic activity of the group was investigated by examining a 1024-point Hanning-windowed spectrogram (120 kHz sampling rate) of the original recording. Echolocation signals were essentially constant from about 14 minutes prior to the event, during the event (Figure ), and for about 20 minutes after the event. Social signals (tonal, pulsed and mixed signals) were detected sporadically during a 10 minute period before the explosions with calls (but not echolocation signals) ending about 1.5 minutes before the first explosion. Sporadic calling resumed about 5.5 minutes after the last explosion and lasted for about 10 minutes before all acoustic signals disappeared.

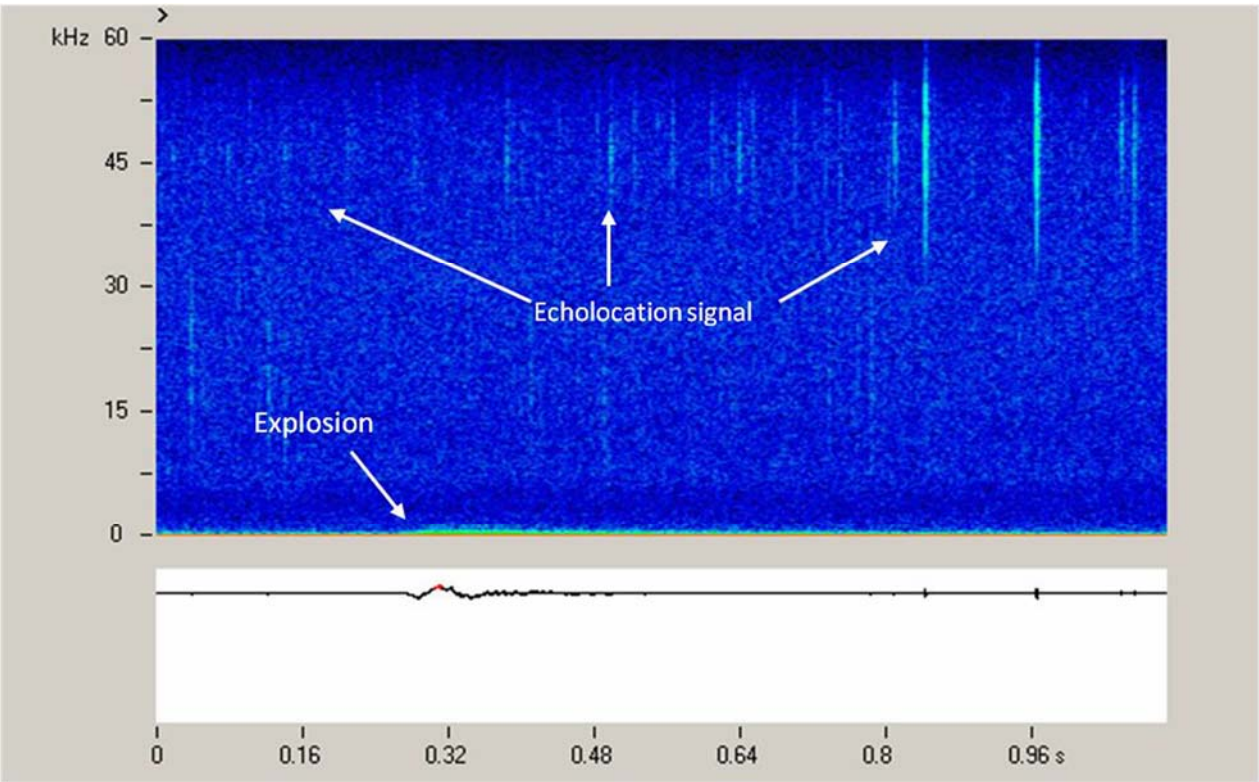



**Figure 1.** Spectrogram of explosion and echolocation signals recorded at the mouth of Eagle River, Alaska on 1 September, 2011.

## Visual Observations and Passive Acoustic Monitoring-2012

JBER wildlife biologists conducted ground-based visual observations of belugas from 16 June through 27 November in 2012, sighting beluga whales on 31 percent of all observation days with a range of 1 to 66 whales (when whales were observed) at an overall sighting rate of 1.2 whales per hour. The mean number of whales observed per day over all observation days during the field season was 6.2 individuals. Table 14 below lists the results of these surveys.

[10] While not specifically referred to as cryptic surfacing or snorkeling, this behavior was described by Alaska native hunters during a traditional ecological knowledge study of CIB (Huntington, 2000).

Team CIBA deployed one acoustic mooring (in the action area) in 2012 at the mouth of Eagle River with coverage between 1 June and 9 October, 2012 (Table 1). Additionally, a separate CPOD was deployed at station ER1 (near the CIBA mooring) with coverage from 1 June to 16 July, 2012 (Table 2). Together, these instruments at the mouth of the Eagle River acoustically covered a total of 131 days between 1 June and 9 October. During that time period belugas were acoustically detected on 83 days

| Location | Start Date | No coverage | | | End date | Total # days covered |
|---|---|---|---|---|---|---|
| | | Start | End | # Days | | |
| **Eagle Bay (North/South)** | -- | -- | -- | -- | -- | **No coverage** |
| **Eagle River mouth/ER1** | 1 Jun, 2012 | -- | -- | -- | 9 Oct, 2012 | **131** |

**Table 11.** Acoustic coverage at the mouth of Eagle River, Alaska, 2012. Acoustic coverage at the mouth of the Eagle River was augmented by the CPOD at station ER1.

In addition to the CIBA moorings, five CPOD's were deployed in Eagle River (see

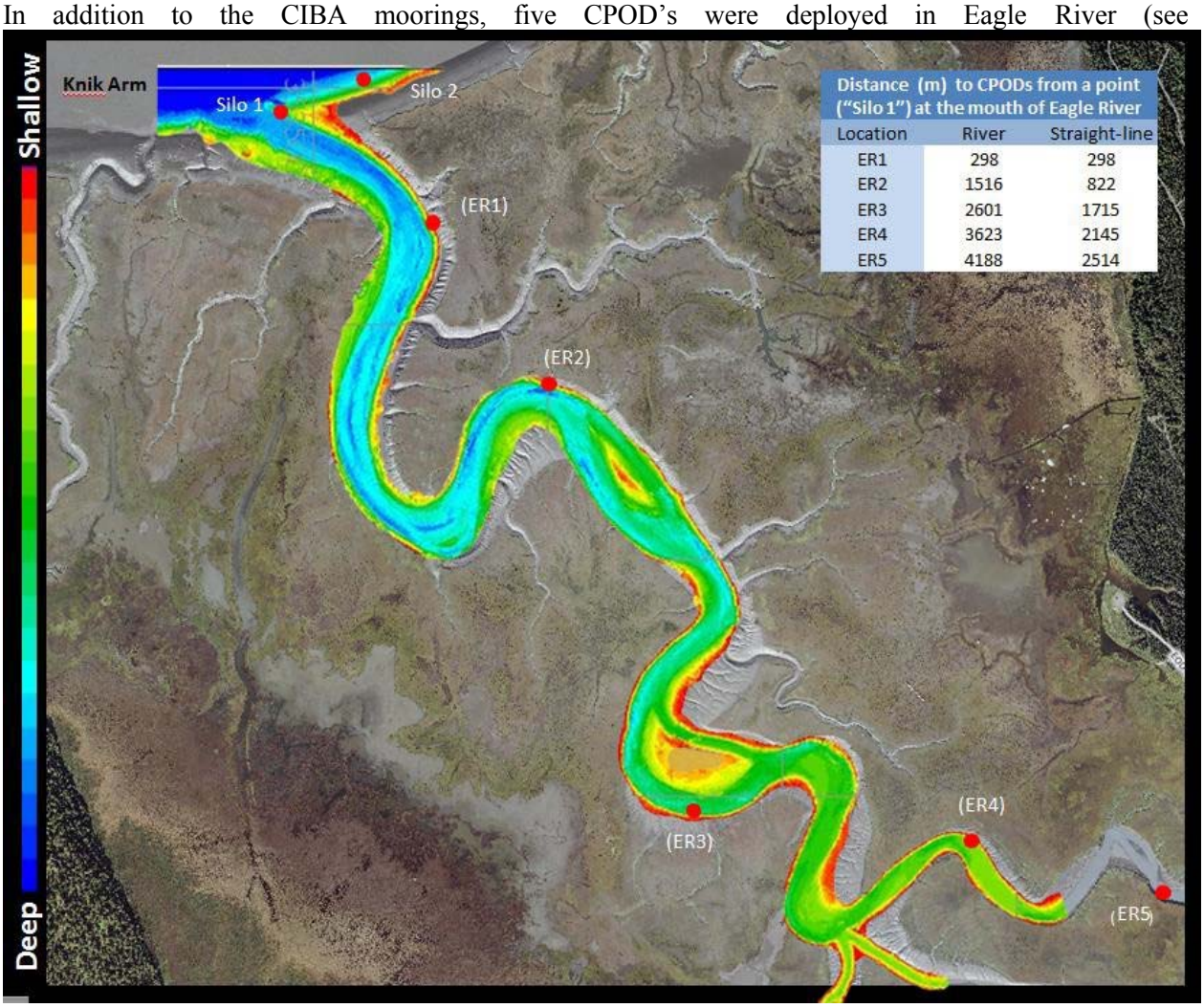



Figure above) between 1 June and 2 November, 2012. The date range with effective acoustic coverage varies for all locations, however, due to equipment problems and losses resulting from sedimentation, bank failures and ice entrapment (see Table 12). The uppermost POD (ER5) was located 4.2 km (river

distance) upstream from the mouth of Eagle River (straight-line distance 2.5 km ) and approximately 900 m (river distance) upstream from the confluence of Eagle River and Otter Creek. Belugas were detected on 83 days[11] at one or more stations between 8 June and 9 October (see Table 13). Whales reached the uppermost station (ER 5) on September 5, 6 and 7.

| Location | Date Coverage | | # Days | Notes |
|---|---|---|---|---|
| | Start | End | | |
| **ER1** | 1 Jun, 2012 | 9 Oct, 2012 | **131** | CPOD at ER1 failed to log after 16 July resulting in no data after that date. Data was used from the nearby CIBA mooring to augment this mouth location. |
| **ER2** | -- | -- | -- | POD deployed but no data |
| **ER3** | 1 Jun, 2012 | 27 Sep, 2011 | **119** | Lost |
| **ER4** | 1 Jun, 2012 | 3 Aug, 2012 | **64** | Lost |
| **ER5** | 29 Jun, 2012 | 14 Sep, 2012 | **78** | Lost |

**Table 12.** CPOD deployment history in Eagle River Alaska, 2012. Date ranges include only those dates when a CPOD was logging properly

| Location | First detection | Last detection | # days whales detected | Notes |
|---|---|---|---|---|
| ER1 | 8 Jun, 2012 | 9 Oct, 2012 | 83 | These are combined results with CIBA mooring at the mouth of Eagle River (adjacent to ER1). This mooring stopped recording/logging on 9 Oct, 2012. The CPOD at ER1 failed to log properly after 16 Jul, 2012. |
| ER2 | -- | -- | -- | CPOD failed to log properly |
| ER3 | 15 Aug, 2012 | 26 Sep, 2012 | 21 | COD lost sometime after 27 Sep, 2012 |
| ER4 | None | None | 0 | CPOD lost sometime after 3 Aug, 2012 |
| ER5 | 5 Sep, 2012 | 7 Sep, 2012 | 3 | CPOD lost sometime after 15 Sep, 2012 |

**Table 13.** First and last dates of beluga acoustic detections per CPOD location in Eagle River, Alaska, 2012. Also indicated are the number of days at each station with at least one beluga detection.

The results of both the visual observations from the mouth of Eagle River and the acoustic monitoring in Eagle Bay and at the mouth of Eagle River are shown in Figure and Table 14 below. Note that detections on the same day and in the same location from multiple studies (visual observations and acoustic) are only indicated once in Table 14. For Figure 2, acoustic data from all instruments at the mouth of Eagle River (EAR/CPOD from CIBA mooring and CPOD at ER1) were combined. The metric used for the acoustic detections was Detected Positive Hours (DPH). Every hour in which there was at least one detection was counted as a positive hour. For instance, if whales were detected at 0805 and 0930 on a given date, the DPH for that day would be two (one in the 8-9 bin and one in the 9-10 bin). The highest DPH out of the three instruments per day was used as the combined acoustic entry for that day in the

[11] The CPOD at ER1 failed to log after 16 July at which point it had logged 2 positive detection days. To provide the most accurate picture of whale presence at the mouth of the river, data from the CIBA mooring at the mouth of Eagle River (near ER1) was used.

figure below. Thus if the DPHs from the EAR, CPOD and CPOD at ER1 were 1, 3, and 9, respectively, then the DPH for that day would be entered as 9.

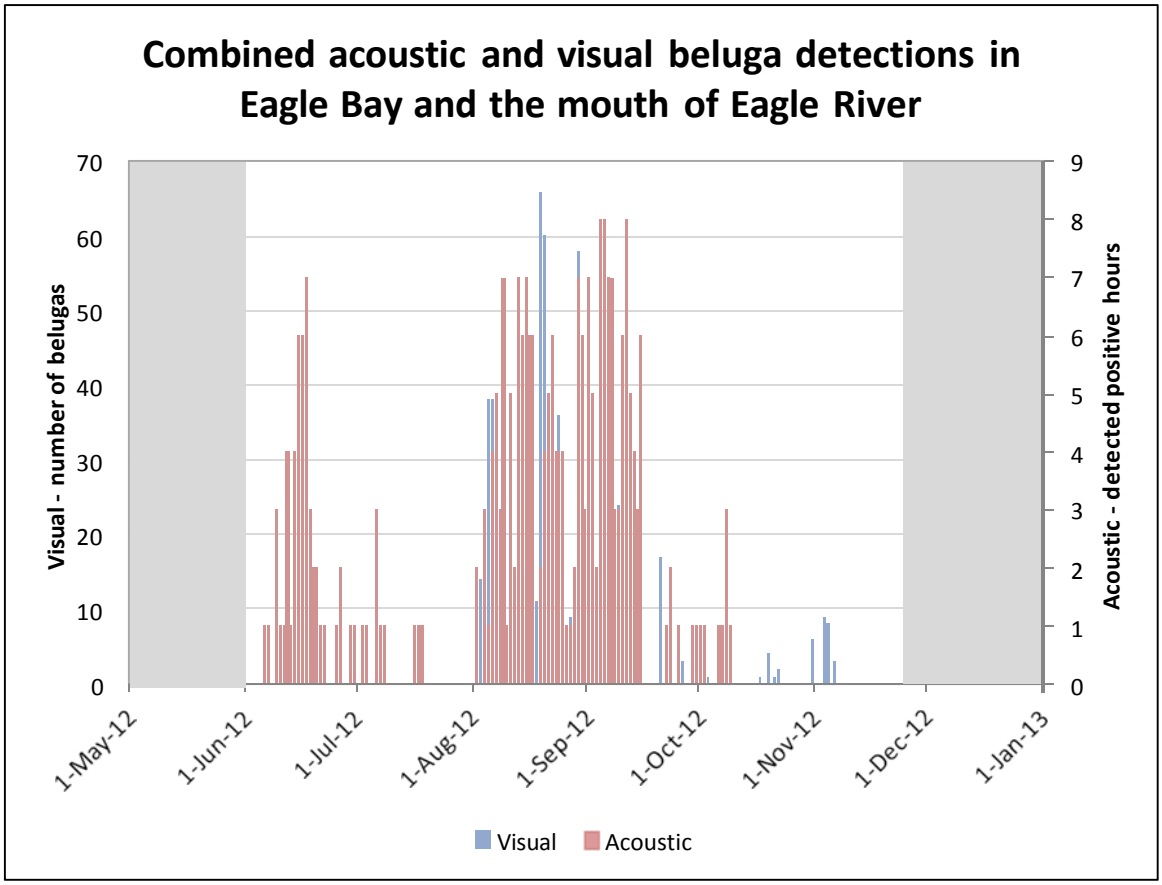



**Figure 2**. Combined Acoustic and Visual Beluga Whale Detections in Eagle Bay and the Mouth of the Eagle River During 2012. Acoustic detections are a combination of EAR and CPOD data from the mouth of Eagle River. The gray areas indicate periods with neither visual nor acoustic coverage.

As in the previous three years, the majority of detections in 2012 occurred in the fall from August through the first week in November (see Table 14 below for details). In 2012, however, whales were detected acoustically on the majority of days in June (n=21) and also numerous days in July (n=8). This is a marked difference from the previous three years in which whales were not detected at all in June and then minimally (one day each in 2009 and 2011) in July with the exception of 2010 in which whales were detected on nine days in July. Since these detection were acoustic only and measured in DPH[12], it is not possible to gauge either the number of whales that entered the area in June and July or their behavior while within detection range.

A closer examination of the acoustic data from that time period, however, offers clues as to possible, even likely, whale activity leading to the June/July acoustic detections. For starters, the majority of these June/July detections were made by the EAR in the CIBA mooring at the mouth of the Eagle River. Interestingly, both the CPOD in that mooring and the CPOD at ER1 collectively only detected whales on 2 of the 21 days in June and 2 of the 8 days in July. This strongly suggests that the whales were either some distance from the mouth of Eagle River or that they moved quickly thorough the Bay without intense acoustic scrutiny of the river, at least on the days when there were detections on the EAR but not the CPOD.

Lower frequency sounds in water experience a lower absorption loss than do sounds with higher frequencies (i.e. they travel farther than higher frequency sounds). The EAR in the CIBA mooring was configured to detect whistles and clicks with frequencies below 30 kHz, giving it a rough detection range of 1.5-2.5 km while the CPOD, which detects echolocation click trains between 20 and 160 kHz, has a shorter range of ~ 700 m or so. Thus, the detection pattern in which the EAR detects whale presence but the CPOD does not could be explained by whales that were inside of the detection range of the EAR but outside of the detection range of the CPOD (i.e. 700m or more from the river mouth).

An additional possibility as to the June/July detection pattern is created by the unique anatomy of the beluga cervical spine itself which allows movement of the head thereby introducing a high degree of directionality to the echolocation beam. This, in conjunction with the ability to focus the beam pattern using the melon (beamforming), allows the beluga amazing control over its biosonar. Thus, a beluga or group of belugas passing quickly by the river without investigation (i.e. without "looking" or pointing their echolocation beam into the river) could be within the detection range of the CPOD but nevertheless be missed by the CPOD[13]. If belugas with this lack of interest in the river were vocalizing as they passed, it is likely that they would be detected by the EAR but not by the CPOD.

It is interesting to note that there were no visual detections in June despite the presence of observers at the mouth of Eagle River (within 100 m of both the CIBA mooring and the CPOD at ER1) beginning on the 16th of June. A closer examination of the data reveals that all of the acoustic detections, with the exception of one instance, occurred outside of the time periods when observers were at the mouth. One acoustic detection, on the 7th of July, did coincide with an active observation period at the mouth of Eagle River and thus theoretically should have been visually detected. The next day (8 July), however, two whales were detected both visually and acoustically. One of the whales was surfacing cryptically[14] and

[12] The metric, DPH, does not necessarily correlate with numbers of whales but rather is a measure of the number of hours in a day with at least one detection per hourly bin. As such, it is possible for a single whale travelling fast through an area to accumulate the same DPH- let's say a DPH of 1 resulting from a single detection in a given hour- as a large group of whales milling in an area for 59 minutes and then suddenly moving off with detections in only one hourly bin (DPH would still be 1). Thus the DPH spike in June of 2012 is indication that at least one whale was present within the detection range for multiple hours (not necessarily contiguous) during certain days, but nothing can be said of numbers or behavior during those time periods, at least based solely on the DPH.

[13] Although it should be noted that belugas passing close to the CPOD (within 200m or so) could theoretically be detected even without pointing their echolocation beam at the instrument due to reverberation and scattering from the bottom and surface of the water (personal communication, Manuel Castellote)

[14] "Cryptic" surfacing describes a surfacing pattern in which the amount of whale seen at the surface is minimized greatly. One type of cryptic surfacing, often observed in Cook Inlet belugas, has been dubbed "snorkeling". During a snorkeling event, the whale appears to arch its head upward, without the normal downward arch of the back. This is done immediately below the

neither were seen until they were within a couple of hundred meters to the north of the observation point at the mouth. This pair travelled rapidly south, entered the mouth of the river where they milled for about 15 minutes (and were detected on both CPODs) and then continued to the northwest where visual detection was lost at approximately 1 km. The last acoustic detection occurred one minute after visual contact was lost. The failure to visually detect the whales that were acoustically detected on the 7th is most likely explained by whales exhibiting a similar combination of cryptic surfacing, small group size and relative lack of focus on the river (i.e. little time spent near the observers).

Unfortunately we cannot, lacking visual data, know for certain how many whales were present in the area in June/July, or what they were doing, or where, exactly they swam. However, it seems likely that they either remained farther than 700 m from the river or that they travelled past the river on the majority of days without stopping to investigate. Given that the one day with both visual and acoustic detections in July resulted from a group of two whales moving quickly through the area it also seems likely that the groups in this time period were small.

This scenario in which a small group of whales moves quickly through the Arm without stopping to mill in Eagle River is consistent with the results of the NMFS annual June aerial surveys conducted between 29 May and 7 June, 2012. During this survey whales were only observed in the mid-inlet (up to 21 whales) and the Susitna delta (up to 286 whales)-no whales were observed in the Knik Arm (Shelden et al., 2012). A small group of whales travelling through an area would be far less likely to be detected during an aerial survey than would a large group or a small group that spent time milling in a single geographical area (e.g. Eagle Bay).

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 6 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 7 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 8 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 9 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 10 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 11 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 12 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 13 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 14 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 15 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 16 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 17 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 18 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |

surface and causes a small wave to form , cresting at the anterior margin of the melon. The whale then breathes in the trough of the wave with only a small portion of skin on its melon visible above the surface of the water.

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 19 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 20 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 21 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 22 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 25 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 26 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 29 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 30 June 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 2 July 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 3 July 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 6 July 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 7 July 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 8 July 2012 | 2 | Travelling/Milling | Eagle Bay/Eagle River |
| 16 July 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 17 July 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 18 July 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 2 August 2012 | 8 | Travelling | Eagle Bay |
| 3 August 2012 | 14 | Travelling/Milling | Eagle Bay |
| 4 August 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 5 August 2012 | 38 | Travelling/Milling/Diving | Eagle Bay |
| 6 August 2012 | 38 | Travelling/Milling | Eagle Bay/Eagle River |
| 7 August 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 8 August 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 9 August 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 10 August 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 11 August 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 12 August 2012 | 8 | Travelling/Milling | Eagle Bay |
| 13 August 2012 | 26 | Travelling/Milling | Eagle Bay/ Eagle River |
| 14 August 2012 | 12 | Travelling/Milling | Eagle Bay/ Eagle River |
| 15 August 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 16 August 2012 | 27 | Travelling/Milling | Eagle Bay/ Eagle River |
| 17 August 2012 | 23 | Travelling/Milling | Eagle Bay/ Eagle River |
| 18 August 2012 | 11 | Travelling/Milling | Eagle Bay/ Eagle River |
| 19 August 2012 | 66 | Travelling/Milling | Eagle Bay/ Eagle River |
| 20 August 2012 | 60 | Travelling/Milling | Eagle Bay/ Eagle River |
| 21 August 2012 | 35 | Travelling/Milling | Eagle Bay/ Eagle River |
| 22 August 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 23 August 2012 | 17 | Travelling/Milling | Eagle Bay/ Eagle River |
| 24 August 2012 | 36 | Travelling/Milling | Eagle Bay/ Eagle River |
| 25 August 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 26 August 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 27 August 2012 | 9 | Travelling/Milling | Eagle Bay/ Eagle River |
| 28 August 2012 | 13 | Travelling/Milling | Eagle Bay/ Eagle River |
| 29 August 2012 | 58 | Travelling/Milling | Eagle Bay/ Eagle River |
| 30 August 2012 | 11 | Travelling/Milling | Eagle Bay/ Eagle River |
| 31 August 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 1 September 2012 | 33 | Travelling/Milling | Eagle Bay/ Eagle River |
| 2 September 2012 | 33 | Travelling/Milling | Eagle Bay/ Eagle River |
| 3 September 2012 | 6 | Travelling/Milling | Eagle Bay |
| 4 September 2012 | 48 | Travelling/Milling | Eagle Bay |
| 5 September 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 6 September 2012 | 26 | Travelling/Milling | Eagle Bay |
| 7 September 2012 | 29 | Travelling/Milling | Eagle Bay/Eagle River |
| 8 September 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 9 September 2012 | 24 | Travelling/Milling | Eagle Bay |
| 10 September 2012 | 42 | Travelling/Milling | Eagle Bay/ Eagle River |
| 11 September 2012 | 30 | Travelling/Milling | Eagle Bay |
| 12 September 2012 | 22 | Travelling/Milling | Eagle Bay |
| 13 September 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 14 September 2012 | 11 | Travelling | Eagle Bay |
| 15 September 2012 | 7 | Travelling | Eagle Bay/Eagle River |
| 16 September 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 17 September 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 20 September 2012 | 17 | Travelling/Milling | Eagle Bay/Eagle River |
| 21 September 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 22 September 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 23 September 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 25 September 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |

| Date | Number of Belugas | Activity | Location |
|---|---|---|---|
| 26 September 2012 | 3 | Travelling/Milling | Eagle Bay/Eagle River |
| 29 September 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 30 September 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 1 October 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 2 October 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 3 October 2012 | 1 | Travelling | Eagle Bay |
| 6 October 2012 | 1 | Travelling/Milling | Eagle River |
| 7 October 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 8 October 2012 | 2 | Travelling/Milling | Eagle Bay |
| 9 October 2012 | N/A | N/A | Acoustic detection at the mouth of Eagle River (no visual data) |
| 17 October 2012 | 1 | Travelling | Eagle Bay |
| 19 October 2012 | 4 | Travelling/Milling | Eagle Bay/Eagle River |
| 21 October 2012 | 1 | Travelling | Eagle Bay |
| 22 October 2012 | 2 | Travelling | Eagle Bay |
| 31 October 2012 | 6 | Travelling | Eagle Bay |
| 3 November 2012 | 9 | Travelling/Milling | Eagle Bay |
| 4 November 2012 | 8 | Travelling | Eagle Bay |
| 6 November 2012 | 3 | Milling | Eagle Bay |

**Table 14.** Beluga Whale Sightings in Eagle Bay and Eagle River During 2012. Acoustic detections are a combination of EAR and CPOD data both from CIBA moorings and CPODs in Eagle River.

### PAMBuoy® trial

A PAMBuoy® system was operational in the mouth of the Eagle River for 19 days in August 2012. Data were collected for a total of 273 hours. Results were reported by Gillespie et al., 2013a. Beluga clicks were clearly visible for much of the time and during the trial it was clear that these detections corresponded well to beluga presence in the river and up to at least 1 km from the river mouth when using Eagle Bay.

Detections were successfully transmitted in real time via wireless IP data link to a station 3.2 km inland for viewing with PAMGuard software. Visual observers concurrently monitored the area for beluga presence during the daytime. Sighting distances varied from 10 to 1035 m. Output of a click rate based event detector was compared to detections selected by a human operator, the automatic system had 96% recall and 98% precision. All visual sightings (432) were acoustically detected, corresponding to 99.5% detection success, except 2 that were missed because either the whale was beyond the range of the detector or only one of two clicks very close in time was detected.

The single click detection and classification system is prone to errors in the form of false positive detections (i.e. saying there is a beluga click present, when in reality there isn't one). To reduce the risk of false positive detections, an event detector was created which requires a minimum number of clicks to arrive in a set time period. By adjusting the minimum number of clicks and the time period it is possible

to adjust the recall and precision of the overall detection system. The event detector was tested with range of time periods and click counts and it was found that a count time of 5 or 10s with click counts of between 7 and 20 clicks could detect most beluga events picked out by a human with a low false alarm rate. Further refinement of these criteria may be possible with additional data collection and may also be required should a different noise source be encountered at the site.

The automatic system was unable to detect all of beluga events picked out by a human operator (HAD's). However, many of the HAD's had few clicks or only quite quiet clicks. Generally, human observers do perform better than automatic detectors and the human observer had two important sources of information which are not available to the automatic event detection algorithm. The first was the ability to listen to the audio data, which enables the observer to aurally pick out the patterns of click trains. The human observer also had the ability to look at the pattern of intervals between clicks on the computer screen. For instance, Figure a shows the Inter Click Interval (ICI) and amplitude of detected clicks over a 20s period at the time of the false detection listed in **Table *15***. Figure b shows similar plots for a true beluga detection. It can be seen that there is considerably more amplitude variation in the true detection and also that the ICI's in the true detection have a greater consistency than in the false detection.

| Date and time (UTC) | Remarks |
|---|---|
| 16 Aug 18:45:46 - 18:47:38 | Loud click trains, presumed to be Beluga. |
| 20 Aug 20:01:22 - 20:01:51 | Loud click trains, presumed to be Beluga. |
| 21 Aug 01:41:03 - 01:41:03 | What appears to be boat noise (no recordings available to confirm this) |
| 25 Aug 04:04:15 - 04:05:39 | Loud click trains, presumed to be Beluga. |
| 27 Aug 15:15:39 - 15:17:16 | Loud click trains, presumed to be Beluga. |
| 27 Aug 17:38:25 - 17:59:50 | Loud click trains from 17:38 to 17:46, then intermittent quieter ones. |

**Table 15.** False positive detections-Automatic acoustic detections during times of visual effort which were at least 30 min from the closest sighting.

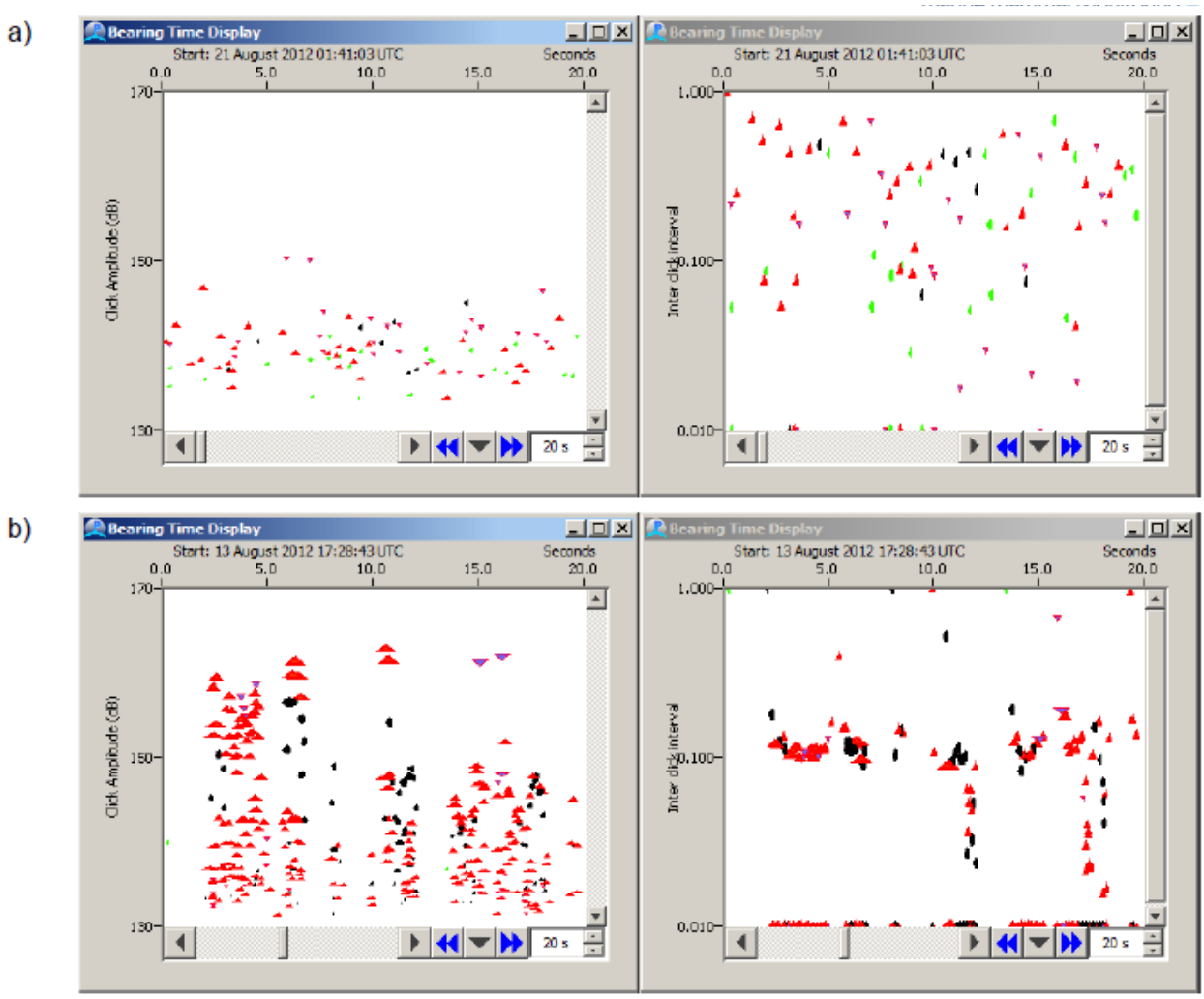



**Figure 3.** PAMGuard Amplitude and Inter Click interval displays for a) a non-beluga false detection (believed to be a vessel) and b) a true beluga event.

While there may be a case for including additional ICI information in the automatic event detector, the acoustic behavior of Belugas is highly variable, and particularly when several animals are present, ICI measurements can become very irregular. Incorporating such a feature into an automatic event detector would therefore not be a straight forward task and may lead to an unstable and unreliable system. Unless shown to be necessary following further data collection, development of an ICI based detector would probably not be an efficient use of resources.

Despite performing less well than a human observer, the system was able to reliably detect all whales approaching or entering the river. The only false detection that passed the event detection criteria was caused by a passing vessel. Presumably, during firing exercises there would be no vessels in the river and it could be argued that if there were for any reason, then detecting them might be a good thing.

Most sightings data were collected within 400m of the hydrophone and nearly all sightings out to the maximum sighting range of just over 1km were detected acoustically. It is therefore impossible to say very much about the detection range of the system except that it is greater than 400m. Depending on the exact operational requirements of a future mitigation system, distinguishing between animals in and

outside the river mouth may be important for operational reasons. Two possible approaches could be used to address this issue. The first would be to raise the detection threshold of the system in order to reduce its range by only detecting louder clicks that would correspond to belugas inside the river or very near the river mouth. The second would be to position the hydrophone further up the river so that sounds from outside the river are masked by the river bank. Practically, the latter of these is likely to be the most effective option since (as can be seen in Figure b) there is several 10's of dB variation in the amplitude of received clicks over time periods of < 10s, i.e. periods short enough that the animal is unlikely to have altered its range from the hydrophone significantly. We can therefore assume that amplitude is a poor proxy for range to animal. However, if higher quality sightings data were available (e.g. theodolite based sightings with a longer range) it may be possible to extract a useable parameter, such as peak amplitude within an event, which may correlate with range to the animals.

Whistles were detected on most days of the deployment. However, most whistle "events" contained very few whistles and whistles were never detected in the absence of clicks. It would appear therefore that whistles would not be a good choice for animal presence detection. It is however possible that the behavioral state of the animals may change with season and this short trial should not be used to conclude that there are never periods when beluga produce more whistles than clicks. Whistles should not be ruled out at this stage. The PAMGuard whistle detector seemed to be doing a good job of picking out whistles from background noise with a low false alarm rate. Tools exist within the software to send short clips of audio data for detected whistles over the wireless modem link so that they can be displayed on the base station for confirmation by a human operator.

## Marine Mammal Related Mitigation Measures for Year Round Firing in ERF (if selected)

### Seasonal Ceasefire Periods

USARAK would adhere to the following restrictions:

- Use of high explosive (HE) munitions would not be used during both the spring and fall *default* waterfowl migration periods (1 April-31 May and 1 Aug-31 Oct) as explained in Section 2.5.1.1.3, of the Supplemental Draft EIS.
- Other munitions (e.g., non-HE) could be used during both the spring and fall *default* waterfowl migration periods, namely: training practice rounds (with the exception of the 155mm TR), illumination, and non-phosphorus smoke rounds. In other words, these non-HE rounds could be used at any time during the year.
- No limitation on fuze type.

Although the *default* migration dates provide an initial starting point, USARAK and JBER may further refine the onset and end of the spring migration period from year to year to maximize training opportunities based on visual observations, as recommended by the JBER wildlife biologist. The beginning of spring would be initiated by visual observation of the arrival of non-wintering migratory waterfowl "trigger" species such as Canada geese, northern pintail, or American wigeon. The presence of five or more birds of any one of these species will result in the start of the spring closure at the ERF Impact Area. The end of the spring would occur when observation of ducks at rest at the ERF Impact Area reach or exceed 75 percent males. In the past, other observational protocols have been implemented to determine the start and end of the fall waterfowl migration period. The actual protocol used would be established and set forth in the JBER INRMP and the appropriate USARAK documents prior to the implementation of Alternative 2, if selected.

While these restrictions were originally created to protect migratory birds, the *default* fall waterfowl migration period corresponds with the heaviest usage of Eagle River by beluga whales.

**Habitat Protection Buffers**
**The following year-round habitat protection buffers would be activated:**

- A 500-meter (m) [1,640 feet (ft)] wide area of land extending along the shore of Eagle Bay.
- A 1,000-m [3,280 ft] wide area of land extending along the shore of Eagle Bay only when 120-mm mortar HE rounds are used.
- The Eagle River and Otter Creek channels. Firing into the river and creek, during all conditions, is prohibited.
- A 130-m [426 ft] wide area extending outward from each bank of Eagle River, beginning from the mouth at Eagle Bay and extending upstream to a point 100 m above the confluence with Otter Creek.
- A 50-m [164 ft] wide area extending outward from each bank along the main Eagle River channel beginning at the point 100 m upstream from the Otter Creek confluence and extending further upstream to the Route Bravo Bridge.
- A 50-m [164 ft] wide area 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 (EFH).

**Marine Mammal Observers**

In addition to habitat protection buffers, USARAK and JBER would employ a method of marine mammal observation immediately before, during and following training exercises (using HE munitions) to detect the presence of marine mammals in areas where they could be subject to harassment or harm. The purpose of marine mammal monitoring is to: avoid "take" under the Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA); ensure that any take of beluga or harbor seals does not exceed the quantity of take that may be authorized under the ESA and MMPA; and to ensure no take of other marine mammals for which there is no take authorization. Training that includes the sole use of non-HE rounds will not require the use of marine mammal observers regardless of the time of year.

Marine mammal observer(s) would call temporary ceasefires during use of HE munitions as follows:

- Firing of HE munitions with 105-mm howitzers would be temporarily suspended in the event Cook Inlet beluga whales are detected in Eagle River. All firing could resume once the whales leave the river.
- Firing of HE munitions with 120-mm mortars would be temporarily suspended in the event Cook Inlet beluga whales are detected in Eagle River. All firing could resume once the whales leave the river.
- No restrictions would be placed on the firing of HE munitions with 81-mm and 60-mm mortars, or the 155-mm TR, while Cook Inlet beluga whales are detected in Eagle River.

  On the bay side of the demarcation line (towards Eagle Bay), the 130 meter habitat protection buffer would prevent noise levels reaching 160 dB RMS from entering Eagle River.

  On the inland side of the demarcation line (away from Eagle Bay), noise reaching 160 dB RMS from the 81-mm mortar and 155-mm TR, would overlap into Eagle River. The 50 meter habitat

protection buffer that exists in the upper portion of Eagle River (north of its confluence at Otter Creek) would not prevent noise levels reaching 160 dB RMS from entering Eagle River because the noise radius from the 81-mm mortar and the 155-mm TR is 69 meters and 91 meters, respectively. However, USARAK and JBER believe that recent beluga observations support removing the requirement for a ceasefire on the inland side of the demarcation line when the 81-mm mortar is being used that was offered in the Draft EIS. In 2011, 2012, and 2014, data collected from passive acoustic monitoring instruments (echolocation data loggers) indicate that beluga may in fact travel north of Eagle River's confluence with Otter Creek, but were only noted to do so from the middle of August to the middle of October. Since the use of HE munitions would not occur during the *default* fall waterfowl migration period (includes the months of August-October), there is presently no need to further restrict the use of the 81-mm mortars or the 155mm TR for the protection of the beluga.

- Firing of all HE munitions would be temporarily suspended in the event Steller sea lions, or other marine mammals for which a take permit has not been issued, are detected in Eagle River. No marine mammal monitoring would be required for use of non-HE munitions.

  As explained in the Biological Opinion (BiOp), the presence of other marine mammals protected by the Endangered Species Act (ESA) and/or the Marine Mammal Protection Act (MMPA) are considered rare in the Knik Arm, which led to the decision to not engage in Section 7 consultation under the ESA and/or obtain an Incidental Harassment Authorization (IHA) under the MMPA for these species (with the exception of harbor seals).

Marine mammal observers would be staffed by JBER during indirect live-fire training.

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# Appendix K. Wildland Fire Management Plan for Joint Base Elmendorf-Richardson

## Letter of Instruction

This Wildland Fire Management Plan (WFMP) complies with Air Force Instruction 32-7064, *Integrated Natural Resources Management*, Chapter 12, *Wildland Fire Management*. A collaborative approach to the development and implementation of this WFMP will ensure the safety and welfare of firefighters, JBER and the surrounding community during suppression of wildland fires while benefiting from the effects of fire to natural resources.

The WFMP supports the goals and objectives of the JBER Integrated Natural Resources Management Plan. This guidance document integrates wildland fire with natural resources management to ensure no net loss of military training lands and conservation of the boreal forest to sustain realistic military training.

WFMP was coordination with 673 CES Fire Chief, 673 CES Environmental Compliance, JBER-Richardson Range Control and Air Force Wildland Fire Center, at Eglin AFB.

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Note: During the 2014 INRMP update, BLM Alaska Fire Service wildland fire responsibilities on JBER were transferred to Alaska Division of Forestry. This document has been edited accordingly, but not staffed for re-signature since the intention of the document has not changed.

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## 1.0 ACROYMN LIST

| | |
|---|---|
| ABWI | Air Base Wing Instruction |
| ADoF | Alaska Division of Forestry |
| AFI | Air Force Instruction |
| AFS | Alaska Fire Service |
| AFCEC/CXF | Air Force Civil Engineer Center, Fire Emergency Services Division |
| AFWFC | Air Force Wildland Fire Center |
| BLM | Bureau of Land Management |
| DoD | Department of Defense |
| DoDI | Department of Defense Instruction |
| GIS | Geographic Information Systems |
| FES | Fire Emergency Services |
| FESCS | Fire Emergency Services Certification System |
| IAW | in accordance with |
| ITAM | Integrated Training Area Management |
| INRMP | Integrated Natural Resource Management Plan |
| JBER | Joint Base Elmendorf-Richardson |
| JBER-E | JBER-Elmendorf |
| JBER-R | JBER-Richardson |
| MOA | Memorandum of Agreement |
| NFES | National Fire Equipment System |
| NEPA | National Environmental Policy Act |
| NFPA | National Fire Protection Association |
| NFP | National Fire Plan |
| NWCG | National Wildfire Coordinating Group |
| WFMP | Wildland Fire Management Plan |
| WFPM | Wildland Fire Program Manager |
| WFSA | Wildland Fire Situation Analysis |
| USARAK | United States Army Alaska |
| UXO | Unexploded ordnance |

## 2.0 INTRODUCTION

The purpose of this plan is to promote a cooperative, consistent, cost-effective, interagency approach to wildland fire management. The response to a wildland fire is determined by the management option designation and the likely consequences of the fire on firefighter and public safety. The options offer a choice of responses from aggressive suppression to surveillance and that range of responses provides an opportunity for Joint Base Elmendorf-Richardson (JBER) to achieve both protection and meet natural resource management goals and objectives. The response listed under each option addresses normal fire conditions and a high percentage of wildland fire situations that occur on JBER. Situations may arise where non-standard responses are prudent and justifiable.

This Wildland Fire Management Plan (WFMP) is consistent with land and resource use defined in the Integrated Natural Resources Management Plan (INRMP). The WFMP also meets state and federal fire management policy and guidance, meets state and federal regulatory requirements and identifies agency-specific goals and objectives. There are three fire management options on JBER; critical, full and limited. These resource assignments prioritize and describe the standard response to a wildland fire. Infrastructure, ecological considerations and suppression costs were factors used to develop the management option criteria.

## 3.0 POLICY AND GUIDANCE

Policies, standards and directives in this section identify the overarching federal wildland fire policy, directives, instructions and professional criteria requirements of the JBER wildland fire management plan.

### 3.1 Federal Fire Policy

The *Federal Wildland Fire Management Policy and Program Review Final Report (December 18, 1995)* was the first joint comprehensive fire policy for the Departments of the Interior and Agriculture. The final report contained guiding principles that directed federal agencies to achieve a balance between suppression to protect life, property and resources, and fire use to regulate fuels and maintain healthy ecosystems. It promoted the use of wildland fire to accomplish resource management objectives and supported implementation of policies and recommendations in conjunction with states, tribes and local governments.

The *Review and Update of the 1995 Federal Wildland Fire Management Policy (January 2001)* contains specific actions to enhance wildland fire management and seeks to build on the strengths of the original policy. Firefighter and public safety are listed as the first priority and the 2001 policy directs all fire management plans and activities to reflect this commitment. The 2001 guiding principles and policy statements guide the philosophy, direction and implementation of fire planning, activities and projects on federal lands. All the principles and policy statements are incorporated by reference into this plan and, where appropriate, the statements are included within this plan.

The first *Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy* was issued in 2003; it was replaced by the *Guidance for Implementation of Federal Wildland Fire Management Policy,* issued February 13, 2009. The 2009 *Guidance* affirmed the soundness of the *2001 Review and Update* and clarifies implementation direction to fully achieve the intent of the 2001 policy.

The National Fire Plan (NFP) was developed in August 2000, following a landmark wildland fire season in the Lower 48, with the intent of actively responding to severe wildfires and their impacts to communities while ensuring sufficient firefighting capacity for the future. The NFP addresses five key points: firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability.

Fuels management was addressed further in the *Healthy Forests Initiative* (August 2002) which sought to reduce the risks severe wildfires pose to people, communities and the environment. The Initiative was followed by the Healthy Forests Restoration Act of 2003, which contains a variety of provisions to speed up hazardous-fuel reduction and forest restoration projects on specific types of federal land that are at risk of wildland fire or of insect and disease epidemics.

### 3.2 Department of Defense Policy

Department of Defense Instruction (DoDI) 6055.06 *Wildland Fire Response*, states that fire department resources preparedness and response to wildland fires be accomplished in accordance with the *Review and Update of the 1995 Federal Wildland Fire Management Policy* and *Interagency Fire Management Agreement*. Exceptions are provided under Department of Defense (DoD) Directive 3025.15, *Military Assistance to Civil Authorities.*

### 3.3 Air Force Policy

Wildland Fire Management and how it interconnects with the INRMP is addressed in Air Force Instruction (AFI) 32-7064, *Integrated Natural Resources Management*; Chapter 12. This WFMP meets AFI 32-7064 requirements.

### 3.4 Wildland Fire Qualifications and Standards

The applicable qualifications and standards used for Air Force wildland firefighting activities and operations are as follows:

a. The National Wildfire Coordinating Group (NWCG) *Wildland Fire Qualification System Guide* (PMS 310-1) (NWCG, 2010) contains the training experience and physical requirements for various Incident Command System positions. The DoD accepts these standards for the use in both wildfire suppression and prescribed fire operations on DoD lands.

b. National Fire Protection Association (NFPA) 295, *Standard for Wildfire Control*, specifies management, organization, equipment, apparatus and procedures required for wildland fire control.

c. NFPA 299, *Standard for Protection of Life and Property from Wildland Fire*, provides fire safe development standards for areas potentially threatened by wildland fire.

d. NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, specifies the minimum requirements in terms of performance objectives and professional competence required for service as an apparatus driver operator for each level of responsibility.

e. NFPA 1051, *Standard for Wildland Fire Fighter Professional Qualifications*, identifies the minimum job performance requirements for wildland fire duties and responsibilities.

f. NFPA 1143, *Standard for Wildland Fire Management*, specifies practices and policies required for a fire protection organization to develop a wildland fire management program.

g. NFPA 1144, *Standard for Protection of Life and Property from Wildland Fire,* provides minimum planning, construction, maintenance, education, and management procedures to protect life, property and other resources threatened by wildland fire. It is designed to assist agencies challenged by wildland urban interface growth and the monetary losses associated with this urban encroachment.

h. NFPA 1500, *Standard for Fire Department Occupational Safety and Health Program,* contains minimum requirements for a fire service-related occupational safety and health program.

### 3.5 JBER Standard Operating Procedures

The objective of fire suppression is to attack and suppress wildfires at minimum cost while protecting values at risk and minimizing the impacts from suppression activities. For purposes of this fire management plan, a wildfire is defined as, “Any non-structural fire that occurs in the wildland”. Three distinct types of wildland fire have been defined and include wildfire, wildland fire use, and prescribed fire. Wildfire suppression is simply the act of putting out a wildland fire using safe and

efficient methods. In some cases, a wildfire on JBER training lands can be controlled with a single attack response vehicle; in others, large numbers of fire fighters, fire apparatuses, and equipment may be required. Because of this range of resource needs, fire suppression can be relatively simple and straightforward or extremely complex. More response information is provided in section 6.5 *Fire Suppression Actions.*

### 3.6 Wildland Fire Qualifications

The NWCG PMS 310-1 is incorporated in this plan by reference as are NFPA standards 295-299. The DoD accepted these standards for use in both wildlife fire suppression and prescribed fire operations on DoD lands.

### 3.7 JBER INRMP

The WFMP is a component plan of the JBER INRMP. The related goals and objectives of the INRMP are consistent with the goals, objective and operational practices of the WFMP.

## 4.0 GOALS AND OBJECTIVES:

Below are the specific guidelines for the JBER wildland fire management program. These mutually developed goals and objectives consider the safety risk, mission requirements, interagency nature and public interest requirement of a WFMP.

**A. Goals**
The preliminary goals and objectives are arranged by four subject categories; Safety, Interagency Management and Budget, Data Sharing and Distribution and Compliance, Coordinate and Education

**Goal 1**: Complete mission-related activities and accomplish fire-related land-use and resource management in a manner protective of human life and health, property, and valued natural and cultural resources, when possible.

*Objectives:*
- Protect human life; emphasize fire fighter and public safety as the single, overriding priority.
- Prioritize protection action areas; allocate firefighting resources without compromising safety.
- Participate in unexploded ordnance management planning prior to allocating field resources.
- Safely suppress all wildland fires to assure minimal military impacts.
- Integrate mission objectives, land use, fire management and natural resource goals.

**Goal 2:** -Facilitate the development of interagency planning and partnerships

*Objectives:*
- Conduct an annual, pre-season review of the fire protection needs and land management options and identify limitations/challenges for potential management activities.
- Define criteria for prioritizing the allocation of resources in response to a wildland fire using operationally, fiscally and ecologically sound principles.
- Work with United States Army Alaska (USARAK), United States Department of Agriculture- Forest Service (USFS) and Air Force Wildland Fire Center (AFWFC) to annually develop a wildland fire budget. Program the budget for the upcoming year and a minimum of three out years.
- Work with USARAK, USFS, Alaska Division of Forestry (ADoF) and AFWFC, if necessary, to review, modify and finalize annual burn plan.
- Promote cooperation, collaboration and partnerships for fire management between Army, Air Force and other federal, state and local or tribal governments.

**Goal 3**: Identify, collect, maintain and monitor strategic wildland fire spatial data.

*Objectives:*
- Identify and establish high priority wildland related geospatial datasets necessary to support implementation of wildland fire prevention, response and resource recovery.
- Promote standard data collection procedures for wildland fire management and share data with wildland fire partners.

- Use spatial data sets to identify and prioritize prescribed burn areas annually and support budgetary cost estimates.

**Goal 4:** Adhere to all compliance requirements. Focus on coordinating and educating of on- and off-base entities.
*Objectives:*
- Work with USARAK and ADoF to modify Title V air permit annually, if needed.
- Maintain Mutual Aid Agreements with applicable off-base entities to ensure effective suppression off-base and out-of control base fires
- Provide adequate public notification of all planned prescription burns.

## 5.1 RESOURCE RISKS

### 5.2 Firefighter Safety

Public and firefighter safety is the first and highest priority. Safety is the responsibility of everyone assigned to a wildfire incident. Safety is an attitude that must be promoted at all operational levels. Once personnel are committed to an incident, those resources become the highest value to be protected.

Fighting wildfires is inherently dangerous, and firefighters risk injury or even death in these operations. Nationally, there are wildland firefighter fatalities nearly every year. In addition to the danger from the fire itself, the need to use cutting tools, mobile apparatuses, heavy equipment, and aircraft add to the risk involved. If firefighters know how to recognize potentially hazardous situations and how to mitigate them, they can reduce or eliminate much of that risk.

The training program and the qualification and certification process are the foundations of the safety program. Only qualified personnel will be assigned firefighting duties. All assigned wildland fire personnel, whether on wildfires or prescribed fires, must meet National Wildfire Coordinating Group, or equivalent NFPA training standards. All personnel engaged in actual fire line operations (in the vicinity of the fire) must have completed: S-110 Basic Fire Suppression Orientation; S-130 Firefighter Training; S-190 Introduction to Fire Behavior, Your Fire Shelter, Standards for Survival and I-100 Introduction to Incident Command System. All trained personnel will be required to complete an annual four-hour refresher course. All personnel will have certified training in accordance with current Air Force Instruction (AFI)s for tasks they are assigned.

The Incident Commander must ensure that safety briefings take place at all operational levels. The identification and location of escape routes and safety zones will be identified and stressed at every briefing.

All fire suppression actions must be in compliance with DoDI 6055.6, AFI 32-2001, and the National Wildfire Coordinating Group *10 Standard Fire Orders* and *18 Watch-Out Situations*. It is mandatory that all firefighting personnel assigned be equipped with the proper personal protective equipment necessary for fighting wildfires. Wildland firefighters must be intimately familiar with the tools used and personal protective equipment worn. Knowledge of proper selection, use and care of the various tools used in wildland firefighting aids firefighters in performing their job as efficiently and effectively as possible. Likewise, knowledge of the proper donning, care, capabilities and limitations of personal protective equipment, gives firefighters a better sense of which situations are tenable and which are not. Firefighting personnel will ensure that proper personal protective equipment is worn at all times when actively engaged in firefighting duties.

### 5.3 Mission

JBER must provide relevant training at home station that adequately portrays the operational environment in training venues and facilities that allow units and staffs to achieve mission essential task list proficiency. The training process for JBER-Richardson (JBER-R) brigade combat teams and echelons above brigade units is to gain proficiencies in four levels: (1) individual skills and marksmanship; (2) squad level collective training; (3) unit's transition to critical collective tasks at platoon and company levels, and (4) mission validation for battalion and brigade level operations. Units must comply with current published pre-deployment training guidance, as well as Army regulation 350-1 training requirements.

Airborne units conduct airborne operations to train and sustain individual paratrooper skills and hone collective task execution. Given limited training time to devote to airborne operations, priority will be given to individual jumper and jumpmaster proficiency and collective proficiency up to battalion level. Airborne operations will be executed in accordance with (IAW) the Army's Airborne Standard Operating Procedures. At a minimum, a battalion headquarters will be designated to provide command oversight for each airborne operation. Airborne troop leading procedures inherent to airborne operations will not be abrogated.

Soldiers must strive to be an expert in employing his/her assigned weapon. Small arms mastery is achieved by effective employment of soldiers' assigned weapons, optics, lasers and night vision devices. Leaders at all levels will maximize the use of the engagement skills trainers and ensure that soldiers are exposed to more advanced skills such as close quarter or short range marksmanship tables, long range marksmanship, non-standard firing positions, high angle fire, target discrimination, and firing under physical stress. Direct, indirect, and aerial gunnery will be planned, resourced and executed as part of a unit's training glide path. Minimum platforms for gunnery requirements include: machine gun crew, mortar, howitzer and aviation.

Another DoD mission consideration is unexploded ordnance (UXO). There are a number of past and present training operations that present lingering UXO concerns. A fair percentage of JBER-R standing timber or transitional grass ecotone converge into timber land within current range training lands or has historically been located within a range safety firing fan for various live fire ranges. It is recommended that Explosive Ordnance Disposal personnel be involved in the annual, pre-season fire protection meeting.

### 5.4 Biological and Cultural Considerations

JBER does not have any endangered or threatened terrestrial flora or fauna. Yet, the Incident Commander needs to select suppression tactics commensurate with the fire's potential or existing behavior, and leaving minimal environmental impact. Minimum impact suppression is an increased emphasis on suppressing a wildfire while minimizing the effects of suppression measures on the vegetation, soils and watershed. Minimum impact suppression tactics will not over-ride considerations for safety or containment or control of the wildfire. However, they will be used to the maximum extent possible within these constraints.

Protection of the local environment will be considered in fire management strategies, particularly in the location of fuel breaks and control lines. Bulldozers are a useful tool in fire suppression efforts but can have a severe impact on natural and cultural resources. The use of dozers to construct fire-lines within pre-established fuel breaks provides for safe dozer operations, enhances ground firefighter safety, and causes the least environmental impact, as these areas are pre-approved for vegetation removal. Dozers are used as a means of last resort in fire suppression because of their potential impact on the environment. Dozer operations in support of a wildland fire have never occurred on JBER; dozer operators are not expected to respond to wildfires on JBER unless it is an absolute emergency.

Fire managers must be familiar with the long-term effects of physical ground/vegetation disturbance. Specific concerns include invasive species introduction through the use of dirty equipment or the creation of invasion routes. Ground disturbance on sloped land may result in lingering erosion problems or permanently damage cultural sites. The use of fire suppression chemicals (foam and retardant), the aerial use of chemical retardant, fire foam or saltwater will be weighed against the potential for fire damage to sensitive plants.

JBER has few archeological sites identified. A complete survey of this installation is ongoing but not complete. Alpine and wetland or riparian areas have received limited archeological surveys. A recent survey along a salmon bearing stream yielded no archeological artifacts. Wildfires may harm unknown archeological areas but riparian areas thought to have high potential for sites are unlikely to be targeted for prescribed burns or experience wildland fire because of the saturated soils conditions associated with this ecosystem.

Use of aerial fire retardant near lakes, wetlands, streams, rivers and adjacent to water sources used for human water consumption should be avoided to protect fish habitat and water quality. If feasible in these areas, the use of water rather than retardant is preferred. When retardant use is necessary, avoid aerial or ground application of retardant or foam within 300 feet of

a waterway or wetland; application beyond 500 feet is preferred. Examples of when the use of retardant is authorized are for the protection of:

- Human life
- Permanent year-round residences
- National Historic Landmarks
- Structures on or eligible for the National Register of Historic Places
- Government facilities
- High value resources on JBER managed land and those of adjacent land owners
- Threatened, endangered, and sensitive species habitats as identified by resource specialist

## 6.0 INSTALLATION FIRE HISTORY

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 over the past 200 years, 48% of JBER-R has been affected by fire (Jorgenson *et al*. 2002).

Although wildfires are a concern at JBER, they rarely present a significant problem. The 2005 BLM Wildland Fire Management Plan estimated the natural fire regime occurs in the Alaska coastal forest every 200 to 600 years. The principal concern on JBER is human caused fires. Numerous fires have been recorded in the Matanuska-Susitna Valley to the north, but no major fires have occurred on JBER-R 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-R and the Integrated Training Area Management (ITAM) Geographic Information Systems (GIS) includes this information in a data layer.

Most military activity occurring on JBER-Elmendorf (JBER-E) happens in disturbed wildland areas that for the most part are not readily combustible. Most wildland fires occurring on JBER-R have been small and confined to areas behind the small arms complex. Nine wildfires, all human caused, have been recorded on JBER since 1956. The largest fire occurred in 2006, the Otter Lake Fire, which burned 81 acres.

## 7.0 WILDFIRE PROGRAM

### 7.1 Responsibilities

The 673d Civil Engineer Squadron Installation Management Flight, Natural Resources Section, is responsible for preparing and updating the WFMP, coordinating project funding where appropriate, and conducting land management responsibilities on all JBER lands, to include:

- Identifying and mitigating hazard fuel risk
- Creating fuels maps and incorporating the maps into the appropriate management plans
- Compliance with cultural resource issues
- Compliance with the INRMP
- Determining landscape fire management options according to the Alaska Interagency Wildland Fire Management Plan
- Attending spring fire preview and fall review meetings
- The natural resource manager in conjunction with wildland fire program manager (WFPM) will ensure all pre and post plan prescribed burn coordination occurs with all appropriate organizations. This responsibility will be accomplished thru the distribution of meeting minutes to all appropriate parties.
- Documenting fire history
- Ecosystem management considerations
- Burned area rehabilitation
- Pre- and post- wildland fire monitoring requirements

- Assisting in Fire planning

The JBER Fire and Emergency Services (FES) are responsible for developing fire indices on a daily basis during fire season. The fire department provides initial attack and limited suppression activities. Under a pending agreement with the ADoF, provides fire suppression on JBER. The 673d JBER FES is responsible for:

- Completing Wildland Fire Situation Analysis (WFSA) process during wildfires and holds a post fire meeting(s) to discuss lessons learned and develop best management practices to reduce future wildfire risk
- Attending spring fire preview and fall review meetings
- Risk assessments for military lands and structures on training lands, with support from Range Control and Natural Resources
- Acting as a Resource Advisor during wildland fires
- Identifying and mitigating hazard fuel risk, with support from Range Control and Natural Resources
- The WFPM, in conjunction with the natural resource manager will ensure all post wildfire coordination occurs with all appropriate organizations by distributing meeting minutes to all appropriate parties

Fire planning is a continual process. Most fire planning is based on five years of records including both weather and fire occurrence. ADoF manually enters fire weather observations into the National Weather Information Management System program. Combining this information with fire occurrence data can improve the efficiency with which JBER can staff its response resources. Based on fire occurrence data and response time, fire managers can determine if existing fire control forces are adequate and if additional suppression forces will be needed.

Fire Danger Rating System data can also be worked into the GIS database. By putting spatial data in an integrated system where it can be organized and analyzed, fire managers will be able to find patterns and relationships to increase efficiency in the decision-making process. Response times, suppression success, and risk factors can all be combined to determine what locations and times require more or fewer suppression resources. In addition, fire managers need to analyze such things as the adequacy of detection to determine if fires are reported while they are small enough to control.

Range Control, in coordination with the WFPM, can also determine if additional training restrictions need to be imposed as a result of unfavorable fire danger ratings or, conversely, if the Fire Danger Rating System restrictions are too tight. This kind of planning, based on experience with the fire danger, allows fire managers to fine tune the Fire Danger Rating System and associated restrictions over time.

### 7.2 Qualifications, Certification, Training, Fitness and Medical Surveillance Standards for Wildland Fire Personnel

Wildland Fire Personnel Certification Standards: All military, civilian, contractor and emergency services personnel involved in wildland fire management must possess certifications appropriate for their expected level of involvement in the wildland fire organization. All Air Force personnel must meet the applicable NFPA or NWCG Standards for wildland fire activities.

The Air Force Wildland Fire Center is responsible for issuing, maintaining and tracking the NWCG certifications and qualifications for AF personnel, to include contractors and volunteers where appropriate. AF personnel whose Job Series is in the 0400 Natural Resources Management and Biological Sciences or 0300 General Administrative, Clerical, and Office Service Occupational Groups, as well as contractors and volunteers that assist them, must meet the training and qualification standards specified in the NWCG *Wildland Fire Qualification Subsystem Guide* (PMS 310-1/NFES 1414). The installation WFPM will annually provide the AFWFC with updates of NWCG certifications, training and experience for applicable personnel.

Air Force Civil Engineer Center, Fire Emergency Services Division (AFCEC/CXF) is responsible for tracking National Fire Protection Association certifications in accordance with DoDI 6055.06-M, *DoD Fire & Emergency Services Certification System*. Personnel in the GS-0081 Job Series, 3E7X1 career paths, and contractors working with Fire and Emergency Services on AF-managed lands must meet the certification standards specified in NFPA 1051 – *Standard for Wildland Fire Fighter Professional Qualifications* and NFPA 1002 – *Standard for Fire Apparatus Driver/Operator Professional Qualifications*. National Fire Protection Association certifications documented in the Fire Emergency Services Certification System (FESCS) database may be used to grant commensurate National Wildfire Coordinating Group wildland fire certifications in accordance with the NFPA to NWCG crosswalk at http://www.usfa.fema.gov/downloads/pdf/wildland_training_crosswalk.pdf.

AF personnel who participate in wildland fire activities will be certified, as a minimum requirement, in Cardio-Pulmonary Resuscitation and Standard First Aid by the American Red Cross or comparable certification authority.

The position description of all Air Force employees will reflect the wildfire duties and required certifications necessary for the individuals expected to participate in wildland fire activities must reflect the expected. Position descriptions for civilian personnel with wildland fire management duties must state if the position qualifies as a primary or secondary wildland fire fighter, as described in Chapter 46 of the Office of Personnel Management *CRCS and FERS Handbook for Personnel and Payroll Offices*. Natural resources management personnel not classified as a primary or secondary wildland firefighter may perform collateral duty in wildland fire management activities as qualified and if authorized by the incident commander.

#### 7.2.1 Wildland Fire Personnel Physical Fitness Standards

WFMP will establish the physical fitness standards required for personnel that participate in wildland fire management activities based upon their expected level of participation. NWCG publications PMS 310-1/National Fire Equipment System (NFES) 1414 – *Wildland Fire Qualification Subsystem Guide*, NFES 1596 – *Fitness and Work Capacity*, and NFES 2071 – *Fit to Work, Fatigue and the Firefighter* provide guidance for establishing physical fitness standards for various wildland fire management activities.

NWCG Publication PMS 307/NFES 1109 – *Work Capacity Test Administrator's Guide* shall be the AF standard for assessing fitness for personnel that participate in wildland fire activities. The Work Capacity Test will be utilized to assess three levels of fitness for personnel involved in wildland fire activities: (1) Arduous, (2) Moderate, and (3) Light.

Civilian personnel, contractors and volunteer's fitness tests are tied to specific qualification in PMS 310-1. Most qualifications directly related to firefighting are tested at the arduous level up to the strike team leader level. Personnel whose job description requires participation in wildland fire management activities as a primary or secondary firefighter on AF installations must meet the pre-employment medical and physical examination criteria contained in NFPA 1582 – *Standard on Comprehensive Occupational Medical Program for Fire Departments*.

### 7.3 Fire Response Planning

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. These pre-suppression actions are planning, prevention, fuels management, and prescribed burning. Pre-suppression planning stresses safety, effective fire response planning, and pre-suppression priority.

Pre-suppression priorities for JBER lands are established by this WFMP. Pre-suppression priorities have been determined for each ecological management subunit on JBER-Richardson.

The Alaska Wildland Fire Management Plan established four fire management options to be used by land owners to determine pre-suppression priorities: Critical, Full, Modified, and Limited. Land managers may select among these options for different parcels of land, based on evaluation of legal mandates, policies, regulations, resource management objectives and local conditions (Alaska Wildland Fire Coordinating Group 1998). JBER has three wildland fire management areas, critical, full and limited and a special subset of the limited land management area described as restricted or hot zone. These restricted or hot zones may contain unexploded ordnances. Presently these management areas are not digitally displayed in this management plan. JBER will strive to create a GIS map illustrating all wildland fire management area in 2014. The fire management options for each of the land management areas are described below:

***Critical Management Option***. These lands receive maximum detection coverage and are given highest priority for attack response, which is immediate and aggressive. Land owners/managers are notified of the situation as soon as possible. These areas receive priority over adjacent lands and resources in the event of escaped fires.

***Full Management Option***. These areas receive maximum detection coverage as well as immediate and aggressive initial attack response. If the fire escapes and requires additional suppression, affected land/lease owners and tenant organization e.g, lease holders, Anchorage School District will be notified if necessary to develop further fire suppression or implement evacuation strategies.

***Limited Management Option***. This option is used in areas where the resources at risk do not warrant the expense of suppression or in areas where natural fire is important to ecosystem sustainability. Fires within these areas receive routine detection effort. Attack response is based on the need to keep the fire within limited management option areas and the need to protect critical sites. Land owners/managers are immediately notified of the fire situation, and the status of unmanned fires is monitored.

In addition, another additional fire management option category has been developed, Restricted Areas or Hot Zones.

***Restricted Areas or Hot Zones***. These areas include impact areas and other locations where no "on the ground" firefighting can be accomplished due to danger of unexploded ordnance. High hazard impact areas are managed as hot zones with limited management. Fire in these areas is suppressed through back-burning and aerial-dropped retardants (Alaska Wildland Fire Coordinating Group 1998).

Boundaries between management options should be readily identifiable from both the air and on the ground throughout the fire season and also be feasible for potential placement of suppression control lines. Any management option may border against any other management option. Either the suppression organization or land managers may make recommendations for relocating or reinforcing fire management option boundaries through prescribed fire or mechanical methods. Only the land managers can approve boundary changes or boundary reinforcement activities for the lands they manage. Consensus between land managers adjacent to proposed fire management option boundary changes should be attempted to minimize establishing boundaries that reflect administrative unit boundaries or creates boundaries that are not operationally or ecologically feasible. Hazard reduction plans may be developed to reinforce fire management option boundaries. Any reinforcement activities will be reviewed by the suppression organization, but can only be authorized by the land managers.

The land managers determine the fire management option for the lands under their jurisdiction. An essential attribute of the fire planning effort in Alaska is providing the land managers with the flexibility to change the fire management option for lands they manage as warranted due to changes in land use, protection needs, laws, mandates or policies. The suppression organizations are encouraged to suggest option changes to land managers based upon suppression concerns.

To accommodate changes in the map atlas and distribution of maps, land managers are encouraged to make changes in their selected fire management option boundaries between September 30 and March 1. All changes should be recorded on the map atlas by April 1. Fire management options boundaries should not be changed during the fire season. However, if a change of the selected management option is requested and can be accommodated by all affected land managers and the suppression organization; it may be accepted and recorded on the map atlas outside the aforementioned time period.

## 7.4 Fire Prevention

### 7.4.1 Education

All commanders, directors, natural/cultural resource managers, and fire managers have a role in developing fire prevention orientation and training programs to educate the users of JBER lands. In coordination with resource protection managers, fire prevention orientation and training programs will be designed and implemented to explain wildfire ignition potentials, probability of escape, impact on natural resources, and the threat to high value areas within and outside the installation. JBER will actively implement an education and notification process relating to wildland fire for military personnel, the public and adjacent landowners. Range Control will be notified when fire danger is high. Wildland fire prevention and awareness will be taught to troops. Each year, during spring, a wildland fire article will be written by Natural Resources for the JBER newspaper addressing wildland fire prevention and awareness. During ongoing wildland fires, articles and news releases will be written and released to Range Control and the Public Affairs office in a timely manner. Public information notices will be coordinated with Public Affairs at least 10 business days in advance of all prescribed fires, and released in newsprint (base and local), social media and base website outlets at Public Affairs' discretion.

### 7.4.2 Enforcement

Enforcement is a very important component of an effective fire prevention program. Enforcers of wildfire prevention include resource management staff, fire management personnel, law enforcement personnel (military police and conservation

enforcement officers), Range Control staff, and all commanders, their staff and leaders at all levels. The Range Control staff has the responsibility for ensuring that all regulations and standard operating procedures are adhered to in accordance with U.S. Army Alaska Regulation (AAR) 350-2 or other standard set by JBER. Range Control has authority to stop live-fire training for noncompliance with any regulation or standard operating procedure. Range Division range inspectors; maintenance, integrated training area management personnel, Civil Engineer Environmental, Real Estate and Grounds staff have the responsibility to report fires or any observed noncompliance with fire prevention procedures to Range Control safety staff. All fires shall be reported to the fire department via 911. Commanders and managers must be aware and involved in fire prevention to ensure compliance with the WFMP requirements.

Existing military training regulations and standard operating procedures cover training activities and restrictions based on specific fire danger ratings. However, communication and enforcement of these restrictions even at the lowest levels is necessary to be effective. Supervising personnel will be held accountable for knowing and implementing these restrictions. Range Control managers and safety technicians who manage the training areas are also accountable. Public laws, Air Force regulations, the Commanding General's command policies/guidance, and range directives outline individual responsibilities and accountabilities for enforcement of fire restrictions and implementation of the WFMP. This information must be passed along by the commander and supervisor and discussed in training sessions given to individuals using JBER land. In order to effectively control ignitions to the maximum extent possible, the installation must ensure that the necessary precautions are followed and that there is strict enforcement and accountability for violations. Though the burden for enforcement will largely fall upon Range Control, it is ultimately the responsibility of all users of JBER lands to prevent fires and enforce fire prevention regulations. Wildland fire prevention is similar to personnel safety; everyone has a responsibility to prevent its occurrence. All personnel must know and understand the fire prevention procedures.

### 7.4.3 Engineering

Engineering involves the alteration of a range design/alignment or physically disrupting the fuels to reduce the likelihood of a fire starting or to reduce its effects, if one does start. This can be accomplished by eliminating fire causes biologically, mechanically, or chemically through reduction of available fuel loads, improving access for fire apparatus, increasing water resources available on site, adjusting target placement, and providing buffer or safety zones.

Engineering activities include the construction of fuel breaks and firebreaks and recognized fuel modification programs (i.e., prescribed burns, mechanical/chemical treatments, and mowing) to minimize the threat of fires. Engineering activities will be coordinated among all JBER's land and fire managers to include appropriate National Environmental Policy Act (NEPA) documentation, Endangered Species Act, Section 7 consultation and National Historic Preservation Act, Section 106 consultation, as required.

Coordination is essential as engineering activities may result in restricted operations and total or partial closure of the training ranges. A work plan, identifying engineering projects by priority, will be developed. This process will ensure that engineering projects can be completed and will eliminate any conflicts between the required maintenance of the ranges and military training activities. The Range Planner and the Wildland Fire Program Manager shall collaborate to develop an annual work plan facilitating maintenance of all required wildland fire infrastructure.

### 7.4.4 Fire Danger Rating System

Limiting military activities according to fire danger reduces the likelihood of starting a fire. Certain military activities are restricted when thresholds of risk are reached. The JBER Fire and Emergency Services Flight collects weather readings during fire season from remote weather stations located in the training areas. Weather readings, along with other fire danger parameters, are used to calculate the fire danger rating. The fire danger rating is used on JBER to reduce the risk of wildfire. The fire department provides the rating to Range Control, which restricts the use of munitions and pyrotechnics as the fire danger increases. Range Control is responsible for ensuring all necessary organizations are kept appraised of current fire conditions. At a minimum, the following organizations, Civil Engineering, Security Forces, Force Support Services, and Public Affairs, must be kept apprised of current fire conditions.

The Fire Danger Rating System is outlined in U.S. Army ARR 350-2. The system utilizes the Canadian Forest Fire Weather Index System and the Fire Weather Index. Fire Weather Index is calculated and translated into Low, Moderate, High or Extreme by the fire department. Each level on the scale corresponds to training restrictions. Range Control is responsible for conveying

and implementing the Fire Danger Rating System to soldiers. Fire Weather Index calculations are based on weather observations from Remote Automated Weather Stations established in all of the major training areas. The Fire Weather Index is calculated from May through September. Interpretation of the indices is necessary as no single index gives a complete picture of the fire danger. The Canadian Forest Fire Weather Index System consists of six components that account for the effects of fuel moisture and wind on fire behavior. The first three components, the fuel moisture codes, are numeric ratings of the moisture content of litter and other fine fuels, the average moisture content of loosely compacted organic layers of moderate depth, and the average moisture content of deep, compact organic layers. The remaining three components are fire behavior indices, which represent the rate of fire spread, the fuel available for combustion, and the frontal fire intensity; their values rise as the fire danger increases.

Calculation of the components is based on consecutive daily observations of temperature, relative humidity, wind speed, and 24-hour rainfall. The six standard components provide numeric ratings of relative potential for wildland fire. The Fine Fuel Moisture Code is a numeric rating of the moisture content of litter and other cured fine fuels. This code is an indicator of the relativ e ease of ignition and the flammability of fine fuel. The Duff Moisture Code is a numeric rating of the average moisture content of loosely compacted organic layers of moderate depth. This code gives an indication of fuel consumption in moderate duff layers and medium-size woody material. The Drought Code is a numeric rating of the average moisture content of deep, compact organic layers. This code is a useful indicator of seasonal drought effects on forest fuels and the amount of smoldering in deep duff layers and large logs. The Initial Spread Index is a numeric rating of the expected rate of fire spread. It combines the effects of wind and the Fine Fuel Moisture Code on rate of spread without the influence of variable quantities of fuel. The Buildup Index is a numeric rating of the total amount of fuel available for combustion. It combines the Duff Moisture Code and the Drought Code. The Fire Weather Index is a numeric rating of fire intensity. It combines the Initial Spread Index and the Buildup Index. It is suitable as a general index of fire danger throughout the forested areas of Canada and Alaska. Table 1 below is used to guide the fire manager to make accurate determinations.

**Table 1 Fire Danger Rating Parameters for Military Ranges**

| | LOW | MODERATE | HIGH | EXTREME |
|---|---|---|---|---|
| Fine Fuel Moisture Code | <77 | 77-86 | 86-94 | >94 |
| Duff Moisture Code | <70 | 70-80 | 80-90 | >90 |
| Drought Code | <150 | 150-300 | 300-400 | >400 |
| Initial Spread Index | <2 | 2-5 | 5-10 | >10 |
| Buildup Index | <60 | 60-70 | 70-80 | >80 |
| Fire Weather Index | <3 | 3-12 | 12-22 | >22 |

NOTE: These are only guidelines and an informed determination will take interpretation. Example: Drought Code may be extreme while Fine Fuel Moisture Content is low and Duff Moisture Code is moderate. It would be logical to place the fire danger at moderate, if the weather trend is toward warm and dry, because Fine Fuel Moisture Content will change quickly to moderate and perhaps even high.

Seasonal fire hazards caused by dry weather may restrict use of tracer and other potentially incendiary ammunition. Units using ranges, training facilities, and training areas are responsible for knowing the daily fire danger rating and adhering to the restrictions in U.S. ARR 350-2. This information is available from the Range Control office. Regardless of the season, trainers must ensure that flame-producing pyrotechnics are not used on or near fuels that may start a forest or range fire. Throwing away cigarettes, matches, or other burning materials is prohibited.

**Table 2 Fire Danger Rating Restrictions**

| Fire Danger Rating | Restriction |
|---|---|
| Low | No restrictions. |
| Moderate | Ball and blank ammunition may be used without restrictions.<br>Pyrotechnics, including smoke, trip flares, and tracers are prohibited in training areas, unless the pyrotechnics are used in a container that completely contains all burning elements of the device. An example of this would be using a cut-off drum to contain a smoke grenade. Any device used will be observed until the pyrotechnic is completely burned to ensure no fire is ignited outside of the container.<br>Aircraft restrictions: Flares or foreign equivalent will be deployed above 1,500 feet above ground level. |
| High | Ball and blank ammunition may be used without restriction.<br>Non-aerial pyrotechnics permitted on the small arms complex only. All other use of pyrotechnics is restricted.<br>Ground units will carry required firefighting equipment.<br>Aircraft restrictions: Flares or foreign equivalent will be deployed above 5,000 feet above ground level. |
| Extreme | Ball and blank ammunition use is restricted to the small arms complex.<br>Use of any pyrotechnics is prohibited.<br>Ground units will carry required firefighting equipment.<br>Aircraft restrictions: Flares or foreign equivalent will be deployed above 5,000 feet above ground level. |

Waivers to this portion of U.S. ARR 350-2 represent a direct liability to the Command in terms of the cost for fighting any fire that results from a waived condition.

### 7.4.5 Ignition Control

Ignition control is accomplished primarily through the enforcement of the fire danger rating system by controlling the use of classes of ammunition and pyrotechnics that have higher fire hazards associated with their use. The fire danger rating is provided to Range Control, which restricts the use of munitions and pyrotechnics as fire danger increase. Open burning requires a permit, except for small warming fires. All open burning shall be conducted in accordance with 673d Air Base Wing Instruction (ABWI) 32-2001. All fires may be prohibited during extreme fire danger conditions. These restrictions apply to both Army and Air Force units.

### 7.4.6 Fuel Hazard Assessments

All vegetation should be actively managed to reduce fire risk within 30 feet of a structure. Trees should be pruned and spaced at least 10 feet apart out to 100 feet from a structure. Standard assessment forms are used to survey structures. The forms were developed by the BLM/AFS and look at vegetation, building material, location and hazardous material storage. Assessments are updated annually with new structures. Structures are visited on a five-year rotation system. Assessment data is stored in a database that is linked to a GIS, with aerial and ground photos of the structures.

Fuel assessments at a landscape scale look at vegetation flammability, weather, historical fire patterns, fire behavior, and proximity to values at risk. Areas with continuous black spruce leading to high value locations receive the highest concern. Wildfire vegetation fuels maps are updated annually along with forest stand maps. The fuels maps reside in a GIS and are updated using wildfire and prescribed fire history data, construction and land clearing overlays, aerial photos, and ground truth plot information. Fuels maps are used for wildfire and prescribe fire planning, military training range location, and hazard fuel assessments. Fuels maps follow the Canadian Fire Behavior Prediction System fuel types (Forestry Canada Fire Danger Group

1992). In fire-prone areas, climate, human activity, and types of vegetation (or fuels) determine the level of wildland fire risk. Common fuels found on JBER include the following (Musitano and Hayes 2002):

***Black spruce*** – These stands are highly flammable and are generally located in wetter and cooler sites. Crown fires are common and typically result in extensive mortality.

***White spruce*** – White spruce is less flammable and located in generally warmer and drier sites. Crown fires may occur during drought conditions.

***Mixed spruce/hardwood stands*** – In these stands the conifers are generally white spruce with black spruce sometimes present. Black spruce is highly flammable and conducive to crown fire. White spruce is less flammable and less conducive to crown fire. The associated hardwoods are generally less flammable and may include birch, aspen, and/or cottonwood. Surface fuels include mosses, lichens, leaf litter, grasses, and shrubs. Fires in these mixed stands are generally of moderate intensity.

***Bluejoint Reedgrass*** *(Calamagrostis canadensis)* – This species occurs in patches on all JBER lands. It may occur in association with hardwoods, mixed forest stands, or may predominate in clearings. Fires with this grass start easily, spread quickly, and burn intensely when conditions are right.

***Tundra*** – In these areas, very flammable grasses dominate. Dwarf birch and willow may be present and are generally highly flammable, especially if they have high lichen content. In alpine tundra, short shrubs, mosses, and lichens dominate. Vegetation in these areas is moderate to highly flammable.

### 7.4.7 Fuels Modification

Fuels modification is defined as removing and/or modifying an area or wide strip of flammable vegetation. Fuel modification can provide a reduction in radiant and convective heat, thereby providing fire suppression forces a safer area in which to fight the fire.

Fire hazard is managed by changing the vegetation type. The goal is to maintain a fuel condition that makes fires easier to control. Maintenance treatments are necessary because the flammable biomass will grow back over time, thus making fires more difficult to suppress.

The following methods, in order of decreasing effectiveness, are used to achieve lower fuel loading or a more manageable fuel matrix. A mixture of these techniques is often used in fuel management. The first method is reduction of the total amount of fuels so that there is not enough or as much to burn. Examples of reducing total fuels are prescribed burning and mechanical or chemical removal. The second method to achieve lower fuel loading is manipulating the spacing of vegetation (both horizontally and vertically) so that it is difficult for fire to spread. Examples of spacing include mowing, grazing, or masticating.
The third method is to decrease the flammability of fuels by increasing the moisture of the vegetation or by changing the vegetation to less flammable species. This can be accomplished by watering, but this technique is only applicable for very small plots of land, such as around an individual house. More often this is accomplished by partially or totally replacing the fuels with fire resistant plants.

There are four categories of fuel modification treatments that can accomplish these objectives, including prescribed burning, mechanical treatments, chemical treatments and biological treatments. The methods used in fuel modification, fuel breaks, and firebreaks will vary due to terrain and acreage, and the shapes of areas to be treated. In many situations, a combination of these treatments is applied.

Prescribed burning reduces the volume of fuel through combustion. Fuel material can be ignited by hand or by mechanical devices at some distance from the site (i.e., helitorch, aerial firing device, etc.). Burning generally takes place when conditions permit adequate combustion as well as control. Prescribed burning is executed by qualified individuals under precise weather conditions and after extensive precautions is taken, such as installing firebreaks or control lines. Prescribed burning is the fastest, most complete, and most cost-effective fuel removal treatment available. However, it generates many concerns over the chance of escape, as well as air quality impacts. Coordination and notification of interested parties are major tasks. The Army and Air Force have successfully conducted numerous prescribed burns on DoD lands in the past.

Mechanical treatments rip up, bury, flail, or cut down vegetation and rearrange the fuel structure. Mechanical treatments generally involve the use of a bulldozer or tractor with a variety of attachments, such as a blade, large chain, rollers, a cutting (or pushing) blade, or a disk. These attachments scrape or break off the vegetation, beat up and crush or cut the fuel into small pieces, or bury the pieces. It reduces the fuel height and thus reduces the intensity of a grass fire. Mowing is especially effective in increasing the ease of fire control if it takes place just inside the firebreak. Mowing is done by a tractor (usually with a rotary or flail mower attachment) in areas of grass and typically carried out by contract or range maintenance personnel. Hand labor is a subset of mechanical treatment, where human labor is used instead of mechanized equipment. Its primary disadvantage is its labor cost, but in certain situations there is no other viable alternative.

Chemicals such as herbicides and growth retardants can prevent seeds from germinating and kill mature fuels. Chemicals can be applied by hand, with a truck/tractor sprayer, or aerially. Vegetation is not removed, but further growth is suppressed or stopped. Where plants are killed, the standing vegetation presents a temporarily increased fire hazard until the plant material decays. Thus, the fuel volume is not decreased immediately by this treatment, but will slowly be reduced by decomposition. It is essential that treatment frequency be high enough to prevent significant growth in the interim periods. Chemical treatments that reduce or prevent growth are most desirable. The choice of herbicides depends on the environmental setting, effectiveness on the vegetation in question, and the consequences for native species and human health and safety. While it can be an effective and efficient method, chemical control may not be appropriate in all settings.

Biological treatments are the introduction of a biological control measure to counteract the undesired fuels. These measures can include the deliberate introduction of other plants or insects that will replace, modify or retard the undesired fuels. Simple biological treatments may be the introduction of fire resistant native or invasive plants to out-compete undesired fuels. Creating a vegetative fuel break is a common means of a simple biological treatment, though it is not an effective means of fire control in all situations. Another example is the introduction of a species of plant(s) to shade out or out-compete undesired fuels in a controlled area.

### 7.4.8 Fuel/Fire Breaks and Natural Barrier Systems

JBER maintains a fuel break/firebreak system on locations with the highest wildfire risk 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. Incorporating them into wildfire pre-suppression planning, initial attack responses, and resource deployment strategies can enhance the effectiveness of fire suppression. They also provide follow-up resources with a quick alternative attack strategy and a place to assemble that has been designated in advance and is well documented and mapped.

Fuel breaks are defined as strategically located blocks or strips within which vegetation has been manipulated to reduce fuel volume or flammability as an aid to fire control. Fuel breaks are most effective if they are linked to other natural or man-made fire containment barriers. Drivable fuel breaks, or fuel breaks that have periodic access, are an important part of a successful fuel break system. Additionally, a fuel break system encompassing a large area is much more effective than an isolated single fuel break or small segments of fuel breaks. Fuel break widths are determined by fuel type, terrain features, and expected fire weather conditions, especially wind direction and speed. Generally, the wider the fuel breaks, the higher the probability and safer is the task of containing the fire.

Fire fuel break establishment consists of the following procedures. Breaks can be created using hand thinning or tree removal techniques. Hand line/trenches may be dug to mineral soil using hand tools. Fuel breaks created with hand thinning are usually 15 - 120 feet wide. Breaks can be created using dozers with shear-blades and or straight blades. Vegetation is sheared or pushed over and windrowed or pushed into piles. The duff and or organic matter are rolled up into the windrows or piles to expose mineral soil. Piles and windrows are burned following stipulations outlined in a burn plan. The soil may then be disked, creating furrows to enhance hardwood and shrub re-vegetation. Fuel breaks created with dozers are usually 15 - 30 feet wide. Breaks can be created using hydro-axes with masticating and rotary blades. Vegetation is chopped up into pieces. Masticating heads incorporate vegetation with the duff and organic layers of the soil. The soil may then be disked, creating furrows to enhance hardwood and shrub re-vegetation. Fuel breaks created with hydro-axes are usually 15 - 30 feet wide.

Fuel breaks provide safe access for firefighting personnel and equipment. Firefighters can be rapidly positioned along these predetermined fire control lines. The low volume fuels within the fuel break, can be fired out (black lined) quickly to further widen an existing firebreak or quickly create a new one under conditions where backfiring operations would be impossible in the adjacent dense vegetation. In situations where the vegetation within the fuel break is not too dense, the fuel break can be used to anchor a backfire, thus allowing a wide black line to be established between the fire and the fuel break.

Fuel breaks normally will not stop the head of a fast spreading, high intensity wildfire that has the potential for long distance spotting. In this situation, the overall fuel break system aids firefighters in the containment of the flanks, rear of the wildfire, and/or reducing the size of the main fire front. If time permits, they may also provide a location from which to backfire, potentially slowing or stopping the advance of the main fire.

Fuel breaks will only remain effective if they are continually maintained. The condition of the fuel break and vehicle accessibility will be reviewed annually to determine necessary maintenance. Fuel breaks shall be cleared at the end of the growing season, before the grasses dry and add to the dead fuel load in the area.

Firebreaks are defined as cleared-to-mineral-soil fire control lines. Similar to fuel breaks, to be effective, firebreaks must be maintained each year prior to potential use in fire control. Firebreaks will be 15 to 30 feet in width or more, but will sometimes be constrained by terrain. An annual preventive maintenance schedule for all designated firebreaks will be developed. During construction and maintenance, all berms should be removed to the extent necessary to minimize erosion. Water bars are to be installed at all natural watercourses on firebreaks, except where permanent drainage structures are provided.

Natural fire barriers (i.e., rivers, streams, roads, etc.) can be used as a control line to stop the spread of fire. A natural barrier is defined as any area where a lack of flammable material obstructs the spread of wildfires. An indirect attack strategy may involve the withdrawal of fire suppression resources to roads, trails, and other natural fuel breaks. The fuel between these barriers and the fire can be burned out or backfired if necessary.

Fuel management corridors are much wider than fuel breaks but do not include any road infrastructure. These are designed around existing natural fire barriers that may become overgrown with vegetation in the future. The corridor is monitored for encroaching vegetation and management is initiated when it reaches a threshold level. Fuel management corridors are designed to slow or even stop a fire. At a minimum, they provide an area in which fire intensity is much lower than the surrounding vegetation, much the same as a fuel break.

Fire and fuel break effectiveness in the event of a wildfire depends on regular maintenance. Standards will be adhered to wherever terrain permits. In some locations slope, drainages, or other factors may make these standards unreasonable. In these situations, the standards will be met to the greatest extent feasible.

## 7.5 Preemptive Measures

### 7.5.1 Prescribed Fire

Prescribed burning is defined as the controlled application of fire under specified environmental conditions that allow the fire to be confined to a predetermined area while at the same time producing fire behavior required to attain resource management objectives. Because of the potential for unintended circumstances, extensive planning, coordination, and a risk management burn plan must be completed prior to ignition of any prescribed burn. Prescribed burns also mimic the important ecosystem functions of wildfire while reducing risk to human environments and other resources. JBER, through a memorandum of agreement (MOA) with the USFS, conducts prescribed burns to improve wildlife habitat, to decrease the potential for ignitions and fire escape from live firing, and to increase the size of military training areas.

JBER recognizes two types of prescribed fires: (1) those ignited by qualified personnel in accordance with an approved prescribed burn plan, and (2) wildfires managed under prescribed conditions as addressed in an approved WFMP.

The opportunity to conduct prescribed burns in Alaska is usually limited to May, between snowmelt and spring growth of plants. Often this period is very wet, which makes burning difficult. Fall is another time of the year when burns can be

accomplished, but the burning window in the fall is narrower due to weather and personnel constraints. Another limiting factor is that winds must be low to prevent smoke from entering urban areas. The approved burn plan is used to evaluate conditions and minimize the risks associated with prescribed burning.

Prescribed burning is an effective and efficient means to reduce or prevent the accumulation of hazardous fuels, where permitted, and will be used as a recognized land management practice for natural resources management and fire protection. The decision to use prescribed burning will be based on the safety hazard involved, the hazard that will develop if burning is not accomplished, the type of natural habitat involved, the impact on the areas total ecosystem, and applicable state and local regulations and coordination with installation fire departments.

In the process of developing practical fuel reduction programs, fire managers will consider the use of prescribed fire. When applied in a safe, carefully controlled situation, it is often the most cost-effective means of achieving management and natural resource objectives. Consideration will be given to prescribed fire to protect habitats, natural resources, and capital improvements as well as reduce hazardous fuels, construct and reinforce fuel breaks, and control alien plants. Well placed prescribed burning units can help prevent large wildfires or slow their advance.

Prescribed burning on JBER training lands will only be executed by qualified individuals. A National Wildland Coordinating Group certified prescribed "Burn Boss" must supervise all prescribed burns. The Burn Boss has the responsibility to make the on-site, tactical "go, no-go" decisions and ensures all prescription, staffing, equipment, and other prescribed burn requirements are met before and during the burn.

Individual prescribed burns are required to have plans and appropriate National Environmental Policy Act (NEPA) documentation prepared after coordination between the USFS and ADoF and the Natural Resources Branch. ADoF will prepare the burn plans for JBER as part of a MOA. Burn plans are used to evaluate and minimize risks associated with prescribed burning and include how the fire will be set. At a minimum, burn plans will include the following:

- Burn objectives.
- Acceptable weather and fuel moisture parameters.
- Required personnel and equipment resources.
- Burn area map.
- Smoke management plan.
- Safety considerations.
- Pre-burn authorization/notification checklist.
- Coordination to consider wildlife, endangered species, cultural resources, and noxious weed effects.
- Alternative plan to cover plan of action if wind direction changes during prescribed burn.
- Plan for analysis of burn success and identification of lessons learned.
- When planning for prescribed fires, and when suppressing wildfire, utilize natural and existing man-made features whenever possible.
- Firebreaks must be constructed, maintained, or rehabilitated to prevent erosion.

The prescribed burning window is very narrow, particularly during spring between loss of snow cover and green-up, usually occurring in May. Often this period is very wet, which makes burning difficult. Fall burns are another option but the weather window is very narrow and resource availability is limited. In addition, winds must be such that they do not blow smoke into urban areas, which further narrows the window. It is difficult to long-range plan prescribed burning due to weather, military training, and availability of resources. An air permit from the Alaska Department of Environmental Conservation is required for any burning as well as NEPA documentation.

### 7.5.2 Prescribed Burn Objectives

The primary objective is to use management-ignited or training-ignited prescribed fires in a safe, carefully controlled, and cost-effective manner as means of achieving fire management objectives. Management-ignited prescribed fires, often referred to as simply "prescribed fires," are defined as intentionally set fires used to achieve a resource management objective. Training-

ignited prescribed fires are defined as fires that are unintentionally started during normal military training, but are allowed to burn to achieve a predetermined resource management objective.

Prescribed fire may be used as a management tool to support mission needs and to attain the goals and objectives of the INRMP, and is designed to implement the land management policies. Prescribed fires are used for silvicultural treatment of sites, preparation for reforestation, hazard fuel reduction, habitat enhancement, and insect and disease control. Prescribed fires are also used as a tool to reduce fuel loading on ranges where the risk of wildfire limits military training opportunities. Wildland fire escapement from impact areas are reduced through prescribed fires and mechanical treatments along the boundaries of impact areas. Burning often opens areas to additional military training options, particularly maneuvers that are hampered by dense cover.

### 7.5.3 Procedures

Prescribed burning consists of the following procedures. A management-ignited prescribed fire burn plan must be completed for all prescribed burning projects in advance of ignition. A training-ignited prescribed fire burn plan must be in place prior to any declaration of any training-ignited fire as a training-ignited prescribed fire. In the prescribed fire/training-ignited prescribed fire burn plans, appropriate actions to take must be addressed if on-site conditions change and cause one or more prescription parameters to exceed acceptable limits. A prescribed fire that exceeds, or is anticipated to exceed, one or more prescription parameters or line holding capability must be declared a wildfire and cannot be re-delegated as a prescribed fire. At this point, appropriate suppression action must be taken.

Each prescribed fire must be conducted in compliance with the approved burn plan. Only trained and qualified personnel may be used to execute each prescribed burn plan. The number of resources required to safely achieve prescribed fire objectives must be based on the size and complexity of each project. Minimum manning will vary with the size and complexity of each prescribed burn. The WFPM, in coordination with AFWFC, must personally approve the prescribed fire/prescribed natural fire burn plan and any changes. Only in the absence of the WFPM may this responsibility be re-delegated

When planning for prescribed fires and when suppressing wildfire, utilize natural and existing man-made features whenever possible. Firebreaks must be constructed, maintained, or rehabilitated to prevent erosion. When the burn prescription window is open, crews assemble at the burn unit. The edge of the burn unit is lit using hand lighting or aerial lighting techniques. Roads, trails or changes in vegetation types surround burn units and these features are utilized as fire lines. Next the interior of the unit is lit using hand lighting or aerial lighting techniques. The interior is lit using a systematic grid pattern. The mop-up process starts after the entire unit is lit. Mop-up consists of extinguishing all hot spots within a specified distance from the burn perimeter. During mop-up, burning trees and shrubs are cut down and extinguished. Smoldering sites are dug up with hand tools and extinguished. Water is applied on an as-needed basis during mop-up, either by backpack pumps, draft pumps, fire engines, or helicopter buckets. The final process involves monitoring the burn unit until the fire is completely out; this process can take anywhere from several days to several months. The ADoF prepares the burn plan which is then approved by the AFWFC and JBER's WFPM. The ADoF working in conjunction with the JBER FES Flight and Range Control implement the prescribed fires IAW the approved burn plan.

### 7.5.4 Prescribed Fire Ignitions

Two types of ignition actions are recognized on JBER 1) igniting a prescribed fire and 2) conducting a training exercise where firefighters practice igniting a prescribed burn. Determination of prescribed fire complexity shall be based on an assessment of technical difficulty and potential consequences. Complexity shall be used to delegate approval authority, set standards for personnel staffing and skill requirements, and to determine the level of burn plan detail. Prescribed fire projects should be classified as Complex, Intermediate or Basic. Burn complexity will be determined by the WFPM in conjunction with ADoF and shall be made in the context of existing or potential social, political, economic, biological and/or legal consequences.

Complex prescribed fire is defined as those where prescribed burning occurs under particularly challenging conditions and/or constraints. This classification includes prescribed fires where the difficulty of achieving resource management objectives is high or where the consequences of project failure may be serious. All training-ignited prescribed fires shall be classified as complex fires. Intermediate classification includes prescribed fires where the difficulty of achieving resource management objectives is not particularly high or complicated and where the consequences of project failure are less serious and can be mitigated. Prescribed fires of basic complexity are defined as those where few constraints, other than the normal prescription

parameters, exist. This classification includes prescribed fires where achieving resource management objectives is routine and the probable consequences of project failure are low.

### 7.5.5 Prescribed Fire Burn Plan Requirements

A prescribed fire burn plan shall be completed for each management-ignited prescribed fire. Prescribed burn plans describe expected results and the conditions necessary to achieve them as part of a vegetation management program. It shall include all items outlined below. The detail needed should be commensurate with project complexity. If a given item is not applicable, it should be so indicated in the plan.

- A description of the burn unit's physical location, including a map.
- Identification of resource management objectives to be accomplished by the prescribed fire.
- Desired effects and tolerable deviations.
- Prescribed fire management of vegetation on JBER training lands requires an understanding of the type, age class, condition, availability, and arrangement of the fuel that can impact the natural resources, structures, and soils. All prescribed burns must have measurable objectives. Monitoring must occur before and after each prescribed fire to document and verify that the stated objectives have been met.
- Project area description that includes unit and fuel descriptors.
- A fire prescription containing those key parameters needed to achieve desired results (i.e., acceptable fire behavior, acceptable limits of environmental elements) and provisions to record on-site conditions.
- The range of acceptable results expected, expressed in quantifiable terms.
- Prescribed burn plans shall include the following smoke management components: actions to minimize prescribed fire emissions, evaluate smoke dispersion, public notification, air quality monitoring, and exposure reduction precautions. JBER fully supports the Clean Air Act (1967) and amendments to the Act (1972, 1977) to protect and enhance the quality of national air resources and to protect public health and welfare. JBER will comply with all applicable State of Alaska and local laws pertaining to prescribed burning and the acquisition of appropriate burning permit(s).
- Provisions for weather data collection, acceptable parameters, and forecasts.
- Provisions for public safety and protection of sensitive features.
- Provisions for inter/intra agency pre-burn coordination and, where applicable, public involvement and burn day notification to appropriate individuals, agencies, and the public.
- Prescribed burn plans will be coordinated with directorates to include: ADoF; JBER Fire and Emergency Services (FES) Flight; Staff Judge Advocate; JBER Natural Resources Office; Training, Mobilization, Installation Range Office, the AFWFC and any other delegates that may be identified through JBER. Technical experts from outside agencies (e.g., National Park Service) may review the JBER prescribed burn plans.
- Identification of the level of complexity of the fire and the appropriate organization needed. No less than the organization described in the approved plan shall be used to execute the burn. Minimum requirements for skill/knowledge element ratings of all elements of each position listed shall be stated. Describe the duties and responsibilities of positions within the organization.
- A communication plan.
- Provisions for line construction, pretreatment, and holding actions to keep the fire within prescription. Firing techniques, containment, patrols, and mop-up procedures are required. Holding actions must be defined in the prescribed burn plan. The burn plan will allow the Burn Boss to take limited holding actions on fires outside the planned perimeter. However, there must be defined limits in the amount and kind of holding that can be done before any fire is determined to have exceeded the approved plan and must be declared a wildfire. The limits of acceptable holding actions must be clearly stated in the prescribed burn plan. These limits must be defined as specific actions that can be tak en, not general terms. If a prescribed burn accidentally crosses the prescribed perimeter, immediate action by the holding crews must be taken to control it.
- Identification of contingency actions to be taken if the fire exceeds prescription parameters and/or line holding capabilities and cannot be returned to prescription with project resources. If the fire exceeds the predetermined and pre-approved constraints on holding actions, the fire must be declared a wildfire and appropriate fire suppression action taken. If a single spot fire escapes, it may be designated as a separate fire. If additional suppression forces are needed, the spot fire is declared a wildfire. The prescribed burn may continue as long as adequate holding forces remain on the prescribed burn as specified in the prescribed burn plan, separate from the suppression action on the spot fire, and the

burn remains in prescription. In no case should the capability to hold the prescribed burn be jeopardized by moving essential holding forces to fight a spot fire.
- A risk assessment that portrays an estimation of the probabilities and consequences of success/failure to the approving official. A safety plan and a "go, no-go" checklist are required.
- Provisions for fire proximity to endangered species and plant boundaries; consideration of existing and predicted weather, fire behavior, and fuel conditions; and drought evaluation impact and/or effect.
- The source of funding and estimated costs.
- Provisions for a test fire and recording the results.

A site specific training-initiated prescribed fire burn plan is required for each training-ignited prescribed fire. This plan will be developed by the training organization and approved by the WFPM prior to igniting any training-initiated prescribed fire. The only location that training-initiated prescribed fire will be allowed within JBER is within the range impact areas. No other locations are suitable for use of this designation. Training-initiated prescribed fire will not be allowed during "Extreme" fire danger. Only the WFPM or the ADoF Fire Management Officer (FMO) may designate a fire as a training-initiated prescribed fire. Fires must be designated as a training-initiated prescribed fire within four hours of ignition. No more than one training-initiated prescribed fire will be allowed within each impact area at any given time. Once developed, the pre-existing plan will be approved by the WFPM. The programmatic elements of the training-initiated prescribed fire burn plan shall include the following:

- General description of the area, history (including fire history), and map.
- Objectives to be achieved by the training-initiated prescribed fire and identification of acceptable outcomes.
- Required skills, qualifications and organization necessary to implement and manage the training-ignited prescribed fire program.
- Funding requirements.
- Program "Inform and Involve" actions both internally and externally. Include program planning as well as execution.
- Potential impacts of plan implementation including environmental, on/off site, socio-economic, and political impacts.
- Evaluation criteria to enable the WFPM or the ADoF FMO to make "go, no-go" decision, The criteria should include a risk assessment that considers, at a minimum, fire growth predictions; threat to life and property; smoke management concerns; local/regional/nation fire situation, including availability of resources; potential impacts on endangered species and plants; fire proximity to endangered species and plant boundaries; assessment of the amount of training- initiated prescribed fire that is acceptable and manageable; consideration of existing and predicted weather, fire behavior, and fuel conditions; and drought evaluation impact and/or effect, provision for daily revalidation, and timely decision by the WFPM.
- Identification of fuel treatment measures needed to reduce hazard fuels in support of the Army's prescribed fire program, including identification of areas or developments that need protection from fire.
- Process for development of a training-initiated prescribed fire plan.
- Process for monitoring and evaluating the training-initiated prescribed fire.
- Escaped Fire Situation Analysis and contingency plan.
- Identification of maximum allowable perimeter within range impact area.
- Monitoring actions to assure accurate and timely information on fire behavior, location, etc.
- Evaluation Plan for assessing outcome of the fire.

Some information will not be known until a training-initiated prescribed fire actually starts. Individual training-initiated prescribed fire burn plans shall also include holding actions necessary to keep the fire within prescription, fire projections using both "expected" and "most severe"" weather scenarios, an estimate of resource needs to manage the fire and cost estimates to manage the fire.

### 7.5.6 Prescribed Fire Organization

A NWCG qualified "Burn Boss," is a person experienced with local weather, fire behavior, fuels, and terrain conditions, shall personally supervise all burning operations. More complex burns may require an "Ignitions Boss" and a "Holding Boss." Every management-ignited prescribed fire requires the performance of the duties shown in these standard operating procedures. On

smaller or less complex projects, one person may perform more than one of the required duties. Larger or more complex projects will require more qualified people to perform necessary duties. An on-scene Burn Boss will determine, through the development of the training-initiated prescribed fire burn plan, the organization, expertise, and positions necessary to manage the prescribed burn training fire. The organization required varies with the size and complexity of each prescribed fire. In the event of an escape, use personnel qualified under National Interagency Fire Qualification Handbook standards (NWCG Guide 310-1) to accomplish the required suppression activity. The temporary use of personnel who do not meet these qualifications is not appropriate for prescribed fires that escape and are declared wildfires. At no time should there be any unqualified personnel on the fire line for a wildfire or prescribed fire.

The WFPM or the ADoF FMO will develop the prescribed fire burn plan for each management-ignited or training-initiated prescribed fire. The WFPM or the ADoF FMO will determine the complexity or number of prescribed fires necessary to meet training requirements. The Burn Boss is responsible directly to both the WFPM and ADoF FMO for implementation and coordination of the assigned prescribed fire activities. The WFPM and ADoF FMO shall coordinate and schedule the ignition and management of two or more management-ignited prescribed fires, or the management of a single training-initiated prescribed fire.

- Develop and implement the training-initiated prescribed fire burn plan on appropriate training-ignited fires.
- Coordinate personnel and equipment requirements, including resources called for holding actions and contingency action section of the burn plan.
- Ensure appropriate public notice is given prior to and during the prescribed fire activity.
- Coordinate prescribed burn projects to avoid exceeding holding and contingency capabilities.
- Monitor prescribed burn projects to ensure that all plan requirements are being met.
- Record and report costs and accomplishments and recommend improvements to the Wildland Fire Program Manager.

The Burn Boss has direct responsibility for on-site implementation of specific actions in strict compliance with the approved prescribed burn plan. The Burn Boss is accountable to the WFPM. The Burn Boss has the following responsibilities that cannot be re-delegated:

- Ensuring safety of personnel.
- Supervising all operations on the project site.
- Ensure that all prescribed fire burn plan requirements are met and that personnel are briefed before proceeding with ignition.
- Making the decision to proceed, accelerate, defer, or curtail operations based on attainment of the approved prescription criteria or lack thereof, including daily validation of prescribed criteria on multi-day projects.
- Ensuring that the fire prescription is met before proceeding with ignition.
- Ensuring that the forecast on site weather parameters are within prescription at the time of ignition and predicted to remain so during the expected life of the burn.
- Ensuring the availability of suppression resources in the event the prescribed fire escapes and is declared a wildfire.
- Controlling directly, or through supervision of Ignitions Bosses, the method, rate, and location of firing.
- Maintaining immediate and clear communications with the Ignitions Boss and Holding Boss at all times.
- Monitoring fire behavior and terminate operations if fire behavior or effects are not according to prescription.
- Accomplishing mop-up to predetermined standards in accordance with the prescribed fire burn plan.
- Certifying that the fire is out.

The Ignitions Boss reports to the Burn Boss. The Ignitions Boss will maintain control of the ignition sources, including aerial ignition, on the burn project at all times, ensure deployment, sequence, and timing of all ignition sources to meet project objectives, supervise assigned personnel and ensure their safety, maintain immediate and clear communications with the Burn Boss and Holding Boss at all times, and if aerial ignition is used, ensure that the aerial ignition pilot is briefed on the Job Safety and Health Hazard Analysis, with emphasis on aerial flight hazards.

The Holding Boss reports to the Burn Boss on management-ignited prescribed fires. On prescribed natural fires, the Holding Boss may report directly to the WFPM. The Holding Boss shall confine the prescribed fire within the planned area, take action

when fire exceeds, or has the potential to exceed, the planned area, confer with the Ignitions Boss, Burn Boss, WFPM, as appropriate, to match holding and contingency capability with firing sequence, supervise assigned personnel and ensure their safety and maintain immediate and clear communications with the Burn Boss, Ignitions Boss, or WFPM, as appropriate, at all times.

## 7.6 Fire Suppression Actions

The objective of fire suppression is to attack and suppress wildfires at minimum cost while protecting values at risk and minimizing the impacts from suppression activities. For purposes of this fire management plan, a wildfire is defined as a free burning fire requiring suppression action. Wildfire suppression is an emergency operation and takes precedence over all other operations, including training, with the exception of safeguarding human life. In some cases, a wildfire on JBER training lands can be controlled with a single attack response vehicle; in others, large numbers of firefighters, fire apparatuses, and equipment may be required. Because of this range of resource needs, fire suppression can be relatively simple and straightforward or extremely complex.

Suppression operations are undertaken on lands with fire management options of critical and full or as requested by the wildfire or land managers. Wildfire on lands with a fire management option of limited are regularly monitored. Suppression actions consist of using the following resources: fire engines, saws, hand tools, pumps, aircraft and backfiring.

### 7.6.1 Incident Coordination

Wildfire suppression follows the incident command system (Fireline Handbook, newest version). The Incident Commander is responsible for suppression and management of a wildfire. Wildfire suppression is conducted by the JBER FES Flight along with the Alaska Division of Forestry (ADoF) as part of an approved MOA. JBER FES will provide initial attack for wildfire on JBER and may request support of ADoF crews as required. The JBER Fire Chief, presently the WFPM, is responsible for all fires and must be informed of the status of new and ongoing wildfires. The Natural Resource office is the land manager (for the purpose of tracking and recording wildland fire events). The WFPM will inform Natural Resources of the status of new and ongoing wildfires, as conditions allow. ADoF maintains incident reports for fires on the lands used by JBER. Data from the reports shall be provided to Natural Resource office at the end of each calendar year in a digital format compatible with GIS protocols utilized on JBER. Natural Resources is responsible for ensuring the digital data layer is updated in the JBER GIS database annual and illustrated in the INRMP and presented at all annual pre-season meetings.

### 7.6.2 Fire Management Strategies

The Wildland Fire Situation Analysis (WFSA) is a systematic and documented decision process employed to determine the most appropriate suppression strategy for a particular situation. A WFSA is prepared when a fire: (1) escapes initial attack, (2) threatens to escape a fire management option into a higher management option, (3) warrants suppression actions but was not initially attacked due to resource shortages, (4) is beyond the capabilities of initial attack forces, or (5) fire and/or resource management objectives are not being met and a significant change in strategy/action is required (Alaska Interagency Wildland Fire Management Plan, newest version).

A WFSA is jointly prepared by the WFPM and suppression organization(s). The WFPM approves the WFSA and any revisions with concurrence of the land managers. It is incumbent upon both the land managers and the suppression organization that knowledgeable and qualified representatives are available to assist with preparing and reviewing the WFSA.

A WFSA identifies several alternative suppression strategies/actions within the constraints of the selected management option, which may range from commitment of resources until a fire is extinguished to routine surveillance. The alternatives are analyzed in terms of probability of success, environmental consequences, social and political considerations, and consequences of failure and cost. Selected suppression alternative must clearly identify the suppression objectives. Assigned Incident Commander and land managers must validate the WFSA to ensure the selected alternative is still achievable. When the selected alternative or fire/resource management objectives are not met, the WFSA must be re-written to determine new suppression strategy/action.

Escaped wildland fires may be placed under the management control of an appropriate level Incident Commander. Transfer of authority to the Incident Commander must be documented in a Limited Delegation of Authority. The need to place a natural

resource representative at the Incident Command Post or the suppression organization's headquarters will be at either the discretion of the affected agency or at the request of the suppression organization. An environmental and/or cultural resource management specialist may be assigned to the Incident Management Team to provide on-site assessment of potential resource impacts. Each agency will furnish expertise as needed (Alaska Interagency Wildland Fire Management Plan, newest version).

#### 7.6.3 Special Considerations for Suppression

The Incident Commander needs to select suppression tactics commensurate with the fire's potential or existing behavior, yet leaving minimal environmental impact. Minimum impact suppression is an increased emphasis on suppressing a wildfire while minimizing the effects of suppression measures on the vegetation, soils, and watershed. Minimum impact suppression tactics will not over-ride considerations for safety or containment or control of the wildfire. However, they will be used to the maximum extent possible within these constraints.

Protection of the local environment will be considered in fire management strategies, particularly in the location of fuel breaks and control lines. Dozers are used as a means of last resort in fire suppression because of their potential impact on the environment. Dozer operators will be equipped and trained for wildland fire protection, trained in environmental sensitive issues relating to the use of dozers (i.e., long term effects of physical disturbance, potential introduction of invasive plants, erosion control, and location of endangered and threatened species populations), and given natural/cultural resource orientation prior to any work assignment.

Fire managers must be familiar with the long-term effects of physical ground/vegetation disturbance, potential of invasive vegetation introduction through the use of dirty equipment or the creation of invasion routes, creation of erosion problems, protection of cultural sites, and limitations on use of fire suppression chemicals (foam and retardant). The aerial use of chemical retardant, fire foam and saltwater will be weighed against the potential for fire damage to sensitive plants.

Use of aerial fire retardant near lakes, wetlands, streams, rivers, sources of human water consumption, and areas adjacent to water sources should be avoided to protect fish habitat and water quality. If feasible in these areas, the use of water rather than retardant is preferred. When the use of retardant is necessary, avoid aerial or ground application of retardant or foam within 300 feet of a waterway or wetland; application beyond 500 feet is preferred.

During fire suppression the Incident Commander will evaluate each and every suppression activity during planning and strategy sessions to see that they meet minimum impact suppression objectives, discuss minimum impact suppression tactics with overhead team during overhead briefings, ensure minimum impact suppression tactics are implemented during line construction as well as other environmentally destructive activities, and consult with environmental staff prior to implementing line construction in sensitive areas, providing time permits and proper personnel are available.

Whenever possible, a Red Card and/or Wildland Fire certified member of the environmental or cultural staff shall accompany hand crews constructing fire lines in previously undisturbed locations. Minimum impact suppression tactics shall be applied to ensure protection of high valued resources. Additional safety briefings are needed between heavy equipment operators and environmental/cultural staff if site reconnaissance is required.

### 7.7 Fire Detection and Reporting

All fires are reported to JBER FES via 911. Fires observed on the training ranges will be reported to Range Control on the Range Control frequency (FM 38.30). Range Control will in turn notify JBER FES. The JBER FES is responsible for notifying the ADoF of fire starts on JBER.

Monitoring is defined as the systematic process of collecting, recording and mapping of fuels, topography, weather, fire behavior, and fire effects data to provide a basis for evaluating and adjusting wildland fire management programs. Monitoring generally requires both on-the-ground and aerial observations. Although monitoring is usually associated with prescribed fire, land managers may elect to use agency personnel to collect fire effects monitoring data to assess the ecological impacts of the wildland fire.

The plan specifies that fires in limited management areas receive routine surveillance. Surveillance is defined as the systematic process of collecting, recording or mapping the fuels, topography, weather, fire behavior, and location of values to be protected to provide suppression agencies or land managers the information necessary to make the appropriate suppression action decisions on a wildland fire. Surveillance is generally conducted from aerial observations. The information also provides a chronological administrative history of the fire and suppression decisions.

### 7.7.1 Public Information

Wildfire progress monitoring is conducted by the BLM/AFS. Updates can be obtained on the web site http://fire.ak.blm.gov/. Updates for fires where suppression action is required can also be obtained by contacting the public information officer at AFS. The JBER Forester acts as a liaison with the wildfire incident command staff on an as-needed basis conveying land management concerns and providing institutional knowledge of the land. The JBER Forester also relays information from the wildfire command staff to the various installation directorates. This function is known as a resource advisor in the wildfire incident command system.

### 7.7.2 After-Action Review

At the end of each fire season, an interagency review of the fire plan implementation and fire suppression operations will be held with fire suppression personnel and land managers. Land managers and fire suppression personnel will be given the opportunity to identify plan implementation problems and operational concerns. People to be contacted for the end of season plan review include; JBER Natural Resources office; State of ADoF; JBER Fire Chief, and JBER-R Range Control. Examples of topics to be discussed include fire operation effects on cultural features, natural resources, smoke management, and the notification process during fires. In addition fuels management projects should be discussed and proposals made. Land manager comments on the fire management plan should be made at this time for the yearly update of the fire management plan.

Land managers should evaluate how the suppression organizations responded to the selected fire management options. Instances where actions other than the selected fire management option were initiated will be re-evaluated to determine if the selected fire management option is appropriate. If the land managers determine that an option change is necessary, they will request the change to the ADoF FMO, which will initiate the fire management option revision process.

### 7.7.3 Rehabilitation

Fire lines and camp areas will be rehabilitated to stabilize the burn area and to mitigate the effects of suppression activities. The Agency administrator will ensure that the Incident Commander consults with natural resource managers as needed, regarding any specific rehabilitation needs. When possible, burned areas will be allowed to regenerate naturally. Fire lines will be monitored to ensure rehabilitation plans are followed and successful. Invasive species colonization and erosion control are some of the main items monitored after fires.

### 7.7.4 Fire Research and Monitoring

Wildfires are monitored for several years after a burn to determine vegetation response, identify erosion issues, and to determine if fire suppression actions have been adequately rehabilitated. Monitoring is conducted using a combination of aircraft flyovers, photo points, vegetation plots, and permanent fuel loading sample plots following procedures outlined by Brown (1976). Prescribe fires are monitored to determine if burn objectives are met, determine fuel loading, and identify rotational periods between burns. Prescribe fires are used as a tool to reduce fuel loading on ranges where the risk of wildfire limits military training opportunities. On representative wildfires and prescribed fires, plot-based vegetation sampling will be utilized to analyze vegetation change. Other monitoring projects could entail public response to fuel reduction projects adjacent to residential and urban interface areas.

### 7.7.5 Minimum Staffing Requirements

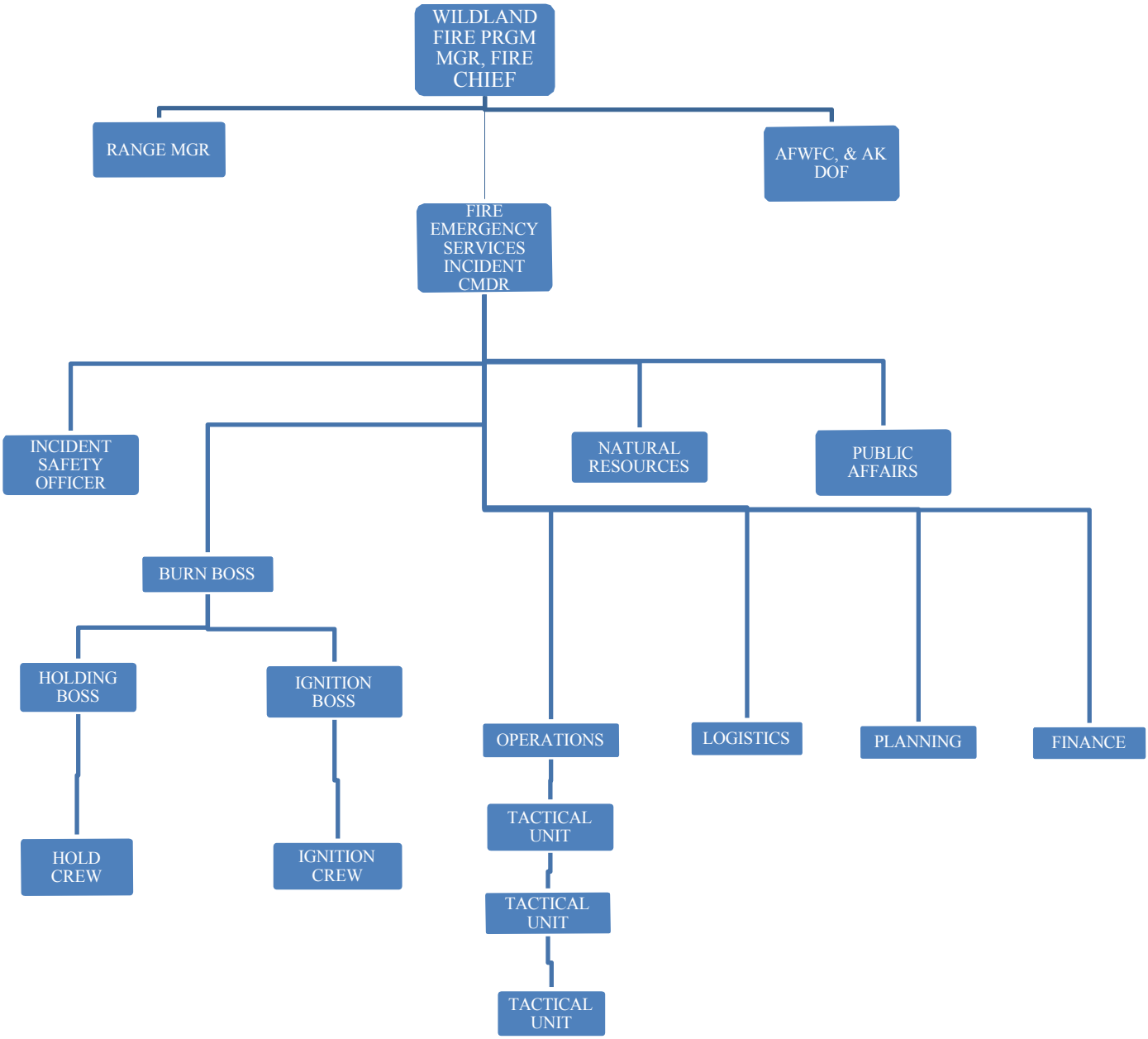
The JBER FES Flight and ADoF shall ensure that proper staffing requirements are in accordance with DoDI 6055.6, *Fire Protection Program*, and established manpower-staffing standards. Minimum staffing is based on the safety and complexity of the firefighting organization during initial attack and extended attack operations. Having a fully qualified and trained firefighting staff is an essential part of an effective suppression program.

JBER Directorate of Plans, Training Mobilization and Security will staff levels of qualified Range Control personnel required to oversee range operations and identify any fire starts on firing ranges and in training areas. JBER Natural Resources Element will staff sufficient numbers of professionally trained individuals to map fires, coordinate prescribed burns, map fuel loading, and update vegetation mapping.

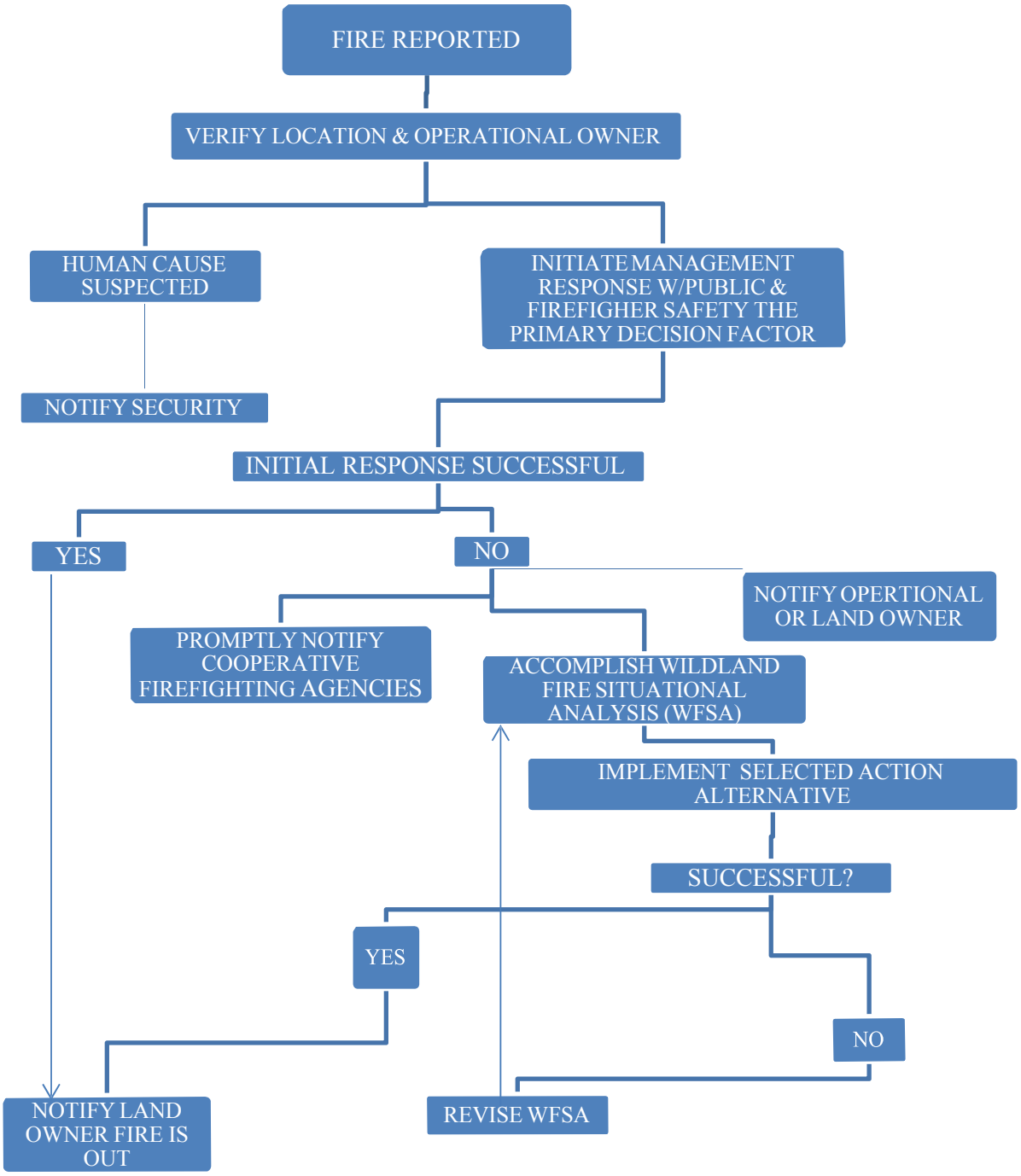
JBER FES staffs one Type III Wildland Engine, one Type VI Wildland Engine, and two Type I Tenders to provide initial attack capability on JBER. Additional structural firefighting apparatus/crews can be employed to augment capabilities in Urban Interface Areas.

## 8.0 FIGURES

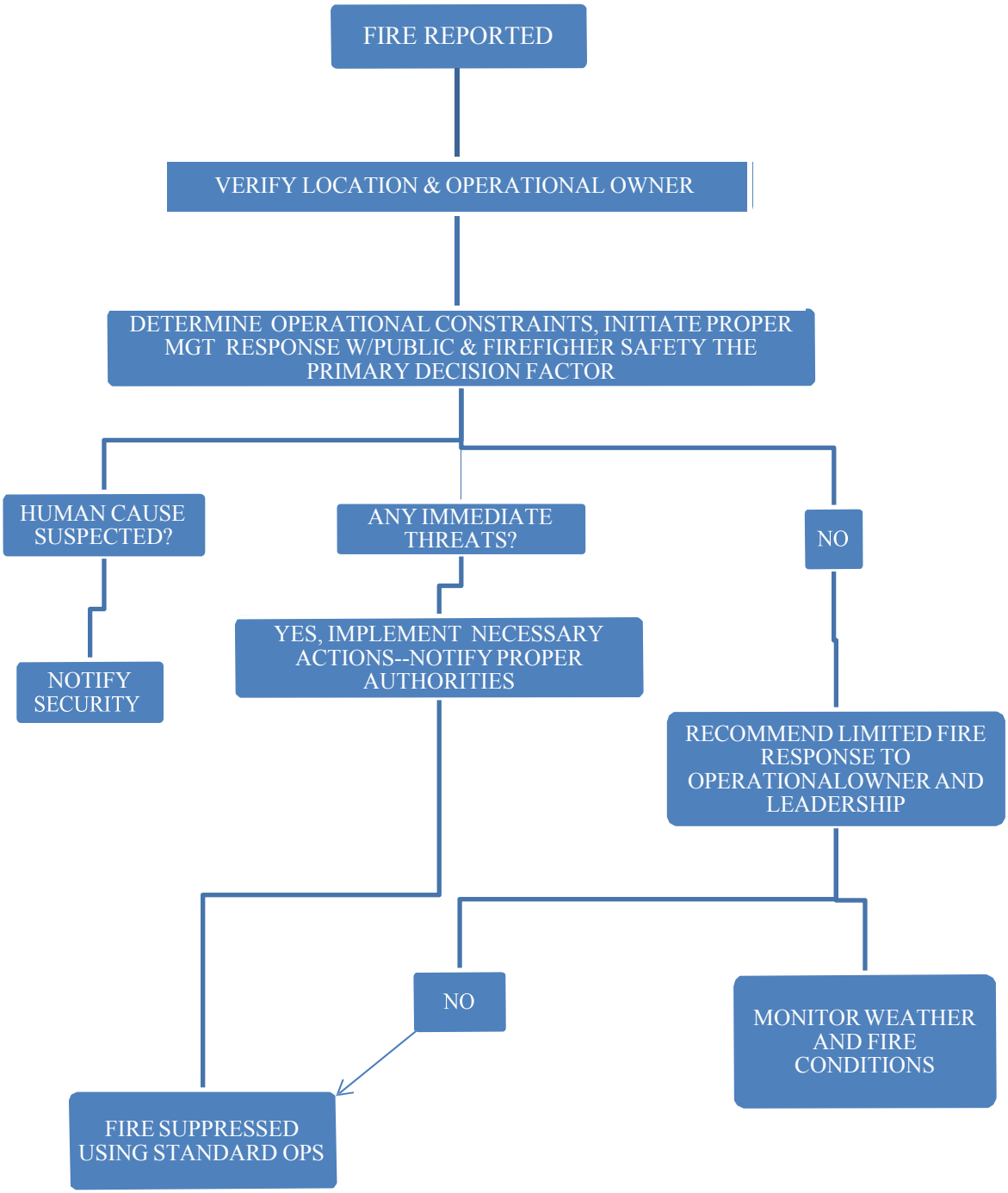
**WILDLAND FIRE ORGANIZATIONAL CHART, Figure 1**



**OPERATIONAL DECISION CHART**
**CRITICAL OR FULL MANAGEMENT OPTIONS, Figure 2**



**OPERATIONAL DECISION CHART**
**LIMITED MANAGEMENT OPTIONS, Figure 3**



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