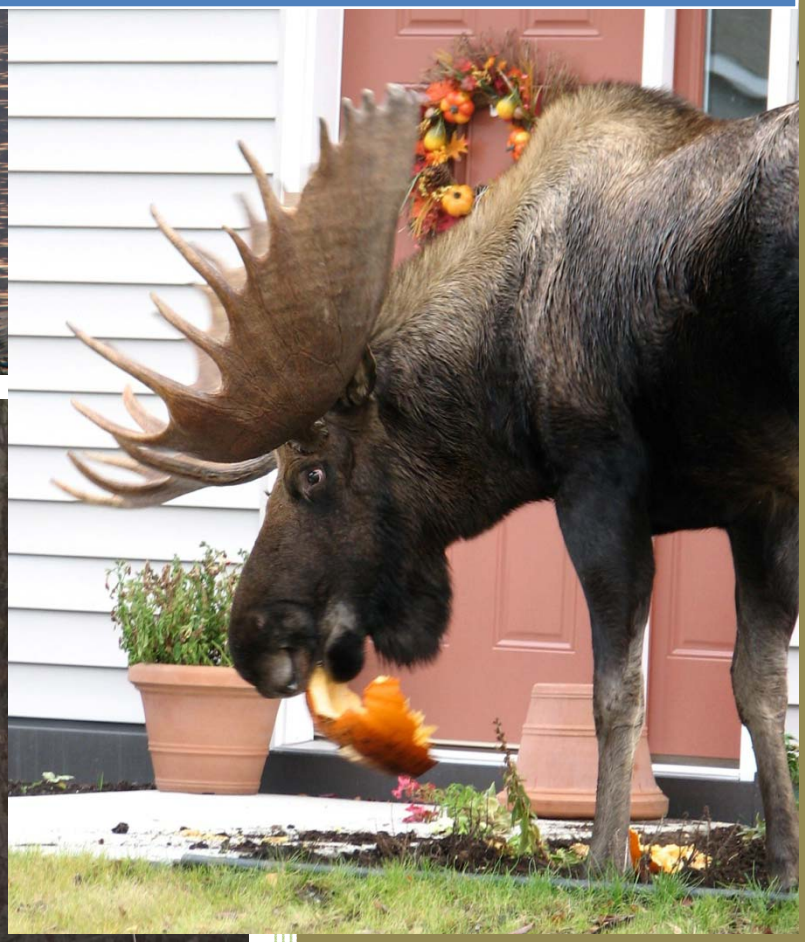
2011

JOINT BASE ELMENDORF-RICHARDSON INTEGRATED NATURAL RESOURCE MANAGEMENT PLAN



673d Civil Engineer Group

9/25/2011

2010 Update and Interim Joint Base Elmendorf-Richardson

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FOR ELMENDORF AIR FORCE BASE 2006 REVISION

3rd Wing

3rd Civil Engineer Squadron
Environmental Flight
Conservation and Environmental Planning Office
Elmendorf AFB, AK 99506-3240

JUN 1 2007

THOMAS L. TINSLEY, Colonel, USAF
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Date

Integrated Natural Resources Management Plan
Elmendorf Air Force Base, Alaska

1

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FOR ELMENDORF AIR FORCE BASE 2006 REVISION

3d Wing
PACAF

This Integrated Natural Resources Management Plan meets the requirements of the Sikes Act (16 U.S.C.670a et seq.) as reauthorized in 2003.

Denby S. Lloyd
Commissioner
Alaska Department of Fish and Game

26 Jan 07
Date

for Thomas P. Lonnie
State Director, Alaska
Bureau of Land Management

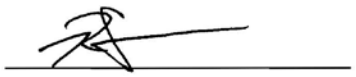
3/21/07
Date

Thomas O. Melius
Regional Director, Region 7
U. S Fish and Wildlife Service

March 27, 2007
Date

COMMANDER CERTIFICATION OF 2010 ANNUAL REVIEW OF JOINT BASE ELMENDORF-RICHARDSON INRMP

All INRMP review and coordination requirements as specified in Sec. 2.6 of AFI32-7064 (17 Sept 2004) have been met for FY 2010.



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EXECUTIVE SUMMARY

Purpose

The overall purpose of this Integrated Natural Resources Management Plan (INRMP) is to manage base lands and natural resources in such a way as to support the new Joint Base Elmendorf-Richardson (JBER) mission while promoting biodiversity and ecosystem health, protecting natural and cultural resources, and, where appropriate, providing commodities on a sustainable basis. JBER is the congressionally directed combining of US Army Garrison Alaska's Fort Richardson (FRA) with Elmendorf Air Force Base (EAFB) under the overriding management of the US Air Force, effective 1 October 2010. For purposes of this document 'JBER-Richardson' and 'FRA' represent the same land mass as does 'JBER-Elmendorf' and 'EAFB'. 'FRA' and 'EAFB' usage will generally reflect actions conducted prior to joint basing, whereas 'JBER', 'JBER-Richardson' and 'JBER-Elemdorf" represent current and future actions.

Scope

This plan is intended to be part of the base comprehensive planning process. It contains goals, objectives, and management strategies for the management of JBER lands and natural resources through 2011 or until the next major revision of the JBER INRMP. As such, it contains general program information. It is intended to supplement the previous EAFB and future JBER General Plan, and is itself supplemented by annual updates, coordinated with agency cooperators and major tenants, that contain more detailed information such as census data, project scheduling, and other details for implementing this plan. The most significant of those changes during 2010 is the addenda that incorporate many FRA specific programs, strategies and resources all indicated in red text, into the 2007-2011 EAFB INRMP. Where length and complexity prevented incorporation of the FRA specific INRMP details directly into this plan, a link referencing the appropriate site within the U.S. Army Garrison Alaska Integrated Natural Resources Management Plan 2007-2011 (http://www.usarak.army.mil/conservation/INRMP_Final.htm) is provided.

This plan incorporates all substantive practices and procedures set forth in the US Army Garrison Alaska (USAG-AK) Integrated Natural resources Management Plan, 2007-2011, as it pertains to the management of natural resources on the former Fort Richardson portion of Joint Base Elmendorf-Richardson. Should any portion of this consolidated plan fail to address or appear to conflict with the requirements and objectives set forth in the 2007-2011 USAG-AK INRMP, the provisions of the USAG-AK INRMP shall control.

Mission

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

Environmental Compliance

This plan is required by the Sikes Act, Department of Defense (DOD) Instruction (DODI) 4715.3, Environmental Conservation, DODI 4700.4, Integrated Natural Resources Management, Air Force Instruction (AFI) 32-7064, and Wing Instruction (WI) 32-7001. Individual sections of this plan address many areas of environmental compliance, including

wetlands protection, endangered and threatened species, protection of cultural resources, and the National Environmental Policy Act (NEPA). The final EIS for the FRA 2007-2011 INRMP can be found at (http://www.usarak.army.mil/conservation/INRMP_DRAFT/USAGAK_INRMP_EA_12-17-06.pdf)

General Goals

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

Major Revisions to 2007-2011 EAFB INRMP

This document represents the initial combination of the 2007-2011 INRMPs of both EAFB and FRA. Efforts were made to bring forward all compatible programs from the FRA INRMP, yet time and resources prevented a complete blending of programs and documents. Thus in many sections, discussions pertaining to FRA are only referenced. Historical FRA information was also drawn from the Integrated Natural Resource Management Plan 1998-2003 U.S. Army Alaska Vol. 2. Fort Richardson, yet much more information is contained within this and the updated INRMPS. Monitoring and program summaries for EAFB have been updated in Appendix G which summarizes data collected in the process of managing, monitoring and inventorying fish and wildlife. There have been no major changes in mission, policy, or goals. However, some strategies have been modified, such as changes made to the list of management indicator species (MIS) discussed and presented in Section 7-7. FRA uses a slightly different ecosystem monitoring program but retains the same objective. Notable additions to this document include discussions of threatened and endangered species, migratory bird protection and the updated project list below. Note that numerous FRA projects can be found in various sections of the Fort Richardson INRMP at: http://www.usarak.army.mil/conservation/INRMP_Final.htm

Natural resource projects and monitoring programs identified for JBER, Alaska, 2007-2015.

Fiscal Year	Project Name / Description	Yr Complete
2007 – 2013	Vegetative Plot Monitoring	2008
2007 - 2017	Biodiversity Habitat Monitoring	2007-2009
2008 - 2017	Invasive Species Mapping and Control	2008, 2009

2007-2017	Annual INRMP Review/Revision	2008, 2010
2007	Terrestrial Invasive Species Survey	2007
2008	Aquatic Invasive Species Survey	2008
2009-2014	Wildlife Education Facility Repair and Upgrade	
2009	Wildlife Corridor Identification	2008-Present
2009-2017	Beluga Whale Prey Monitoring – Sixmile Creek	2009, 2010
2010-2014	Moose Habitat Enhancement	2010
2010	EIAP for Sixmile Watershed Enhancement Activities	
2010	Design Sixmile Watershed Fisheries Enhancement Activities	
2010	Upper Sixmile Lake Spawning Habitat Enhancement	
2010	Wildlife Education Facility Repair and Upgrade	
2011	Replace Sixmile Creek Fish Ladder	
2011	JBER Integrated Natural Resource Management Plan Revision	
2011	Macro-invertebrate Indicator Species Survey	
2011	Timber Inventory and Wildfire Plan Update	2010
2011, 2013	Moose Habitat Survey	
2011	JBER Programmatic Biological Assessment	
2012	Repair Salmon viewing platform and kiosk	
2012	Wildlife Enforcement Facility Upgrade	
2012	Investigation of Wood Frog Populations	
2012	Sixmile Lake Campsite Feasibility Study	
2012	Wetland Delineation for 50-Year Plan	
2013	Ship Creek Bank Restoration	
2013	Update Vegetation mapping for JBER	
2014	Black bear population estimate	
2014	Bat population inventory	
2014	American Dipper Habitat Survey and Enhancement	
2015	Generate WEZ Goose Use Index	

Natural resource projects and monitoring programs identified for JBER-Richardson, Alaska, 2007-2011

Fiscal Year	Project Name / Description	Yr(s) Complete
2007-2011	Aerial Moose Survey	2008
2007-2011	Moose Browse Survey	2007
2007-2011	Moose Harvest Data Collection	2007-2010
2007-2011	Wildlife Movement Corridor Study	2009-2010
2007-2011	Moose Habitat Enhancement	2007-2010
2007-2011	Winter Track Surveys	2007-2009
2007-2011	Beluga Whale Surveys (Eagle River Flats)	2007-2010
2007-2011	Pike Removal and Monitoring on FRA	2007-2009
2007-2011	Rusty Blackbird Nesting Survey	2007-2010
2007-2011	Wolverine Population Estimate	2008-2010
2007-2011	Wood Frog Survey	2008-2010
2007-2011	Spawning Salmon Surveys on Campbell Creek	2007-2009
2007-2011	Spawning Salmon Surveys on Chester Creek	2007-2009
2007-2011	Nuisance/Injured Wildlife Response	2007-2010
2007-2011	Tracking of Nuisance Wildlife Calls	2007-2010
2007	Brown Bear Telemetry Survey	2007
2007	Brown Bear Population Estimation using Non-invasive Genetic Methods	2007
2008	Alaska Landbird Monitoring Survey (Arctic Valley)	2008, 2010

1. PURPOSE, AUTHORITY AND RESPONSIBILITIES

1-1 Purpose

This planning document originally provided the framework for ecosystem-based management of natural resources on Elmendorf Air Force Base (EAFB). The plan is designed to give background information, and then focus on current and future management. This plan is the complement to the base General Plan. Effective 1 October 2010, the Fort Richardson (FRA) portion of the US Army Garrison- Alaska 2007-2011 Integrated Natural Resources Management Plan (INRMP) will be blended into this plan as EAFB and FRA become Joint Base Elmendorf-Richardson (JBER). Throughout this plan references will be made to existing strategies and resources from the FRA INRMP. "Although not specifically broken out separately in [US Army Garrison- Alaska 2007-2011 INRMP], this plan covers …, Eklutna Mountain Training Site, Eklutna Dispersal Site, Davis Range Buffer Site, Knik Glacier Training Site, Gulkana Glacier Training Site, Gakona Convoy Rest Site, Haines Terminal, Tok Terminal and Haines-Fairbanks Pipeline." (P1.1.2 Ecological Management Units (page 5) in http://www.usarak.army.mil/conservation/INRMP_Final/USAGAK_INRMP_07-11_volume_IV_prescriptions.pdf) The 673rd Services Squadron managed Seward Recreation Camp should also be included in future JBER INRMPs; however, like the remote training and support sites acquired from US Army Garrison, it is to be managed under the same strategies outlined in this interim 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 as amended through the 108th Congress.

Complete involvement in the base comprehensive planning process by environmental and natural resources personnel is critical to the successful implementation of this plan. Natural resources and environmental constraints must be formally included in the general plan. Coordination and communication between engineering planners, community planners, and Cultural and Natural Resources Conservation office (673 CES/CEANC, hereafter referred to as 'CEANC') personnel is also critical, particularly in terms of coordinating new projects through the Air Force NEPA and Work Request process. Medium and long-term base planning should be coordinated as well. Long-term changes in mission should be anticipated and planned for. Failure to coordinate between engineering designers, community planners, and environmental planners will result in degrading natural habitats and could possibly result in violations of federal environmental and cultural resources protection laws.

1-2 Policy on Biodiversity and Ecosystem Management

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

1-2a Department of Defense Directives for Biodiversity

In 1989, Department of Defense (DOD) Directive (DODD) 4700.4 called for integration of the various natural resources programs such as forestry, wildlife, and outdoor recreation, and the development of Integrated Natural Resources Management Plans (INRMP). This important first step led to the military establishing partnerships with other natural resources and land management agencies that were already utilizing the principles of ecosystem management. In 1994, the DOD issued an "Ecosystem Management Policy Directive." This directive defined the principles of ecosystem management and directed that ecosystem management would become the basis of natural resources and land management in the DOD. The DOD would use the principles of ecosystem management (see Chapter 6) to:

(1) Restore and maintain ecological associations of local and regional importance

(2) Restore and maintain biodiversity

(3) Restore and maintain ecological processes, structures, and functions

(4) Adapt to changing conditions

(5) Manage for viable populations

(6) Maintain ecologically appropriate perspectives

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

The Department of Defense 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:

(1) Monitoring and inventory efforts to provide information for adaptive management

(2) Protection of sensitive areas

(3) Use of native species and natural landscaping techniques

(4) Wetlands management and protection

(5) Conservation of biodiversity is a critical issue

(6) Restrictions on activities that negatively affect biodiversity

1-2b 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.

1-3 Authority

1-3a Major Federal Laws and Executive Orders

Sikes Act Revision of 1997. The Sikes Act, as amended through 2003, provides much of the legal authority for management of wildlife and natural resources on military lands. Key provisions include:

(1) Requirement for fish and wildlife management on military lands

(2) Requirement for preparation and implementation of INRMP

(3) Required elements for INRMP

(4) Sustainable use of resources but with no net loss to military capabilities

(5) Required 5-year review seeking public comment required for INRMP

(6) Required annual review of program effectiveness by SOD and Secretary of the Interior

(7) Migratory bird management to include opportunities for collecting hunting fees

(8) Authority to license, permit and charge fees for natural resources use and directs use for management on the installation

(9) Public access for outdoor recreation on military bases to include opportunities for disabled veterans, dependants and others

(10) Authority for the DOD to enforce all federal and selected state environmental laws

(11) Requirement for sufficient numbers of professionally trained civilian resource managers and enforcement personnel who are inherently governmental

(12) Authority to enter into multi-year cooperative agreements with non federal agencies, organizations or individuals for the purpose of management of natural resources

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. US Fish and Wildlife Service published regulation changes in 8946 FR 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 INRMP (see sec 7-7c)
(4) Incorporate migratory bird population goals and habitat objective into INRMPS
(5) Conduct annual INRMP reviews with FWS & State to:
    (a) Solicit their input concerning INRMP effectiveness of bird conservations
    (b) 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 FWS

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

- Americans with Disabilities Act
- Bald and Golden Eagle Protection Act
- Clean Water Act
- Clean Air Act
- Coastal Zone Management Act (CZMA)
- Endangered Species Act (ESA)
- Erosion Protection Act
- Fish and Wildlife Coordination Act
- Hunting, Fishing and Trapping on Military Lands
- Land and Water Conservation Fund
- Magnuson-Stevens Fishery Conservation and Management Act
- Marine Mammal Protection Act (MMPA)
- National Environmental Policy Act (NEPA)
- Lacey Act
- Alaska National Interest Lands Conservation Act (ANILCA)
- Federal Advisory Committee Act (FACA)
- Federal Land Policy Management Act (FLPMA) (secondary authority for entering into cost share programs)
- Department of Interior and Related Agencies Appropriations Act of 1991 (par. 101-512) (Bureau of Land Management (BLM) authorization for challenge cost share programs)

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

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

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

Executive Orders. Important Executive Orders (EO) that affect natural resources include EO 11910, *Protection of Wetlands*, EO 11988, *Flood Plain Management*, EO 11989, *Off-Road Vehicles on Public Lands* and EO 13112, *Invasive Species.* EO 11910 requires federal agencies to take action to minimize destruction, loss, or degradation of wetlands. EO 11989 provides for closure of areas to use by off-road vehicles where soil, wildlife, or other resource values may be adversely affected. Numerous other Executive Orders have some pertinence to natural resources management on military bases. For jurisdictional EO, see Appendix C.

1-3b DOD Instructions

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

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

1-3c Air Force Policy and Guidance

Air Force Instruction (AFI) 32-7064, Integrated Natural Resources Management. This Air Force Instruction, which was published 17 Sept 2004, implemented Air Force and DOD Policy Directives. It explains how to manage natural resources on Air Force property in the United States so as to be in compliance with state, federal and local laws and standards for natural resources management.

Other Air Force Policy. Other policy 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 base, and *Fire Protection*, which covers wildland fire fighting procedures and policy.

Air Force Manuals. (Deleted Jan 2010)

673d Air Base Wing Instruction (673ABWI) 32-7001, Conservation and Management of Natural Resources (2010). This Air Base Wing Instruction implements Air Force environmental and natural resources policy directives at the base or wing level. It prescribes the 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. The basic objectives and procedures stated in 673ABWI 32-7001 are incorporated into this plan.

1-3d State and Local Directives

Alaska Forest Practices Act. The Alaska Forest Practices Act applies to all state and private lands in Alaska. It specifies harvesting procedures, best management practices, and provides penalties for non-compliance. Although not regulatory on federal lands, most federal land management agencies accept these standards as a minimum.

State Fish and Game Regulations. State fish and game laws apply to federal lands within the state of Alaska, and are enforced on JBER. Alaska Statutes Title 16 and Alaska Department of Fish and Game (ADF&G) 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 ADF&G, Alaska (AK) Department of Public Safety, Bureau of Wildlife Enforcement and CEANC military conservation agents (MCA).

1-4 Responsibilities

1-4a 673d Air Base Wing

The 673d Air Base Wing is the host unit at JBER, with responsibilities to maintain daily operation of the base and furnish services and support to JBER's military personnel, tenant organizations, civilian staff, family members, and the surrounding community.

1-4a(1) Vice Air Base Wing Commander

The Environmental Safety and Occupational Health (ESOH) council is typically chaired by the Vice Wing Commander if so delegated by the Air Base Wing Commander. The ESOH council frequently addresses INRMP issues.

1-4a(2) 3d Wing Vice Commander

The 3d Wing Vice Commander chairs the Bird Hazard Working Group (BHWG) as mandated by 3WI 91-212 (Bird and Wildlife Aircraft Strike Hazard (BASH) Program). The commander also has approval authority for recommendations of the BHWG.

1-4a(3) 3d Wing Flight Safety/BASH Officer

The 3d Wing Flight Safety and Bird Aircraft Strike Hazard (BASH) Officer has primary responsibility in regard to 3WI 91-212 or BASH Program. The 3d Wing Safety office works with newly arrived personnel making sure that all are briefed on JBER's BASH program, and that squadron safety officers have an established briefing on bird hazards and know the report procedures. Additionally, 3d Wing Safety schedules BHWG meetings, takes minutes and attendance at these meetings, and maintains the BHWG minutes for at least three years.

1-4a(4) 673d Air Base Wing Public Affairs

673d Air Base Wing Public Affairs is required, upon request, to provide base personnel, dependents and the general public, information on the hazards of wildlife and bird activity and the measures to minimize them. Additionally, the Public Affairs office provides the public with information concerning activities occurring on base dealing with natural resources or the outdoor recreation program. The Public Affairs Office is also involved in any natural resource public awareness programs.

1-4a(5) 3d Operations Group

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

1-4a(6) 673d Civil Engineer Group

The 673d Civil Engineer Group provides most of the natural resources direction for JBER. Figure 1 shows the organizations within the 673d Civil Engineer Group that are involved with natural resources management.

The 673d Civil Engineer Squadron, Asset Management Flight, Natural Resources Element, Environmental Conservation Office (CEANC) manages natural resources on the installation in a wide variety of areas, including forestry, fish and wildlife, outdoor recreation, and land management. This INRMP is the responsibility and documentation of the actions taken by CEANC. 673 CES Asset Optimization Element (CEAO) is primarily responsible for coordinating base-wide planning and associated NEPA analysis and coordination for all activities. Capitol Asset Management (CEAC) is primarily responsible for dormitories and coordination with base housing provider.

1-4a(7) 773d Civil Engineer Sqaudron

The 773d Civil Engineer Squadron (773 CES/CEO) is responsible for control and management for the Pest Management activities on JBER, with the exception of pest issues within the privatized housing units. 773 CES/CEO is also responsible for maintaining the JBER GEOBASE, but CEANC is responsible for producing clean and current data for entry into the system.

1-4a(8) 673d Security Forces Squadron

The 673d Security Forces Squadron (673 SFS) partners with the 673d CES for wildlife enforcement functions. The 673 SFS assists with wildlife enforcement. Occasionally, 673 SFS law enforcement officers receive the required wildlife enforcement training and work part time for CEANC as an MCA. MCA personnel are trained by the Natural Resources staff as specified under AFI 32-7064, and are designated by the 673d ABW Commander to enforce all applicable natural resources laws (including regulations) on JBER in accordance with 16 United States Code (U.S.C.) 670a (b)(1)(h). MCA personnel obtain their authority in writing for enforcement activity from the Commander of the Security Forces Squadron.

1-4a(9) 673d Logistics Readiness Group

The 673d Logistics Readiness Group Commander is part of the BHWG. Responsibilities toward the BASH program include giving guidance to maintenance personnel and fuels personnel for reporting hazardous bird activity to proper channels and the procedures for the preservation of bird remains found on aircraft during maintenance. Also, the 673d Logistics

Group provides munitions, vehicles and equipment to support the bird dispersal efforts when necessary.

1-4b Tenant Organizations

There are several tenant organizations on JBER. These organizations include the 11th Air Force, US Army Alaska's 4/25th Infantry Brigade Combat Team (Airborne), the 632nd Air Mobility Support Squadron, the 381st Intelligence Squadron, the 611th Air Operations Group (AOG), the 611th Air Support Group (ASG), and the Utility Aircraft Detachments, Army Corps of Engineers AK District Office. All tenant organizations have some responsibilities in supporting the BASH program and most have a representative on the BHWG.

1-4c U.S. Army Alaska

U.S. Army Alaska's (USARAK) 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 USARAK encompassed approximately 61,142 acres and is home of the 4/25th Infantry Brigade Combat Team (Airborne). FRA provided 30 individual training areas managed by Directorate of Plans, Training, and Mobilization and Security (DPTMS). Under JBER DPTMS will retain much responsibility for managing range complexes, coordinating military training, and releasing training areas for forestry, land rehabilitation, and recreational use. The 673d ABW will ensure the US Army training mission on JBER will be met through close coordination with DPTMS.

1-4d Corps of Engineers

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

1-4e Other Federal Agencies

1-4e(1) U.S. Fish and Wildlife Service

In accordance with the Sikes Act, the U.S. Fish and Wildlife Service (USFWS) is a signatory cooperator in the implementation of this plan. Coordination with USFWS in regard to BASH has been maintained throughout the planning process. 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.

1-4e(2) U.S. Bureau of Land Management

The BLM is the Secretary of Interior's authorized delegate for jurisdiction responsibilities regarding vegetative and mineral resources on all lands that were acquired through various PLOs and EO (approximately 66,545 acres or 91% of JBER). The Secretary of Interior, through BLM, reserves authority to change use and grant various rights with the concurrence of the Air Force so others may use the land for such things as rights-of-way, utility lines, fuel pipeline, gas, water, electric, cable, TV, sewer, telephone, fiber optics, and specifically the Alaska Department of Fish and Game fish hatcheries. The BLM is a signatory and partner in the implementation of this plan in accordance with the Sikes Act (Public Law (PL) 105-85) and the Department of Interior and Related Agencies Appropriations Act of 1991 (par. 101-

512) as amended. The Alaska Fire Service (AFS) could be utilized in any prescribed fire activities such as planning and/or operations.

1-4e(3) U.S. Environmental Protection Agency

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

1-4e(4) U.S. Department of Agriculture

U.S. Department of Agriculture (USDA), Animal Plant Health Inspection Service and Wildlife Services (APHIS, WS) has national expertise in developing actions and strategies for BASH programs. USDA-APHIS, WS is currently under contract with 3d Wing to provide 24/7 BASH activities between 1 April and 31 October and daylight-work-week coverage during the remainder of the year. USDA-APHIS, WS activities involve removing birds within the Bird and Waterfowl Exclusion Zones (BEZ/WEZ) and other wildlife within the airfield fence. USDA-APHIS, WS provides training for all active BASH participants as required by the USFWS Migratory Bird Airport Depredation permit.

USDA Forest Service may be called on to provide technical assistance in managing forest resources on JBER. They can provide information and technical advice on forest pests, timber sales, timber management, and wildfires. Through an agreement with Air Force Center for Environmental Excellence (AFCEE) professional environmental assistance is available to AF installations.

Natural Resources Conservation Service (NRCS) provides technical assistance in identification and conservation of soils.

1-4e(5) National Park Service

As one of the largest landholders in Alaska, the National Parks Service (NPS) may have some interest in sections of this plan dealing with outdoor recreation and cultural resources. The NPS is the lead agency on Antiquities Act, ARPA, and NAGPRA.

1-4e(6) National Oceanic and Atmospheric Administration (NOAA)'s National Marine Fisheries Service

National Marine Fisheries Service (NMFS) is a branch of NOAA and serves to provide 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. NMFS is the lead agency for issues regarding the Cook Inlet population of Beluga Whales.

1-4e(7) U.S. Geological Survey

The U.S. Geological Survey (USGS) will support the development of JBER's Geographic Information System (GIS). This federal agency is a good source for remotely-sensing imagery and 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.

1-4f State Agencies

1-4f(1) Alaska Department of Fish and Game

As required by the Sikes Act, the ADF&G is a signatory and partner in this plan. It is also the primary state agency for fish and wildlife management at JBER. The base is part of the Cook

Inlet Management Area for fisheries, and Game Management Unit 14C for wildlife. The ADF&G has assisted in most areas of fish and wildlife management. Its most active roles are in the fish stocking program, and with moose and BASH management. All JBER activities involving handling, hazing or taking fish and wildlife, outside of authorized hunting and fishing, require State of Alaska (SOA) Scientific and Education permits.

Habitat Division is responsible for issuing permits for a number of activities that may have impact on 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 (*Castor canadensis*) dams also requires a permit from Habitat.

1-4f(2) Alaska Department of Natural Resources

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

Division of Parks and Outdoor Recreation may be involved with JBER on the issues of public access on adjacent Chugach State Park and how JBER's recreation plans affect tourism within the Anchorage area.

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

1-4f(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 will need to coordinate with the ADEC on some of these issues. ADEC also guides and provides help in spills, disposal of hazardous waste.

1-4g Municipality of Anchorage

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

1-5 Management Philosophy

This INRMP outlines many of the values that have been expressed by the Air Force, 673d ABW, reviewing agencies and the public concerning JBER. Objective sections in each of the management chapters reflect the values that have been chosen at this time as highest priorities. These values may change in time, in which case, this plan will also change to show the new values

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

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

673 ABWI 32-7001 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 673d 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 (TES)

(2) Second priority will be given to maintaining biodiversity through the protection, preservation, and enhancement of fish and wildlife habitat

(3) Third priority will be given to development, management, and conservation of areas capable of providing intensive recreational use, such as winter sports areas, picnic areas, and nature trails. Such areas will be maintained primarily for their recreational value

(4) Fourth priority will be to manage the remaining areas for the greatest public benefit. This determination will be made based on an analysis of the ecological factors involved, supply and demand for resources, and both tangible and intangible social and economic values

1-5a Multiple Species Management

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

JBER has selected several species that it will monitor and manage (Tables 8 & 8A). There are several categories these species fall into, including keystone or key species, featured species, species with legal constraints and management indicator species (MIS).

Keystone or key species are those species that play a disproportionately large role in ecosystem structure. Their significant role in the ecosystem 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.

Featured species, unlike the key species, are chosen based on human values instead of ecosystem values. These species may or may not be key or indicator species.

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

Management indicator species are those species managers choose to track ecosystem health or status, or specific management programs. These species may or may not be key species or featured species.

1-5b Management Indicator Species Selection

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

(1) Ecological indicators including sensitivity to successional stages and to man's impacts on the system

(2) Endangered or threatened species on federal or state lists

(3) Species with special habitat needs that may be affected by proposed management activities

(4) Species commonly hunted or trapped, or of economic importance to man

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

(1) Broad range of ecosystems and successional stages represented

(2) Species importance within its ecosystem (keystone species)

(3) Current status as featured species

(4) Listed as Endangered, Threatened, or Species of Concern at federal or state level

(5) Economic and social importance to man

(6) Sensitivity to disturbance and management activities

(7) Is management and habitat under our control?

(8) Species associated with specific management activities

(9) Species can be monitored with the manpower and funds likely to be available

In the FRA portion of JBER an Ecosystem Management Plan was developed to focus effort on a short list of species in a manner similar to the MIS process. All species included in the Ecosystem Management Plan were objectively ranked and prioritized for management. The ranking process determined which species to manage, based on considerations of maintaining species viability and ecosystem integrity. The necessary tasks required to establish this selection process are completed (see below), but the process will continue to be refined as input is received from reviewers of the Ecosystem Management Plan and area stakeholders.

To be included for management in the Ecosystem Management Plan, a species must occur in at least one of four categories. All rare, threatened, and endangered species fall under the below categories:

(1) the species is of conservation concern, as determined largely by population declines noted broadly throughout the species range (not necessarily in Alaska) or from conservation priority species lists produced by the USFWS, Alaska Department of Fish and Game, and specialist working groups (for birds, the national Partners-in-Flight Watch

List, the Alaska Audubon Watch List, Boreal Partners-in-Flight Working Group, Alaska Shorebird Working Group, and Alaska Loon Working Group, and for vascular plants, the Alaska Natural Heritage Program),

(2) the species has socioeconomic importance as a locally hunted game animal,

(3) the species is ecologically important in ecosystems as a predator, or

(4) the species is ecologically important in ecosystems as prey.

1-5c Partnerships

Partnering is a process by which two or more organizations with shared interests act as a team to achieve mutually beneficial goals. These partnerships can range from very informal to very formal. Partnerships provide support for ecosystem management, allowing the base to look at a broader picture. JBER is a significant portion of the ecosystem in the Anchorage Bowl area and will be able to glean, as well as contribute, information on the ecosystem as partnerships are built and strengthened. The Sikes Act (PL 105-85) requires the military to establish partnerships with major landowners such as the BLM, and other interested agencies including the USFWS, and ADF&G.

Partnerships allow the abilities of JBER's natural resources managers to increase by being able to work with surrounding natural resources managers who may have expertise in different areas. These skills can include GIS, knowledge of biodiversity conservation and ecosystem management, strategic planning, biological expertise on a particular species or community type, ecological expertise on linkages and processes, landscape relationships, wetland and riparian system management and restoration, statistics/modeling/computer analysis, ecological monitoring and experimental design, fire management, technical writing, public outreach/education, and community participation.

Partnerships are usually formalized as cooperative or support agreements, memorandums of agreement (MOA) or understanding (MOU). While several formal agreements have been enacted at DoD or AF level, installations are encouraged to enter into agreements with state and federal agencies to coordinate and improve management of natural resources on the installations (MOU – DoD, USFWS and International Association of State Agencies, 31 January 2006). Current agreements between 11th Air Force or JBER and other agencies are summarized in Appendix D.

Partnerships that JBER has formed or likely to form in the near future follow:

(1) USFWS – Loon Watch program, rusty blackbird nesting study. USFWS monitor and manage volunteers that conduct annual distribution on production of loons on base lakes. USFWS in cooperation with ADF&G, 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)

(2) 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.

(3) ADNR, DOF – 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.

(4) ADF&G, BLM – Brown bear distribution and movement corridor study. All agencies have partnered in seeking information on the movement corridors and habitat selection of brown bears in the Anchorage Municipality – important for land management decisions. JBER joined with UAF and ADF&G in documenting movement corridors of moose, black bear, wolves and wolverine.

(5) Port of Anchorage (POA) and Knik Arm Bridge and Toll Authority (KABATA) – Beluga whale numbers and activity and movement patterns. In preparation of EIS for respective projects, data are being collected on beluga whales in Knik Arm adjacent to JBER. Information will be useful in processing ESA requirements.

(6) Native Village of Eklutna (NVE) – Natural and Cultural resource interests. NVE shares a common interest in the optimal management of cultural and natural resources on JBER lands. In a government-to-government capacity NVE is frequently invited to participate in resource identification, inventory, research and monitoring review. NVE is a primary resource for identification of cultural sites that may be affected by base developments or habitat projects that may affect the surface soils.

1-5d Adaptive Management and Decision Making

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

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

(1) Changes to funding and staffing resources

(2) Integrate new information from inventories, monitoring, and research

(3) Changes in military mission

(4) Changes in laws and mandates

(5) Changes in the status of abiotic or/and biotic components of the ecosystem

(6) To address additional issues from stakeholders

During 2005 and 2006 INRMP review meetings were held with cooperating agencies, native representatives and the local community representatives. The minutes and attendees from those review and revision meetings are included in Appendix I. Annual review minutes of the EAFB INRMP from 2008 are also enclosed in Appendix I.

1-5e Geographic Information System (Geobase)

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

Data gathered through inventory and monitoring will be stored in two ways, as digital data within a computer database, and on paper as hard copy of the digital data. All inventories and monitoring studies that are done by outside contractors will have stipulated in the contract that all data be delivered in these two forms (electronic and paper), with the electronic data being in a format compatible with current software used by the JBER GEOBASE.

1-5e(1) Natural Resources Spatial Database

GIS utilizes computer technology for efficient storage, retrieval, and analyses of spatial data. JBER's natural resources spatial or GIS database is stored in JBER Geobase by 673 CES. The layers that have been developed from scientifically collected data sets include: ecological land classifications (geomorphology, surface form class, vegetation class, disturbance class, and ecotype) (Pullman, E., et al 2003), salmon spawning habitat (Gotthardt 2004), Ship Creek flood hazards (USA Corps of Engineers 1980) and wetlands (USFWS National Wetland Inventory 1995), loon and raptor nesting territories (Anderson et al, 2008), rusty blackbird nesting habitat. Additional INRMP related values entered into Geobase include: recreational trails and facilities, BASH zones of bird exclusion and vegetation management, moose hunt areas, timber harvest areas, and habitat mitigation areas.

EAFB portion of JBER has used Geobase to support numerous mission objectives including improvement of land and resource management decisions. When combined with FRA GIS data sets Geobase will provide a JBER planning tool. It will eventually incorporate field locations and data for various inventory and monitoring activities to make the data more accessible to natural resource managers. Geobase will provide a variety of maps for managing and monitoring impacts of military use, recreational use, other uses, and for natural resources projects. Geobase will be used to produce maps that include features such as military facilities, transportation networks, drainage, cultural sites, vegetation, wetlands, elevation, soils, and more.

Geobase is being used to support 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 map building option of Geobase provides a readily available resource for field activities that provide relevant ecological, geomorphic and development details to field crews.

1-5e(2) GIS Maintenance and Use

CEANC will continue to coordinate and exchange data with CEO in the maintenance of Geobase. New contracts that go to outside agencies or persons include a clause that requires any spatial data developed from the study to be incorporated into a compatible GIS format, and CEANC will get digital 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.

1-5f Social and Cultural Values

The values of those using and managing the base cannot be ignored. Human values are an integral part of ecosystem management. These values will establish priorities and activities that occur on 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 problem can be addressed immediately and thoroughly; some are elevated to immediate concern while others must be relegated to lower status. How these choices are made is critical to the futures of species, biological communities, and ecosystems, as well as to the condition of military lands and the sustainability of training and operations. Fortunately, there are principles, guidelines, and precedents that help us make intelligent and thoughtful choices.*"

1-6 Conditions for INRMP Implementation and Revision

1-6a Implementation and Review

The implementation of this INRMP is a coordinated effort by all parties of the 673d Air Base Wing and its partners. Coordination of the separate and shared roles for implementation lies with the 673d Civil Engineer Group Commander (673 CEG/CC) as delegated to 673d Civil Engineer Squadron, Asset Management Flight, Natural Resources Element, Environmental Conservation (673 CES/CEANC) (Figure 1). Initiating the required annual reviews and revisions is also the responsibility of 673 CES/CEAN. Invited annual reviewers will include as a minimum:

(1) Region II Sport Fishery Division, ADF&G

(2) Region II Wildlife Conservation Division, ADF&G

(3) Anchorage Area Field Office, Region 7, USFWS

(4) Anchorage Field Office, BLM

(5) Anchorage Field Office of National Oceanic and Atmospheric Administration (NOAA)- National Marine Fisheries Service (NMFS)

(6) USAGAK/ITAM Coordinator

(7) JBER Citizen Environmental Board

(8) Native Village of Eklutna (NVE)

1-6b 5-Year Review and Revisions

Revisions or updates to this INRMP are required at least once every 5 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. Revisions to the plan will be noticed through the major newspapers in Anchorage newspaper. The public will be given a 30-day review period.

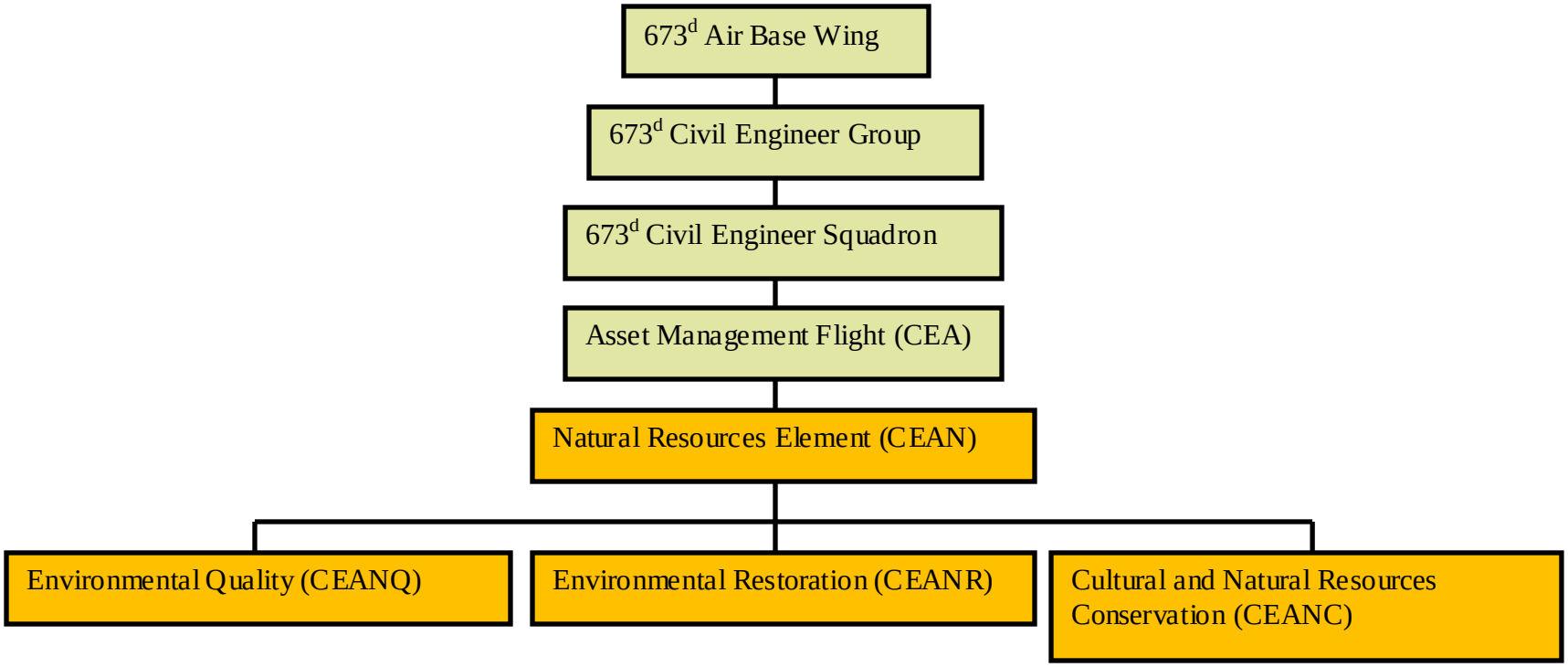

Figure 1. A simplified organizational chart of the new 673d Air Base Wing with emphasis on the 673d CES Natural Resources Element, the successor to the 3d CES Environmental Flight.

2. INSTALLATION OVERVIEW

2-1 Location, Acreage, and Population

JBER-Elmendorf is located in south-central Alaska (latitude/longitude: 61°15'N/149°18'W), just north of Anchorage (Figure 2). It is bordered on the east by the 61,000 acre Fort Richardson (U.S. Army Alaska), on the south by residential, industrial, and business districts of Anchorage, and on the north and west by the Knik Arm of Cook Inlet.

Of the 13,455 acres that comprise EAFB, 4,038 acres are classified as improved, 1,118 acres as semi improved and the remaining 8,299 acres are unimproved (Pacific Air Forces 1998). Improved grounds include buildings, runways, pavement, and lawns that require maintenance on a regular basis. Semi-improved areas are mainly open fields around the flight line, roads, munitions areas, and antenna fields that require periodic maintenance. Unimproved grounds represent the forest, shrub and wetland areas of the base.

The number of people associated with EAFB was once reported to exceed 25,000 (Pacific Air Forces 1998). This included active duty Air Force, tenant units representing the U.S. Navy, U.S. Marine Corps and U.S. Army, their dependants, the civilian and contractor work force, and retired military in the southcentral Alaska area. This number has undoubtedly grown since that estimate.

JBER-Richardson is located in south-central Alaska, approximately seven miles northeast of downtown Anchorage. At 149° 40' west longitude and 61° 15' north latitude, Fort Richardson is situated between two prominent natural features—the Knik Arm of Cook Inlet to the north and the Chugiak Mountains to the east.

The cantonment area encompasses 5,760 developed acres located along the Glenn Highway near the center of the post. This area contains 568 buildings with 7,609,513 square feet of floor space. The post provides housing, facilities and activities that add up to good military living. There are community services, medical and dental facilities, excellent churches, schools, libraries, crafts shop, newspaper, theater, golf and ski courses, and cross country trails, along with a post exchange, commissary and a large physical fitness facility.

Fort Richardson's remaining 55,000 acres are comprised of maneuver and impact areas (U.S. Army Alaska Undated). The 44,071 acres of maneuver area include 42,898 acres of training area. The post has major ranges in addition to artillery and mortar firing points. These include small arms ranges, large ranges, landing zones, and drop zones.

2-2 Installation History

The area that is the installation 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 the 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 1800's and early 1900's through the Homestead Act. And with the decision to build a railroad with connections to the mouth of Ship Creek, Anchorage was born in 1916. The development associated with the railroad encouraged homesteading on JBER lands. In 1929 President Franklin D Roosevelt issued an executive order to withdraw 45,000 acres of public

land in south-central Alaska for military reservations. In 1939, an Executive Order was issued that withdrew 36,570 acres of land from the public domain placing it under War Department jurisdiction. This land, along with small fee-based (private land) acquisitions, subsequent Executive Orders, Public Land Orders, makes up the predominant land base of the Fort Richardson portion of JBER. A time line and explanation of the numerous Executive Orders and Public Land Orders can be found in Appendix E. Land clearing began in 1940 at Whitney Station and soon expanded to house an Army infantry regiment. Several homesteads in the area were also vacated to make room for the installation development. (Daugherty, P. M and B. M. Saleeby, 1998).

Between 1939 and 1945, approximately 151,180 acres of land were withdrawn for military use. FRA originally resided on land that EAFB occupied through 2010. In 1950, Fort Richardson was moved east to its current location, and 9,042 acres were transferred to the Air Force, which later became EAFB. By January 1941 the 7,500 foot runway was completed. Following the Japanese attack on the Aleutian Islands the installation served a critical role. 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. EAFB once again served as a vital location for aircraft for the Vietnam War. The host for EAFB through September 2010 was the 3d Wing, which replaced the 21st Tactical Fighter Wing in 1991.

From 1945 to 1955, the military returned approximately 85,000 acres to the Department of the Interior. Many Executive Orders stipulated the return of these lands following the end of World War II. 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. From 1955 to 1965, the Department of the Army released approximately 10,000 acres to various entities such as the U.S. Air Force, State of Alaska, and the Bureau of Land Management and acquired approximately 6,000 for Army use. From 1966 to 2010, FRA boundaries remained fairly stable. Leases from the BLM expanded the boundary to the east and in the south. Between 1980 and 2010 FRA acreage was re-allocated to MoA for a municipal landfill and to EAFB for privatized housing.

In 2005 the Base Realignment and Closure Commission (BRAC) called for the realignment of EAFB and FRA into a single joint installation. The new joint installation will become Joint Base Elmendorf-Richardson effective 1 October 2010. In addition, the 176 Wing Air National Guard (ANG), associated aircraft, and Expeditionary Combat Support from Kulis Air Guard Station (AGS) will become tenants on JBER. The 3d Wing will retain air operations and safety responsibilities but transfer most other JBER management to the 673d Air Base Wing. INRMPs from each installation were combined in this Interim INRMP effective 01 October 2010.

2-3 History of Natural Resources Management

Prior to 1950, the War Department managed the land that is currently JBER. 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 on the base. Rothe, T.C., S.H. Lanigan, P.A. Martin, and G.F. Tande (1983) summarized the results of the inventory and summarized records of previous natural resource activities. The first EAFB INRMP 2001-2006 was approved and signed by all parties September 2001. The Air Force has managed the base 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).

The early history of natural resource management on the FRA portion of JJBER is best described in Section 6 of U.S. Army Alaska. 1998. Integrated Natural Resources Management Plan 1998 – 2002, U.S. Army Alaska, Vol. II Fort Richardson. This INRMP documents forestry management on the installation back to 1955 and fish and wildlife management activities beginning in 1953 with the initial stocking of trout in local lakes.

2-4 673d Air Base Wing Mission

"Posturing Airmen for the fight while providing unsurpassed joint installation support, services and home to America's Arctic Warriors."

Goals:

1) Develop and maintain mission-ready expeditionary Airmen postured and motivated for world-wide deployment

2) Provide world-class facilities, services and quality of life supporting entire Joint Base military community

3) Provide unsurpassed installation support capabilities responsive to all JBER mission commanders

4) Establish JBER as DoD's premier joint warfighting installation supporting America's Arctic Warriors

JBER's proximity and access to Asia, Europe, and North America provide a strategic location yielding significant importance to global military operations. The base's location is ideal for deploying aircraft, troops, and equipment around the world, and air defense and superiority, with some units on alert 24-hours a day, year-round. The 673d Air Base Wing is JBER's host unit, with responsibilities for maintaining daily operation of the joint base and furnishing quality services and support to JBER's military personnel, civilian staff, family members, and the surrounding community.

As JBER's host unit, the 673d Air Base Wing provides administrative and logistical support to US Army components of the former Fort Richardson of US Army Garrison Alaska, 11th Air Force, 3d Wing, 732nd Air Mobility Squadron, 381st Intelligence Squadron, and 611th Air Operations Group (AOG), 611th Air Support Group (ASG) and several smaller supporting units.

Air Force mission support activities include airfield flight line functions, munitions storage, base security, readiness training for remote airbase development (Camp Madbull), tenant unit facilities and activities, personnel service and support functions, housing, and recreational services and opportunities.

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.

U.S. Army Alaska is presently comprised of two brigade combat teams (one at Fort Richardson and one at Fort Wainwright), the 4/25th Infantry Brigade Combat Team (Airborne) is located at Fort Richardson.

2-5 Facilities

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

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

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

The Joint Military Mall, the hospital, VA hospital and privatized family housing units expanded into previously forested ecosystems in the southeast portion of the base.

FRA portion of JBER has 31 training areas (TA) 401-431. Formerly TA 16 was eliminated and now is used for the Alaska National Guard facility. Former TA 15 was transferred to EAFB in August of 2004 to facilitate the development of a new housing area.

U.S. Army Alaska Regulation 350-2, Table B-1, lists 32 small arms and crew-served ranges on FRA. These ranges include two demolition ranges (Demo II and Demo III, listed as a single range) that are similar to non-duded 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. In addition, the post has surface danger zones, which are the same as non-dudded impact areas associated with small arms ranges.

2-5a FRA Firing Ranges

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; includes 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; 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

The Infantry Platoon Battle Course (1668 acres) provides a range where a dismounted infantry platoon can conduct mission-oriented training exercises

2-5b Other Range Facilities

Eagle River Flats Impact Area for mortar and artillery firing from approximately 30 firing points on North Post.

Malemute Drop Zone (214 acres, which is being expanded by 200-300 acres); used to support of strategic airborne operations; and can support a company size operation

Landing Zones (about 25) for helicopter assaults.

Another significant training facility is the Squad Obstacle Training Course, which consists of rope bridges and cliff rappelling sites.

2-6 Surrounding communities

Practically surrounding JBER, the Municipality of Anchorage influences much of the planning on JBER. Anchorage, as of 2008, had an estimated population of 279,243, representing a growth rate of 7.3% from the 2000 estimate. To the north Palmer and Wasilla, the primary communities of in the Matanuska-Susitna Borough, serve as 'bedroom communities" for many workers of Anchorage businesses and agencies, providing a one-way 40-60 mile commute. The 2007 estimated population of the Matanuska-Susitna Borough was 85,458.

2-7 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 (POA) has recently expanded which required the transfer of JBER land. Two large shopping malls were constructed near JBER boundaries and a request is in progress for a lease of JBER land for an industrial park within its current boundaries. The overall effect of these non-DoD developments is rapidly diminishing wildlife habitat outside JBER boundaries.

2-8 Transportation and Water Supply

2-8a 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. Richardson Drive passes through the heart of the FRA cantonment area, becoming the Davis highway as it approaches the EAFB cantonment. JBER is also accessible from Post Road and the A/C Street Couplet.

JBER is served by the Alaska Railroad Corporation (ARRC). ARRC's mainline cross between the cantonment areas and a spur extends to a loading facility and an ammo storage complex. The railroad provides both freight and passenger service with access to Fairbanks and three port facilities: (1) Port of Anchorage, (2) the port of Whittier, and (3) Seward, which is a deep-water port at the southern terminus of the railroad. USAG-AK operates a deep-water seaport and fuel terminal at the Port of Anchorage.

There are three airfields on JBER. The EAFB 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. Bryant Army Air Field, located adjacent to the FRA cantonment area and the Glenn Highway, has a main, hard-surfaced, north / south runway, which is 3,000 feet in length. Sixmile Lake Sportsman Club maintains a recreational aircraft gravel airstrip on the south 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.

2-8b Domestic Water Source

JBER's water is supplied primarily by Ship Creek, which traverses JBER from east to west. Ship Creek "high 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 "high 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 can be found in the publication Chronology of Water Use and Water Rights on Ship Creek (Quirk 1997).

2-9 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. This park is the second largest state managed park in Alaska. Being within and adjacent to the municipality of Anchorage and JBER it serves to provide numerous recreational opportunities 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 and Palmer Hay Flats border upper Cook Inlet and provide thousands of acres of important coastal wetland for waterfowl, shorebirds and other wildlife. These important waterfowl areas surrounding JBER serve a significant role in BASH risks.

Bicentennial Park 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.

3. MISSION AND NATURAL RESOURCES

3-1 Support of the Military Mission

The natural resources on JBER are relevant to the military mission. The Air Force uses the natural areas of the base as a buffer for the airfield activities while the Army takes advantage of the natural area for ground troop, vehicle 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. Maintaining the health of the natural ecosystem ensures that JBER complies with USFWS regulations to conserve migratory birds.

3-2 Mission Generated Issues

New base-level developments are individually or cumulatively impacting 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. Approximately 1,000 acres of forested habitat have been developed or converted to early succession forest types on or adjacent to the original EAFB footprint. Included in those changes were the new hospital complex, the joint military mall and support services, and new base housing that came in the form of Private Sector Financed (PSF) housing. PSF housing construction required over 350 acres of undeveloped land to be 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 the expansion of their facility accounted for the loss of over 150 acres. Just outside the boundary of the installation another 100 acres of forest habitat was converted to a large shopping mall. The effect of these losses has greatly restricted habitat available for lowland forest species in the JBER area. Similarly on the FRA portion of JBER recent losses of habitat generated by development of advanced training ranges and facilities has amounted to 450 acres in the last 5 years.

In addition, F-22A and C-17 bed-down, fighter fuel cell maintenance, establishment of horse stables near Hillberg, realignment of the Alaska railroad right-of-way, and Arctic Warrior realignment, and rapid gravel pit expansion in support of the many JBER and POA projects, and erection of security fences in support of 9/11 forces protection particularly impact the remaining outwash plain area east of the runway, the Ship Creek flood plain, and the south face of the Elmendorf moraine. They are leading to habitat fragmentation and wildlife movement corridor restrictions.

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 face of hurried, inadequately coordinated development and gravel extraction has become an issue. As a direct result of the September 11, 2001 attack on the United States by Al Qaeda terrorists,

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. When combined with rapid expansion of gravel extraction sites, these activities have substantially reduced undeveloped corridors for large animals to move between north JBER and the Ship Creek riparian ecosystem and the associated underpass of the Glenn Highway.

3-3 Political, Social and Economic Resource Issues

3-3a Urban Encroachment and Development

Urban encroachment and increasing development are facts of life for most military bases. Encroachment is the primary issue in land use planning. DoD has defined encroachment as the cumulative result of any and all outside influences that inhibit normal military training and testing. Similarly, the Army considers encroachment as any external and / or internal actions or requirements that restrict training. Encroachment reflects the cumulative result of a slow but steady increase in influences affecting the use of installation ranges or assets. Societal demands near and around installations are constantly changing and JBER needs innovative methods to deal with that change. Serving land-based forces, the Army and National Guard, JBER needs land area to train, and, paradoxically, as technology advances training space for ground-based units increases. Conversely, encroachment reduces the size of the area available for military training.

JBER, with its location close to downtown Anchorage, has more issues than most. Mission-essential activities are requiring increased facilities, as new units and personnel are being sent to JBER every year. In addition to mission-related activities many projects proposed or planned by the civilian community will have an encroachment impact. Examples include the realignment of the Alaska Railroad rights-of-way, the ongoing expansion of the PoA and its associated gravel extraction, and the proposed bridge over Knik Arm with access adjacent or through base property, commercial or long-term real estate interests involving rights-of-way, easements, land use permits, leases, outgrants, land transfers, exclusive use areas, and special concessions, and critical habitat designation for beluga whales, many of which have detrimental effects on current or future military training requirements.

Developments outside the JBER boundary also pose cumulative impacts to military operations. As home building, shopping malls and industrial parks increase, frequency of potential issues with military generated noises increase and requests to use JBER lands for recreation increase.

3-3b Public Access and User Fees

Public access is required by regulation, within the restrictions of non-mission interference and security requirements. Events over the past several years have forced installations to tighten security requirements, 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.

User fees are authorized under the Sikes Act and are common at bases in the lower 48 states. JBER initiated access fees for certain recreational activities in 2001. In coordination with FRA and ADF&G both installations began charging moose hunters an access fee. FRA experimented with an access fee for fisherman but eliminated the fee in 2004. Standardizing fee structures for both installations provides the perception of validity and uniformity.

3-3c Development of Ecosystem Management Partners

Partnerships with agencies such as the Alaska Department of Fish and Game (ADF&G), US Department of Commerce's National Marine Fisheries Service (NMFS), and several resource agencies of the US Department of Interior need to be nourished and expanded to take advantage of their respective expertise.

3-3d Beetle Infestation and Old Growth Issues

Much of JBER is old growth boreal forest or recovering disturbed sites dominated by alder and blue joint grass. The beetle infestation of the 1990's and subsequent salvage logging of the dead spruce trees has resulted in further blue joint 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 is already established in wet soils. Prescribed burning opportunities are limited due to narrow burning windows and air quality standard conflicts.

3-3e Viability of Commercial Timber Sales Program

The viability of JBER's timber sales program is tied to the local market for wood products. An unresolved issue over timber ownership between BLM and JBER on BLM lands complicates sales.

Market conditions have improved slightly in the past 5 years. The demand for personal firewood to replace increasing energy costs for heating homes has increased recently. The exportation of chipped wood by a firm in the Matanuska –Susitna Valley has also provided occasional demand for Anchorage bowl timber. Past timber salvage sales glutted the local market, as beetle-killed spruce resources age and diminish market conditions are likely to improve. Currently, it is difficult to have a commercial sales program when there are few or no bidders for timber contracts.

3-3f Ship Creek Fish Passage Initiative

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 (Sec. 7-7f(1)). This goal is shared by NVE residents 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 the JBER and BLM signed an agreement with ADF&G that resolved the issue. In providing land for the expansion of the ADF&G fish hatchery, the Air Force would not be required to allow salmon escapement above the existing dam a the Elmendorf hatchery.

3-4 Wildlife Conflicts with Mission

Wildlife conflict issues are extremely 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 (7-7k, Wildlife Conflict Management).

3-4a 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 including ducks, geese, hawks, eagles, gulls and ravens, mammals that pose a risk on the runway, including moose, bears, and canids, but also microtines that attract raptors to the airfield, and beavers that create attractive waterfowl habitat within the WEZ. Grasshoppers also create a BASH risk by attracting gulls, corvids and other passerines to the airfield.

3-4b Non-BASH Risks to Human Safety and Health

For reasons of safety for personnel, large, potentially dangerous animals are also a management concern. Those species include moose, black and brown bears, and wolves. Not only can their aggressive offensive or defensive actions cause human injury or death, their potential for conflicts with vehicles on streets and highways also pose a risk to vehicle occupants. Species that pose a risk human/pet health 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.

3-4c Living with Wildlife MOU

Recognizing the unique nature of human-wildlife conflicts in the Anchorage area, the ADF&G initiated a planning program for the Anchorage area in 1996 called "*Living with Wildlife.*" Two of the stated goals of this program were to "*optimize human-wildlife interactions (positive and negative) within the Municipality of Anchorage, and to integrate wildlife issues into land planning and decision-making process within the Municipality.*" JBER, when separate as EAFB and FRA, is a member of this planning group and became a signatory to the 2000 MOU Regarding a Comprehensive Wildlife Management Plan, Living with Wildlife in Anchorage: A Cooperative Planning Effort for Anchorage, Alaska (FWS70181-9-K235). Other key signatories include ADF&G, the Municipality of Anchorage, USFWS and other land and natural resource management agencies.

4. LAND MANAGEMENT UNITS

4-1 Land Acquisition and Ownership Issues

Joint Base Elmendorf Richardson was established through the BRAC process and combined land and facility management of EAFB and FRA installations under the responsibility of the 673 ABW. The area previously known as EAFB was acquired by the War Department through Executive Orders (EO), Public Land Orders (PLO), and land bought outright from private landowners and homesteaders from 1939 through 1945 (Appendix C). In 1950, through a General Order, the area was transferred from the Department of the Army to the Air Force and was named Elmendorf Air Force Base. EAFB was the original headquarters for the Army before it moved to its present location on FRA.

Lands acquired through EO or PLOs are still public domain lands retained by the Department of Interior under the management of the BLM. Lands acquired from private landowners and homesteaders, or Fee Simple lands are considered the property of the Air Force (Figure 4). For details on land acquisition, see Appendix C.

4-2 Military Land Uses

Military land use defined primarily can be separated into two broad groups: urban areas and training areas. Urban areas include most of the developed areas on an installation. Training areas also can be separated into two broad categories – maneuver training and weapons training. Maneuver training is conducted primarily in training areas. 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 has land-based requirements. Weapons training occurs primarily on firing ranges, and munitions from firing ranges land in surface danger zones or impact areas. Descriptions for each military land use category are listed in Table 1.

Table 1. Military land use descriptions.

General Land Use Type	Primary Military Land Use Category	Secondary Military Land Use Category	Description
Urban Areas	Cantonment Area		The area where most of the buildings are located, including buildings for office use, indoor training facilities and housing for military and their families.
	Recreation Area		Areas are designated as recreation areas when recreation use is the primary land use. Examples include Otter Lake Recreation Area and the Moose Run Golf Course.
	Ammunition Storage		Ammunition storage areas are off-limits areas where ammunition is stored. These areas are typically fenced off and are not compatible with other land uses.
Training	Weapons	Firing	Ranges are semi-permanent or permanent facilities for weapons

Areas	Training	Ranges	firing, demolition, assault courses, or other specific training, usually with associated buildings or berms. This includes firing ranges, assault courses, urban assault areas, etc. Firing ranges are areas, which are controlled and restricted for firing live ammunition from direct fire or line-of-sight weapons systems at targets within a controlled area. Typically, a range has left and right boundaries, which extend from the firing line forward to just past the last target array. Training ranges are normally reserved and equipped for practice and qualification in weapons delivery and/or shooting at targets. Further, training ranges constitute a functional complex that normally includes a Range Control tower with associated firing points, lanes or pits, a cleared or graded area, target system emplacements, and a firing flag and flagpole, in addition to equipment-in-place such as target control systems, target systems, targets and fixed PA 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.
		Non-Dudded Impact Areas	A surface danger zone or a non-dudded impact area is an area that has designated boundaries within which ordnance that does not produce duds 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 will detonate or impact. Vehicle bodies are sometimes placed in the area to act 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.
	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 assigned area, relocating/establishing new area of operations, trail construction, mobility and counter mobility operations, reducing obstacles with equipment, and constructing obstacles with equipment.
		Bivouac Areas	Bivouac areas are areas where units stop together for a period of time. Most often, bivouac areas are semi-open to semi-closed areas where the units “camp out.” Activities conducted in bivouac areas are assembly area operations, combat service support operations, and unit security and defense operations.
		Foot Use Areas	Foot use areas are areas that show little or no impacts from military use. Units are on foot and are conducting movement to contact and land navigation.
		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.

		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.
		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.
		Road Corridors	Road corridors are defined as semi-permanent or permanent access ways (including ditches and the open right-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.

4-3 JBER-Elmendorf Management Units

Land management units (LMU) for JBER will duplicate the previously established LMUs for EAFB and FRA until a uniform system of LMUs is adopted. LMUs on EAFB were based loosely on watersheds with consideration to topography, land use patterns, ownership, roads and physical features. In some cases, compromises and minor adjustments were made to produce a boundary that could be physically found on the ground to make operations and enforcement easier (Figure 5). These LMU may have areas within them that will require special considerations or unique management activities. Eight LMU were recognized on EAFB. These units and their primary management activities are listed and described in Table 1.

4-3a LMU 1 or EOD Creek Watershed

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

Table 2. Descriptions of JBER-Elmendorf land management units, including watersheds, ownership, acres and main uses.

Area #	Description	Watershed	Ownership / Jurisdiction	Acres (est.)	Main Use
1	EOD Creek	EOD Creek	BLM – 100%	779	Natural Area
2	Sixmile Creek/lake	Sixmile Creek	AF – 45% BLM – 55%	2,662	Military Use, Wildlife Habitat, Recreation
3	Kettle Lakes	Kettle Lakes	AF – 92% BLM – 8%	2,917	Recreation, Wildlife Habitat
4	East Moraine	Sixmile & Ship Creek	BLM – 99% AF – 1%	1,387	Woodlot, Wildlife Habitat, Gravel Extraction
5	Outwash Plain	Ship Creek	BLM – 93% AF—7%	1,266	Gravel extraction, Wildlife habitat
6	Ship Creek	Ship Creek	BLM – 90% AF – 10%	2,470	Housing, Golf Course, Hospital & Military Mall
7	Main Cantonment Area	Cherry Hill Ditch & Ship Creek	BLM – 70% AF – 30%	3,348	Airfield & Main Base
8	Coastal Mudflats	EOD, Six-Mile, & Ship Creek	State – 50% AF – 50%	6.6 miles	Wildlife Habitat & Recreation

4-3b LMU 2 or Sixmile Creek/Lake

LMU 2, or Sixmile Creek/Lake, is south of LMU 1 and surrounds Sixmile Lake and includes the 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. This area is a travel corridor for moose, bear (brown and black), and wolf. The area is important as for moose calving. Sixmile Creek supports salmon runs through June and July and Upper Sixmile lake shorelines provide spawning habitat 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 LMU 2 is easy, with numerous maintained roads hiking trails, cross-country ski trails, All-Terrain Vehicle (ATV)

trails, snowmobile trails and a floatplane landing strip on Lower Sixmile Lake. This area supports a high degree of recreational use, from boating, fishing, moose hunting, and snowmobile trails. 673d Forces Support Squadron, Community Services Flight (FSC), 381st Intelligence Squadron and 611th Air Group maintain rental lodges along Lower Sixmile Lake. Within this LMU the Air Force 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.

4-3c LMU 3 or Kettle Lakes/Moraine West

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

4-3d LMU 4 or Moraine East

LMU 4, or Moraine, is east of LMU 3 and south of LMU 2b. The south boundary is Declaration Drive and the north boundary is the ridgeline south of Sixmile Lake. Vegetation for LMU 4 is a mix of alder and birch. Besides being a corridor for bear movement, this area is highly used by moose for browse. Access is easy with several maintained unpaved roads. LMU 4 is used for snowmobiling and other ATV activities. Moose hunting is also allowed in this area.

4-3e LMU 5 or Outwash Plain

LMU 5 or Outwash Plain is located south of LMU 4, east of LMU 7 and north of LMU 6. The North Boundary is Declaration Drive, the western boundary is Talley and Vandenberg Avenues and the southern boundary is the JBER power line corridor. The LMU name is the result of the historical glacial and riparian outwash from Eagle River glacier. The resulting soils and gravel base create conflicting roles for this area. It has less than a 3 degree slope making it attractive for development; the airfield was constructed on the western extent of this landform. The soils and drainage characteristics are ideal for aspen, willow and birch growth, when the spruce component is removed. This characteristic has prompted several mitigation activities to enhance wildlife habitat, for moose and hare specifically. 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 5 years, have expanded rapidly. A past gravel extraction site became a landfill in the southern half 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 evapo-transpiration cover. The landfill cover will also serve as mitigation for habitat lost in the development of private sector financed family housing in LMU 6. Clearing of trees and brush is occurring near the edge of this LMU where it joins with LMU 7, due to safety considerations for the flight line. The Alaska Railroad and the Davis Highway pass through

the central portion of this unit. This LMU also serves as an important corridor for wildlife that passes between the Ship Creek corridor and the northern part of the base. The ongoing brown bear study has strongly highlighted the importance of this LMU for brown bear movement. Heavy moose traffic is also obvious. Recreational activities are limited by the munitions storage units located in and near this LMU. Moose hunting, a travel corridor for snowmachines and a remote-control aircraft strip are located in this LMU. The primary activities for this area are vehicle transportation, munitions storage, habitat mitigation, gravel extraction, fire fighting training facility, and wildlife movement corridor. This area may also serve to meet future expansion of the airfield runway.

4-3f LMU 6 or Ship Creek

LMU 5, or Ship Creek management unit, is located south of LMU 5 and southeast of LMU 7. This management unit has recently been extensively developed. 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 ADF&G, provides the fish that are used to stock many of the base's lakes. Moose and bear are often seen in this management unit, along with beaver and fox. Moose use this area heavily in the winter. Although this area has portions developed or cleared of natural vegetation, it remains a heavily used movement corridor for wildlife. Wildlife 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 (RV), moose hunting (restricted areas), and fishing. Most of the military activities in this area consist of the supporting facilities, such as the hospital complex, joint military mall, extensive private sector financed family housing, and other support buildings and facilities.

4-3g LMU 7 or Main Cantonment Area

LMU 7 is the main cantonment area, which is mostly developed, having little wildland remaining. The pockets of wildland remaining are important in reducing human/animal conflicts by giving wildlife a safe place to retreat. The loss of these pockets near in-flight kitchen and 90th, as well as extending the clear zones, has the potential for increasing conflicts. The airfield, supporting buildings, housing and recreation areas dominate the 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.

4-3h LMU 8 or Coastal Mudflats

LMU 8, or the Coastal Mudflats LMU, is a long narrow area that follows the coast. Beach area that is below the mean tide is state land, which leaves approximately 6.6 miles 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 Endangered Species Act, Marine Protection, Research and Sanctuaries Act, the Coastal Zone Management Act, the Marine Mammal Protection Act of 1972, and the Rivers and Harbors Act of 1899. Additionally, the Air Force Instruction 32-7064 directs bases with coastal or

marine properties to enter into an agreement with the Coastal America National 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. This area is the least disturbed of the LMU and 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. CIBW are often sighted off shore, especially salmon runs. Killer whales have been reported infrequently in Upper Cook Inlet and are likely to 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 in this area because of treacherous mudflats and the strong and fast moving tides except that fishing at the mouth of Sixmile Creek occurs during salmon season. Recreational boat launching is not allowed.

4-4 JBER-Richardson Management Units

4-4a Integrated Training Area Management Program

In managing the training areas on JBER the Army recognized that training to doctrinal standards under realistic combat conditions would 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 Integrated Training Area Management program serves the overall needs of the Army. The Integrated Training Area Management program essentially acts as an ongoing mitigation program for Army maneuver training activities. It is the Army's formal strategy for focusing on sustained use of training lands, and it provides the Army with the sound planning and execution mandatory to protect Army land as an essential asset for training. The integration of stewardship principles into training land and conservation management practices ensures that the Army’s lands remain viable to support future training and mission requirements.

As part of the Integrated Training Area Management program USAG-AK developed a hierarchical classification system (termed environmental limitations overlays) for use with existing military installation maps to inform Soldiers and units where, when and how military operations can be conducted. These classifications are applicable to all Alaska Army training lands and are used by military units and Range Control when making scheduling decisions. These overlays serve as the primary guide in regulating and minimizing surface disturbance from maneuver and general military training in the field. USAG-AK is also conducting soil and water quality monitoring in impact areas to identify and detect if any munitions residues are moving out of impact areas. Preliminary data from these studies suggests that munitions residues are not moving out of impact areas through surface water, groundwater, wind-blown soils or wildlife.

FRA ITAM info available at these sites:
http://www.usarak.army.mil/Conservation/ITAM_Downloads.htm
and section B2.9 in:
http://www.usarak.army.mil/conservation/INRMP_Final/USAGAK_INRMP_07-11_volume_II_annex_B_watershed_and_wetlands.pdf

5. PHYSICAL ENVIRONMENT

5-1 General

JBER is located within the Municipality of Anchorage in south- central Alaska (latitude/longitude: 61 degrees 15 minutes N/149 degrees 42 minutes W). It is bordered on the east by the MoA community of Eagle River and Chugach State Park, on the south by the BLM Campbell tract/and The MoA's Bicentennial Park, and on the north and west by the Knik Arm of Cook Inlet and the Muldoon community (Figure 2). The base is strategically located at the air crossroad connecting the United States with the Pacific Far East and Europe. The Glenn Highway to the north and the Seward Highway to the south connect JBER to other road accessible portions of Alaska. The base also is served by the Alaska Railroad that passes through the installation as it runs from Seward to Fairbanks. Along both the Glenn Highway and the Alaska Railroad, critical utility lines run between Anchorage and the areas to the north.

5-2 Climate

5-2a 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 1600 meters. The base is situated in a transitional zone between the maritime climate effects to the south, and the interior or continental climate zone to the north. The principal factors affecting the climate of the base include terrain, latitude, altitude, and proximity to oceans. The coastal mountains to the south act as a barrier to the maritime influences of the northern Pacific Ocean, while the Alaska Range to the north and west protects the area from the extreme cold air masses of the interior region. The proximity of Cook Inlet also provides additional temperature effects on the climate. A summary of temperature, precipitation, and surface winds averages for the period 1941 through 1991 are presented in Table 2.

5-2b Temperature

Seasonal variations in temperature at JBER are a function of latitude, geomorphology and oceanic influences. JBER has subfreezing temperatures that usually lasts from mid-October to mid-April. The spring is marked by the ice "break-up" starting in mid-April, and lasting until June, characterized by a rapid rise in temperature. Summer lasts from June to early September, and average monthly high temperatures range from 43 to 65 degrees Fahrenheit (°F) in the summer, with the highest monthly average of 58 °F occurring in July. Autumn on JBER is brief, lasting from about mid-September to mid-October. Low average monthly temperatures range from 5 to 29 °F, with the lowest monthly average of 12 °F occurring in January. High-pressure weather systems during this period may lead to successive days with temperatures below minus 35 degrees Fahrenheit (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.

5-2c Precipitation Patterns

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

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

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

5-2d 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 base from Cook Inlet. In winter, these winds are more likely to blow south along Knik Arm. Surface wind velocities average about four knots, although wind velocities of 70 knots have been recorded in the Anchorage area. Channeling of the winds near Ship Creek is common with gusts reaching 53 knots. Prevailing winds come from the west in summer and from the north and northeast in winter. Average wind velocity is six miles per hour (mph). Channeling of south and southeasterly winds passing over the Chugach Mountains, during low-pressure systems, can lead to "chinook" wind gusts up to 100 mph. These gusts can inflict significant property damage (Gossweiler 1984).

5-2e Global climate change

According to a number of scientists, the effects of global warming are already taking a toll in Alaska. Damage to forests, loss of wetlands, degradation of salmon habitat, rising ocen

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 Fort Richardson are subject to seasonal freezing, thermokarst (melting of permafrost) is not a major problem in JBER lands 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 Professor, Glenn Juday, have found clear indication that normal cycles of forest growth changed dramatically starting in the early to mid 1970s. The studies also show that the forests have been experiencing stresses since then, often involving complex interactions of different effects of warming that have no precedent in the historical record. However, spruce bark beetle (*Dendroctonus rufipennis* [Kirby]) infestations reached epidemic proportions during the 1990s 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 9 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 the affected areas.

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 changes. The influence of rising ocean levels is likely to be seen first in the Eagle River Flats impact area.

The effects of climate change on JBER natural resources will be monitored and compared to trends in Alaska. Diligent efforts will be made to anticipate their future impacts on the military mission for planning purposes.

5-3 Geology/Topography

5-3a Geological/Seismological History of Area

JBER lies primarily within a lowland area that is part of the Cook Inlet-Susitna Lowlands, a physiographic province within the Pacific Mountain System and JBER includes a portion of the west face of the Chugach Mountains. The Cook Inlet-Susitna Lowlands cover an extensive area, part of which is submerged by the waters of Cook Inlet.. The area is bordered on the west by the Alaska Range, on the east by the Kenai and Chugach Mountains, and on the north by the Talkeetna Mountains. The Pacific Mountain System runs in an arc from southeastern to south-central Alaska and includes the Alaska Peninsula and Aleutian Islands to the west. The Anchorage area is also bordered by two fault systems: the Bruin Bay-Castle Mountain fault system to the west, and the Border Ranges fault system running parallel to the base of the Chugach Mountains. JBER is in a tectonically active region that has experienced numerous earthquakes (nine seismic events exceeding 8.0 on the Richter scale within the last 85 years) and volcanic eruptions (including Mount Spurr, Mount Augustine, and Mount Redoubt) since 1954.

Regional bedrock does not outcrop within the base, but is exposed along the flanks of the Chugach Mountains, where the bedrock generally consists of a consolidated, complex mixture of metamorphosed sedimentary and igneous rocks deposited during the late Paleozoic and Mesozoic Eras. A unit of moderately consolidated sedimentary rocks (the Kenai Group)

overlies these rocks, up to 20,000 feet thick, which filled a gradually sinking trough in the Cook Inlet-Susitna Lowlands during the Tertiary Period of the Cenozoic Era. The Kenai Group is found extensively throughout the lowlands, but is covered by unconsolidated deposits on the base. The Mesozoic and Cenozoic deposits form the bedrock underlying the base. By definition, bedrock must consist of consolidated deposits; at JBER, it is characterized by low permeability.

5-3b Topography

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 (Figure 6).

5-3b(1) Elmendorf Moraine

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

5-3b(2) Ground Moraine

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

5-3b(3) Outwash Plain

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

5-3b(4) Chugach Mountains bedrock

The Chugach Mountains are the visibly dominant geological feature of JBER rising from the Anchorage plain to 5,200ft. On JBER the Chugach Mountains are composed of both metamorphic and sedimentary rock formations, more prevalent along the Border Range Fault. (More details are available in *Integrated Natural Resources Management Plan 1998-2003 U. S. Army Alaska, Volume 2 – Fort Richardson*. U. S. Army Alaska 1998.)

5-4 Soils

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

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

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

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

Major soil series occurring on JBER-Richardson are taken from the Soil Conservation Service (now known as the Natural Resources Conservation Service) study (Soil Conservation Service, 1979).

Homestead series: Homestead silt loam is the most common type of soil on the post. It is a shallow, well-drained soil formed in loess over very gravelly drift on moraines and outwash plains. Terrain varies from level, to rolling, to strongly sloping. Permeability is moderate to moderately rapid. Runoff ranges from slow to very rapid, and the erosion hazard is slight to severe.

Purches series: This moderately well drained to somewhat poorly drained silt loam is found on muskeg borders and slight depressions in glacial moraines. It has a surface layer of black silt loam and a subsurface layer of gray silt loam. The subsoil is mottled dark brown and the substratum grayish brown. It was formed in glacial till. Terrain is smooth to moderately sloping. Permeability is moderate to moderately slow in the more compact till. Available water capacity is low, and erosion hazard is low to moderate.

Kasilof series: This excessively drained silt loam is found on outwash plains and stream terraces. It was formed in a thin mantle of loess over very gravelly alluvium. The surface layer is dark gray silt loam. Subsoil is dark brown gravelly loam, and the substratum, dark olive gray, very gravelly sand. Runoff is slow to rapid, and erosion hazard is slight to severe. This soil series is a potentially severe threat for flash flooding.

Jacobsen series: This very stony silt loam is poorly drained and found in small valleys, shallow depressions, and low-lying areas bordering muskegs. It was formed in very stony glacial till. A typical soil profile has a peaty surface mat covering a black, very stony silt loam layer. Stones and cobbles make up about 40 percent of the volume, and gravel makes up about 20 percent. The water table is normally less than two feet below the surface. Permeability is moderate, and erosion hazard slight.

Doroshin series: This soil series is comprised of peat over a substratum of dark greenish gray silt loam. It is poorly drained and found in muskeg borders and depressions in glacial moraines. Permeability is moderate. Runoff is very slow to moderate, and erosion hazard slight.

Salmatof series: This soil is comprised of dark reddish brown coarse peat materials. It is very poorly drained and occurs in broad basins and depressions. The water table is usually near the surface.

Tuomi series: This silt loam soil is well drained and occurs on low moraines. The soil consists of silt loam over sandy loam and has moderate permeability. Runoff is slow to medium, and hazard of erosion slight to moderate.

Slikok series: This soil is a mucky silt loam occurring in valley bottoms and low areas around lakes or muskegs. The soil has a peaty surface layer. Terrain is nearly level. The soil has a

high water capacity and a moderate permeability. Surface runoff and erosion hazard are moderate.

Caswell series: This series consists of coarse silt loam formed in silty and sandy water laid sediments over gravelly sand. It occurs on low terraces and in broad depressions. Water capacity is moderate, and permeability moderate to rapid. Surface runoff is slow, and erosion hazard is slight. The water table is normally two to four feet below the surface.

Clam Gulch series: This series consists of deep, poorly drained silt loam that occurs in flood plains and in depressions in glacial moraines. It has dark silt over gray sediments that are high in clay. Water capacity is high, and the water table is often near the surface. Surface runoff is slow to rapid, and erosion hazard is slight to severe.

Chena series: This series consists of sandy-skeletal silt loam that is excessively drained. It occurs in alluvial fans and flood plains. The substratum contains 35 to 50 percent gravel and up to 10 percent cobbles. Permeability is moderate to rapid, and water capacity is low. Surface runoff is slow, and erosion hazard is slight.

Niklason series: This series is characterized by coarse silt loam occurring on flood plains and broad low-lying stream terraces. Soil is dark grayish brown silt loam and fine sand over gravelly sand. Water capacity is moderate to low, and permeability is moderate to rapid. Surface runoff is slow, and erosion hazard slight. This soil is susceptible to flooding, but is a good source of sand and gravel.

5-5 Hydrology

5-5a Watersheds

The major watersheds or drainage systems on JBER are Ship Creek, Eagle River, Chester Creek, Fire Creek, Cherry Hill Ditch Campbell Creek, Sixmile Creek, EOD Creek, and Moonshine Creek (Figure 6). Within the Ship Creek watershed are important secoundary watersheds of McVeigh (Gunnery) Creek and Snowhawk Creek. Clunie Creek and Otter Creek are important secoundary watersheds within the Eagle River Watershed.

5-5a(1) Ship Creek.

Ship Creek is a fourth-order stream, which empties into the Knik Arm. From its headwaters in the Chugach Mountains east of JBER, Ship Creek flows through the installation for a distance of 13.3 miles, draining approximately 31,215 acres, the largest watershed on JBER (Figure 6). As it exits JBER the channel is approximately 20 feet wide, 2 feet deep, with an average three percent fall over a rocky/gravelly bottom. The average stream flow is 144 cubic feet per second (cfs), but varies greatly over the year, with highs occurring in the spring and lows in the late winter. Due to the porous nature of the gravel substrate, portions of the channel show no surface flow during winter low flow periods. The creek loses water over some stretches and gains water over others, with most of this gain taking place on the lower stretches before leaving the installation. Flooding has occurred twice in recent years. Both times it has resulted in extensive damage to channelization structures along the 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 last five years, a 50-year flood event occurred during September rains.

As Ship Creek enteres 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.

The JBER-Richardson High dam on Ship Creek forms a sizable reservoir, which provides all the potable water for JBER and nearly half 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 new golf course constructed in 1997 has reduced the riparian vegetation associated with the creek. More importantly, the "high dam", constructed in 1952, has, and 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 over the years. The creek bottom from Cottonwood Park to the decommissioned Central Heat and Power Plant has been channelized and the north bank has been stabilized to prevent erosion. Near the power plant is a low dam and intake pond that supplies water for power plant operation. West of the Fort Richardson Fish Hatchery is a cooling pond, which empties into Ship Creek. The fish 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 in the hatchery. A bridge carrying a steam line crosses Ship Creek about a half mile downstream from the hatchery. The remainder of Ship Creek to the Eagleglen Golf Course is for the most part in a natural condition and has not been disturbed. Through Eagleglen GC portions of the bank have been reinforced over the years with rip-rap, asphalt and concrete slabs, creosote boards and in some stretches gravel filled drums are reappearing on the banks. 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 watershed of 6,545 acres and a stream length of 7.5 miles and Snowhawk Creek watershed of 6,700 acres and a 7.0 mile length. McVeigh Creek watershed supports the small arms range complex while Snowhawk Creek supports high elevation troop maneuvers.

5-5a(2) Eagle River

Eagle River flows northwest 8.2 miles through JBER (Figure 6). The overall watershed of Eagle River within JBER is 18,754 acres. The 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 3,600 cubic feet per second (CH2M Hill 1994b).

Upstream of JBER, the Eagle River passes through the community of Eagle River. From there the river flows into the northwestern portion of the post and through the Eagle River

Flats tidal marsh before it empties into the Knik Arm of Cook Inlet (CH2M Hill 1994b). In winter, the Eagle River is a clear stream with excellent 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 1994b).

Notably, the Eagle River Flats impact area is within this drainage as Eagle River transitions into tidal influences of Knik Arm. Clunie Creek watershed of 3,317 acres and Otter Creek watershed with 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 morrains northeast of Eagle River Flats.

Otter Lake, an important recreational lake is south of Eagle River Impact Area (Figure 6) and is a tributary drainage of Eagle River. Otter Lake and Sixmile Lake are fed primarily by springs from a common aquifer. 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 for several decades inhibiting anadromous fish from entering the lake

5-5a(3) Chester Creek

Chester Creek, located on JBER south of the Glenn Highway, is the third largest watershed on the installation, draining approximately 8,088 acres and fourth longest with almost 7.0 miles of stream (Figure 6). Chester Creek originates on the west 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).

5-5a(4) Fire Creek

Fire Creek is the fourth largest watershed on the installation, encompassing approximately 5,120 acres on the extreme north end of JBER (Figure 6). While none of Fire Creek streambed is within the JBER boundary this watershed covers important training areas. The Fire Creek watershed for purposes of this plan includes minor drainages that flow directly off the bluff into Knik Arm between Fire Creek and Eagle River.

5-5a(5) Cherry Hill Ditch

Cherry Hill Ditch is a storm drainage system that receives flow from the developed portions of the original Elmendorf cantonment area (2,912 ares), including the flightline. It has a maximum flow of 3 cfs after heavy rains, but is normally less than one cfs. Flow is year round, but minimal during the winter.

5-5a(6) North Fork Campbell Creek.

Approximately one mile of North Fork of Campbell Creek actually flows through the very southern portion of JBER just north of the Stuckagian Heights subdivision outside the border (Figure 6). The upper reaches of the drainage to include Long Lake are also within the JBER boundary, creating a total watershed of 2,781 acres. Campbell Creek is an important anadromous stream for the Anchorage bowl.

5-5a(7) Sixmile Creek

Sixmile Creek located in western JBER flows into Knik Arm has a watershed encompassing 2,326 acres (Figure 6). 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 south side of Upper Sixmile Lake. Average flow of the system is 3 cfs and varies no more than 0.5 cfs between winter and summer. The stream is 5 feet wide and 10 inches deep, with an average three percent fall over a rocky/gravelly bottom. A portion of the stream channel flows through a bog and has a substrate of peat and silt in this area. This system is the primary focus for wetland mitigation through fisheries and shorebird enhancement projects.

5-5a(8) EOD Creek

EOD Creek has a small watershed draining approximately 1,500 acres (Figure 6). It consists of one mile of stream channel, originating from seeps in a bog wetland area. The summer flow rate has been estimated at approximately 0.75 cfs. The stream substrate alternates between silt, gravel, and organic peat deposits.

5-5a(9) Kettle Lakes

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

5-5a(10) Moonshine Creek/Green Lake

Green Lake and its outflow, Moonshine Creek, drain into Knik Arm south of the Sixmile Creek drainage (Figure 6). Moonshine drains approximately 696 acres.

5-5b Wetlands and Riparian Areas

5-5b(1) Freshwater Lakes and Ponds

On JBER there are a total of 32 natural and man-made lakes and ponds, of one acre or larger in size, with the largest 123.9 acres in surface area. Sixteen of these are managed for their wildlife or recreational value and most will be discussed in more detail later in this INRMP. There are numerous ponds on the installation less than one acre in size and others that are only seasonally flooded. They provide varying amounts of wildlife habitat but are not actively managed.

5-5b(2) Wetlands

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

For complete discussion of wetlands on JBER Richardson portion see the Integrateed Natural Resources Management Plan 1998-2003, Vol. 2 – Fort Richardson.

5-5b(3) Salt Water

The Knik Arm of the Cook Inlet borders JBER on the west and north for approximately 20 miles. JBER Elmendorf has eight miles of saltwater shoreline and JBER Richardson has about 12 miles. Water is generally shallow and murky, and tides in this area are extreme, creating a tidal zone with minimal vegetation, with the exception of the Eagle River flats.

5-5c Sub-Surface Water

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

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

The deeper confined aquifer is found under the entire base and generally flows west, from the Chugach Mountains to the Knik Arm. 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 the demand. The Municipality of Anchorage, bordering JBER, uses water from this aquifer for various services including industrial, commercial, domestic, and public supply.

6. ECOSYSTEMS AND BIOTIC ENVIRONMENT

6-1 Ecosystem

JBER lies within the Cook Inlet Lowlands section of the Coastal Trough Humid Taiga Province of Bailey's eco-regions of the United States. JBER also 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. There are three physiographic zones of vegetation and plant habitat found on the base.

a) Coastal Halophytic Zone: Comprised of the shoreline and intertidal flats along Cook Inlet.

b) Lowland Interior Forest Zone: Lowland boreal forest found to 1500 feet elevation. Mesic to dry forest types include birch (*Betula papyrifera*) forest, white spruce (*Picea glauca*), quaking aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*), and mixed birch-spruce forest. Wetlands include black spruce (*Picea mariana*) and tree-less bogs with graminoid forbs. Alder (*Alnus spp*.) is the dominant shrub community.

c) 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.

d) 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 snowbeds.

e) Artificially Cleared or Disturbed Area Zone: Includes main cantonment area and airfield, roadsides, rights-of-way, pipelines, moose mitigation areas, etc.

6-2 Vegetation

6-2a General Description

Natural vegetation in the region is a transition between the Pacific Coast, western hemlock (*Tsuga heterophylla)* -Sitka spruce forest *(Picea sitchensis*) and the interior boreal forests of white spruce, paper birch, and aspen (Figure 7). The species associations of base forests are similar to those of the Interior, but are less modified by fire due to the wetter maritime climate of the area. Of the 476 vascular plant species known to occur in the Anchorage area, 221 are found on JBER-Elmendorf. A 1994 floristic inventory of the Fort Richardson portion of JBER (Lichvar and Racine, 1995), sampling from six areas and 98 collection sites produced 561 vascular plant species. The inventory also found 19 hepatics, 112 lichens, and 108 mosses. The Elmendorf survey identified only fifteen major lichens and mosses to genus and/or species. Floristic inventories on JBER identified no threatened or endangered species nor species that have been proposed as candidates for listing.

Vegetation types for JBER- Elmendorf are listed below in Table 4 and the current list of species is found in Appendix E. JBER-Richardson species can be found in *Floristic Inventory of Vascular and Cryptogam Plant Species at Fort Richardson, AK*. (Lichvar and Racine 1995).

Table 4. A Summary of Vegetation Types for JBER-Elmendorf (only) as of 2001.

Type No	Class	Vegetation Type	Vegetation Description	Percent Cover	Area (Acres)
1	Forest	Black spruce	Closed needleleaf forest	9.1	972
2		White spruce	Closed needleleaf forest	3.6	384
3		Black spruce	Open needleleaf forest	2.8	299
4		Birch	Closed broadleaf forest	5.3	566
5		Balsam poplar	Closed broadleaf forest	3.3	352
6		Birch	Open broadleaf forest	.3	32
7		Upland Forest Regeneration	Broadleaf woodland	3.0	320
8		Old-growth birch-white spruce/alder	Closed mixed forest	7.4	790
9		Old-growth birch-white spruce	Closed mixed forest	17.0	1858
10		Young birch-white spruce	Closed mixed forest	16.6	1815
12		Floodplain black cottonwood-white spruce	Closed mixed forest	.3	32
13		Aspen-white spruce	Closed mixed forest	.6	64
14		Old-growth birch-white spruce/alder	Open mixed forest	2.1	224
15		Aspen-white spruce	Open mixed forest	2.0	214
16		Flood plain black cottonwood-white spruce	Open mixed forest	2.1	224
17		Aspen-white spruce	Mixed woodland	.2	21
18	Dwarf tree	Black spruce	Open dwarf tree scrub	1.0	107
19		Black spruce	Dwarf tree scrub woodland	.9	96
20	Tall shrub	Alder	Closed tall shrub-scrub	13.9	1485
21		Alder/upland forest regeneration	Open tall shrub-scrub	1.3	139
22	Low shrub	Ericaceous shrub or sweet gale	Open low shrub-scrub	.7	75
23	Moss	Sphagnum	Bryoid moss	.8	85

Type No	Class	Vegetation Type	Vegetation Description	Percent Cover	Area (Acres)
24	Sedge-Grass	Bog bean-marsh five-finger	Wet forb	.3	32
25		Sedges – bluejoint grass	Mesic graminoid herbaceous	1.8	192
26		Sedges- bluejoint grass	Wet graminoid herbaceous	.8	85
27	Rooted floating aquatic		Freshwater Aquatic Herbaceous	.1	11
28	Coastal mud			1.1	117
OW	Open water			2.4	256

6-2b General Description of Forest Vegetation Types

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

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

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

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

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

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

(6) **Cottonwood and Balsam Poplar Type.** These types are found on poorly-drained soils especially in the flood plain areas (cottonwood) or in certain upland areas (poplar). It can occur as an early stage in the development of white spruce forest.

(7) **Ground Cover.** Associations of devil's club (*Echinopanax horridum*), cow parsnip (*Heracleum lanatum*), and blue joint grass (*Calamagrostis canadensis*) are the most common ground cover types found in base forest stands. Older stands have large components of devil's club and cow parsnip, while young stands have a larger proportion of grass. Several edible berries are also present in the ground cover, including bunchberry (*Cornus canadensis*), American red current (*Ribes triste)*, high bush cranberry (*Viburnum edule*), and lowbush cranberry (*Vaccinium vitus-idaea*). Detailed descriptions of understory plant components can be found in the 1983 Natural Resources Inventory (Rothe, et al. 1983) and in the Long Term Vegetation Monitoring Plots (LTVMP) report (Tande et al 2001).

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

(9) **Wetlands.** Wetlands on JBER include brackish and freshwater marshes, bogs, lakes and ponds, and riparian areas. Wetland vegetation types include open water, emergent vegetation, aquatic bed, and shrub types. Wetland types include wet herbaceous forbs, mesic and wet graminoid forbs, bryoid moss, and freshwater aquatic herbaceous types (Table 4). A re-inventory of JBER-Elmendorf wetlands was conducted in 1995 which has allowed species lists to be updated in Appendix E.

(10) **Disturbed areas.** Disturbed areas include abandoned and in-use antenna fields, power-line and railroad rights-of-way, the main cantonment area, and the area adjacent to the airfield. Antenna fields in particular have been largely taken over by alder, and to a lesser extent, blue joint grass, to the exclusion of other tree and shrub species. The area around the airfield is in the process of being converted from current grass types to beach rye and blue joint grass. Disturbed sites are most susceptible to introduction of invasive vascular species and are thus the focus of invasive species inventories (HDR Alaska, Inc. 2007).

6-2c Specialized Vegetation Components

6-2c(1) Old Growth Forest

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

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

Old growth stands are concentrated in the mid to northern portions of the JBER-Elmendorf (Figure 8). Virtually all upland areas north of Sixmile Lake are comprised of old growth stands. Significant old growth also occurs in the Knik Bluff area. Most old growth areas are in an advanced state of decline, due to age as well as mortality due to bark beetle attack in the case of white spruce. Canopies are open, and the understory and openings are largely composed of alder and blue joint grass

6-2c(2) Rare and Threatened and Endangered Plants

No threatened and endangered plant species are known to occur on JBER.

Lipkin, R (2001) reported that five vascular plants that are considered 'rare' in Alaska were found during a recent floristic survey. Though rare in Alaska, Lipkin noted that these 5 species are more common globally, and they are not recognized by ADF&G as species of special concern (Table 5). 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*) found in the small salt marsh recently filled by the POA; 4) pod grass (*Scheuchzeria palustris*) found in several of the base's bogs and fens; and 5) saltmarsh bulrush (*Scirpus maritimus*) also found in the small salt marsh recently filled by the POA. The loss of two of these species to POA expansion is of concern. Their loss was not identified in the Environmental Assessment (EA) for the project.

A comprehensive survey of rare and endangered species was completed on FRA in 1995. This report indicated that no federally listed endangered or threatened plants existed on FRA (Lichvar and Racine 1995). However two alpine species 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 1998).

6-2d JBER-Elmendorf Fish and Wildlife Habitat

6-2d(1) General

Information on JBER-Elmendorf wildlife habitat is contained in the 1982-1983 Natural Resources Inventory (Rothe et al. 1983), supplemented by information obtained through observations since. Additional information and guidance is obtained from the ADF&G as required.

6-2d(2) Terrestrial Physiographic Types

Forestlands. Because forest lands on JBER are a mixture of small stands of various timber types and age classes, they have been broken down into two categories for wildlife management purposes: moraine and outwash plains. This classification relates more to the landform than the vegetation but the soils composition directly influences the vegetative cover. The understory

vegetation has a greater influence on the quality of a site for the featured wildlife species than the overstory. Maps of vegetation types are found in Figure 7.

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

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

Shrublands. The 1,510 acres in this category are found primarily on disturbed upland sites, interspersed among the various timber types. For the most part, they occur in small patches less than 10 acres in size, although there are three that exceed 100 acres each. The primary vegetation on these sites is blue joint grass (*Calamagrostis canadensis*) and thin leaf alder *(Alnus tenuifolia*). These areas provide some spring and summer habitat for moose, but produce only small quantities of winter browse.

6-2d(3) Semi-Aquatic Habitat Types - Wetlands

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

6-2d(4) Aquatic Habitat Types

Lakes and Ponds. Various species of migratory waterfowl make use of these bodies of water (Table 5) as breeding habitat, primarily loons (*Gavis* spp.), grebes (*Podiceps* spp.) mallards (*Anas platyrhynchos*) and ring-necked ducks (*Aythia collaris*). Seven of the ponds and lakes support a variety of fish species, which include rainbow trout, salmon and sticklebacks (*Gasterosteus aculeatus*). Beavers, muskrats (*Erethizon dorsatum*), and river otter (*Lutra canadensis*) make their homes on the lake shores.

Table 5. Aquatic Habitat Summary for JBER-Elmendorf only.

Lakes/Ponds/Creeks	Acres/Miles
EOD Pond	2.5 Acres
Fish Lake	4.2 Acres
Cooling Pond	7.0 Acres
Green Lake	8.7 Acres

Lakes/Ponds/Creeks	Acres/Miles
Hillberg (Tuomi)Lake	11.2 Acres
Lower Sixmile Lake	123.9 Acres
Oval (Beebe) Lake	6.1 Acres
Spring Lake	10.1 Acres
Triangle Lake	3.7 Acres
Upper Sixmile Lake	41.4 Acres
EOD Creek	0.8 Miles
Ship Creek	4.2 Miles
Sixmile Creek	1.0 Miles
Saltwater Shoreline	8.0 Miles

JBER-Richardson has 12 named lakes and ponds and several unnamed water bodies. The combined area for the named lakes and ponds is 348 acres. Five relatively large lakes, Clunie, Otter, Gwen, Thompson, and Waldon, are managed for recreational fishing. Clunie Lake (116 acres) is the largest lake on the post. It is picturesque and situated in the northern, moraine area of JBER-Richardson. It attains a maximum depth of approximately 33 feet and drains into Clunie Creek. Otter Lake covers 93 acres and is the post's second largest lake. It receives the most fishing pressure. It is fed by a small creek on its southern end and drains into Otter Creek on its northern end. It attains depths of 23 feet. Gwen Lake is small and shallow with an area of 10 acres and a maximum depth of 11 feet. It is located two miles north of the cantonment area along a well-maintained road. Due to its small size and lack of depth, it cannot support fish over winter. Thompson Lake is smaller but deeper than Gwen Lake. Its eight acres make it the smallest of the actively managed lakes on JBER-Richardson. It attains a depth of 21 feet and can support fish over winter. Waldon Lake is approximately 50 acres. It is only about eight feet deep, therefore it may not support fish during some winters. This lake is easily accessed. The other seven lakes and ponds on the post are: Chain Pond, Web Pond, Lake Kiowa, Dishno Pond, Cochise Lake, Diablo Pond, and Snowhawk Lake. Snowhawk Lake is located in the southeastern corner of JBER-Richardson and is the largest and least accessible of the seven. None of these other lakes or ponds support a fishery, except Dishno Pond which is stocked annually with catchable-sized rainbow trout for flyfishers. About 80 percent of Campbell Lake lies within JBER (Gossweiler 1984).

Streams. A total of six miles of the JBER-Elmendorf streams (Table 5) are rated as anadromous fish waters. The streams provide spawning habitat for trout as well as salmon and thus important feeding areas for bears and river otter.

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

Sixmile Creek**.** This stream presently has only one mile of channel from its origin at the outlet of Lower Sixmile Lake to the Knik Arm of Cook Inlet. Prior to the construction of the earth dams, which formed Lower and Upper Sixmile Lakes, the stream was three miles long. The creek has approximately 900 feet of excellent spawning habitat, and

another 2,000 feet of marginal spawning beds. Though the remainder of the creek has no useable spawning areas due to a muddy-sandy bottom and weed growth, it does provide excellent rearing habitat for trout and salmon. Development of the lakes in the Sixmile drainage is the reason red salmon have entered the system and increased in numbers. This species of salmon requires a lake in its spawning stream in order for fry to survive, as they spend up to three years in the lake before going to sea.

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

Otter Creek (JBER-Richardson). Lower Otter Creek on Eagle River flats area is spawning and rearing habitat for silver salmon yet a large beaver dam and the man-made structer inhibits entry into Otter Lake.

Chester Creek (JBER-Richardson) A short section of Chester Creek on JBER – Richardson is spawning and rearing habitat for silver salmon.

North Fork Campbell Creek (JBER-Richardson). The lower portion of this steam is spawning and rearing habitat for king, silver and red salmon (*Oncorhynchus nerka*).

Eagle River (JBER-Richardson). Eagle River serves as an important system for spawning and rearing of all five species of Pacific salmon.

Saltwater Shoreline. Although EAFB has eight miles of saltwater shoreline, the inter-tidal areas located along it are not significant wildlife habitat due to a lack of vegetation below the high tide line. The extreme differential between high and low tides, up to 37 feet, and the heavy silt load of water act together to keep the gravel and mud bottom well scoured. It receives only limited use by shorebirds. The 12 miles of JBER Richardson shoreline differ substantially from EAFB because of the estuarine habitat of Eagle River flats at the mouth of Eagle River, rich in shorebird and waterfowl habitat. Knik Arm is, however, used by marine mammals such as the beluga whale (*Delphinaterus leucus*) and rarely killer whales (*Orcinus orca*) and seals (*Phoca* spp.), and its shoreline on JBER is a heavily used travel corridor for brown bears (*Ursus arctos*) (Figure 12) and wolves. Fish and wildlife management on inter-tidal areas in Alaska most often falls under the jurisdiction of the ADF&G.

6-3 Fauna

6-3a Insects (Macro-invertebrates)

Little effort has been devoted to inventorying macro invertebrates on JBER. The 1982-83 surveys of natural resources by USFWS failed to document a list of macro invertebrates. A 2000 survey of Ship Creek as part of a Ship Creek Restoration Strategy Plan provided a summary of macro invertebrates collected and identified to genus, if possible. A total of 10 samples at three locations produced a minimum of 20 different taxa. (Montgomery –Watson 2001).

Butterflies were collected and identified on JBER-Richardson during summers of 2002 and 2003. While some of the collection took place in alpine habitats on FRA there is probability that many species are shared with EAFB.

Dragonflies and damsel flies have been identified as potential indicator species for monitoring lentic aquatic system health and are identified in the Alaska state action plan as needing an inventory and monitoring program. A basic species inventory along with temporal and spatial distribution is a necessity to begin a meaningful monitoring program.

6-3b Fish

6-3b(1) Pacific Salmon

All five Pacific Salmon species return to JBER streams to spawn. Ship Creek has enhanced runs of king or Chinook salmon (*Oncorhynchus tshawytsha*) and silver or coho salmon, with natural returns of chum (*Oncorhynchus keta*) and pink salmon (*Oncorhynchus gorbuscha*). Red or sockeye salmon return in small numbers to Ship Creek each year. Salmon return to the creek beginning in early June, with different species present through the end of September. Sixmile Creek has natural runs of four salmon species, with reds and pinks comprising the bulk of the returning fish, followed by silvers and infrequent chums. Although kings have been reported the viability of the run of kings is suspect, as they have been rarely detected in recent years. This may mean the species are present only as pioneers. The run of silvers is small, with typically less than 200 fish annually. Reds 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 since weir operation from 1988 to present has been 663-4,282. The average sockeye escapement during 2002-2006 was 1,900. EOD Creek has some silver salmon, but the extent and viability of the run is unknown.

Eagle River and its tributaries support habitat for all five species of pacific salmon, however details of their run size is not well documented. Campbell and Chester Creeks both support silver salmon, and king and sockeye salmon both spawn in Campbell Creek within JBER boundaries.

6-3b(2) Rainbow Trout

Rainbow trout (*Oncorhynchus mykiss gairdneri*), are found in twelve JBER lakes, either as naturally occurring populations or as the result of past stocking programs. The majority of stocked fish are caught during their first summer in the lakes, but those that survive can reach substantial size after several years. The base record for rainbow trout is 11 pounds and 4 ounces. The 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 rainbows and arctic char are present in Ship Creek. Native trout and char are also found in Eagle River and its tributaries and in Campbell Creek and Chester Creek.

6-3b(3) Landlocked Salmon

Landlocked salmon (king, silver, or kokanee, *Oncorhynchus spp*.) are stocked in Green and Hillberg Lakes. Ice fishermen take most of the stocked fish during the winter. Some survival may occur beyond the first winter but survival level is not well documented.

6-3b(4) Other Small Fish

The three-spine stickleback is common in most base lakes, and is a major source of food for rainbow trout as well as grebes, loons and other fish eating birds. The nine-spine stickleback (*Pungitius pungitius*) and slimy sculpin (*Cottus cognatus*) also occur. The 1983 inventory also found occasional Dolly Varden (*Salvelinus malma*) in the Sixmile Lake system. Dollies have also been found in Ship Creek. Historically Arctic grayling (*Thymallus arcticus)* fry were stocked in Sixmile Lake. Survival of the species was apparently unsuccessful. The Pacific tomcod (*Microgadus proximus*) has been caught in the mouth of Eagle River and Sixmile Creek.

6-3c Reptiles and Amphibians

No reptiles are known to occur on JBER. One species of amphibian, the wood frog, exists, and is common in bogs, wetlands, and fresh and saltwater marshes. Spring chorus surveys are conducted on both portions of JBER.

6-3d Birds

A partial inventory of birds was conducted as part of the 1982-83 natural resources inventory (Rothe, et. al. 1983). Since 2002, breeding birds have been surveyed each spring using modified variable circular plot counts (Reynolds, R. T., J.M. Scott, and R. A. Nussbam. 1980) and a typical 50-stop roadside breeding bird survey (BBS) (Robbins, C.S., D. Bytrak, and P.H. Grissler. 1986). In addition breeding owl surveys and winter berry-use surveys have added to our knowledge. On JBER-Richardson a BBS and Alaska Landbird Monitoring program have documented presence and trends. A complete list of birds observed from these activates and trusted reports from the public are listed in Appendix F.

6-3d(1) Loons and grebes

Red necked grebes (*Podiceps grisegena*) are the most common type of waterbird on the base lakes. Two species of loons, common (*Gavia immer*) and Pacific (*Gavia pacifica*), successfully nest on four of the base lakes (Green Lake, Upper Sixmile Lake, Lower Sixmile Lake, and Oval Lake). Typically 3 pair of common and 1 pair of Pacific loons uses the base lakes.

6-3d(2) Waterfowl

Ducks. Mallards and ring necked ducks are the most common 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.

Geese. Canada geese (*Branta canadensis*) were once common on JBER, particularly during the spring and fall migration seasons, however during the period 2002-2006, 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.

6-3d(3) Shorebirds

Shorebirds are most abundant near Lower and Upper Sixmile lakes. Most abundant species include yellowlegs (*Tinga spp.*) and Wilson's snipe (*Gallinago delicata*). Spotted sandpipers (*Artitus macularia*) and semi-palmated plovers (*Charadrius semipalmatus*) are common. Sandhill cranes (*Grus canadensis*) are seasonally common at Eagle River Flats on FRA, and have been seen more regularly in JBER bogs and fens.

6-3d(4) Gulls and Terns

Gulls and terns include mew gulls (*Larus canis*), herring (*Larus argentatus*), Bonaparte's gulls (*Larus philidelpia*), and Arctic terns (*Sterna paradisaea*). The latter 3 species seem to be the more common nesters on JBER-Elmendorf. Herring gulls select roofs in the industrial areas of the base to nest. Gulls are commonly found along the saltwater shoreline in the summer, as well as the hatchery, airfield, and golf course. 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 south end of runway 16/34.

6-3d(5) Raptors

Eagles and Ospreys. Bald eagles (*Haliaeetus leucocephalus*) are year-round residents of the base, with the highest numbers and visibility occurring between May and October. The eagles make heavy use of the lakes during summer feeding on fish, and the Ship Creek drainage in the winter, feeding on ducks. At least 6 pairs nested on or adjacent to JBER in recent years. Golden eagles (*Aguila chrysaetos*) are sighted in the alpine and subalpine zones of JBER. Ospreys (*Pandion haliaetus*) are uncommon, but up to two pairs have nested on EAFB communication towers in recent years.

Hawks and Falcons. Hawks nesting on base include the northern harrier (*Circus cynaeus*), red-tailed hawk (*Buteo jamaicensis*), sharp-shinned hawk (*Accipiter striatus*), merlin (*Falco columbarius*) and the northern goshawk (*Accipiter gentilus*). At least three goshawk nesting territories have been found on JBER. A major migration corridor passes through the JBER area. Rough–legged hawks (*Buteo lagopus*) are seen commonly in migration. Peregrine falcons (*Falco peregrinus*) and gyrfalcons (*Falco rusticolus*) are infrequent migrants on JBER.

Owls. The great horned owl is common. Owl surveys conducted on EAFB during February-April typically detect great horned, northern saw-whet (*Aegolius acadicus*), and boreal owls (*Aegolius funereus*). Great gray owl (*Strix nebulosa*) sightings also occur from time to time, but this species is uncommon. Short-eared owls (*Asio flammeus)* are frequently observed during migration periods especially seen near the airfields and drop zones.

6-3d(6) Grouse

Spruce grouse are common nesters and remain in good numbers despite heavy mortality of mature spruce trees, important winter food sources. Ruffed grouse (*Bonasa umbellus*) were reported by FRA hunters in 2004 and two were collected on EAFB during spring 2006, the species was introduced to southcentral Alaska in the later 1990's. Willow ptarmigan (*Lagopus lagopus*) are residents of the alpine and subalpine on JBER and winter visitors to lowland shrub habitat.

6-3d(7) Passerines and Other Small Birds

About 40 species of passerines and neo-tropical birds are common nesters on base. 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 robins, dark-eyed juncos, white-crowned sparrows (*Zonotichia leucophrys*), and common redpolls (*Carduelis flammea*) are the most common nesters. Townsend's warbler (*Dendroica townsendi*) has been heard only once in 4 years of surveys and it was located on the border of FRA and EAFB in the Ship Creek riparian forest but are more common on FRA on mountain slopes.

Common 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.

6-3e Mammals

6-3e(1) Small Mammals

Results of a 1973 small mammal survey on EAFB were apparently lost. However, a small mammal survey was done as part of the 1982-1983 Natural Resources Inventory. Since then FRA conducted a survey which added to the knowledge of species that may occur on the remainder of JBER (Peirce 2003).

Small mammals found on JBER includes snowshoe hare, porcupine, arctic ground squirrel (*Spermophilus parryi*), red squirrel, northern redback vole (*Clethrionomys rutilus*), common shrew (*Sorex cinereus*), tundra shrew (*Sorex tundrensis*), vagrant shrew (*Sorex vagrans)*, little brown bat (*Myotis lucifugus)*, and possibly northern flying squirrel (*Glaucomys brinus*). Also found in the FRA survey were pygmy shrew (*Sorex hoyi*), dusky shrew (*Sorex monticolus*), northern water shrew (*Sorex palustris*), tundra vole (*Microtus oeconomus*), meadow vole (*Microtus pennsylvaticus*), meadow jumping mouse (*Zapus hudsonicus*), and house mouse (*Mus musculus*).

6-3e(2) Furbearers

Furbearers found on JBER include beaver, river otter, muskrat (*Ondatra zibithica*), ermine or short-tailed weasel (*Mustela erminea*), red fox, coyote (*Canis latrans*), gray wolf (*Canis lupis*), lynx (*Lynx canadensis*), mink (*Mustela vison*), marten (*Martes americana*) and wolverine (*Gulo gulo*). Red fox are relatively common throughout the base, including the cantonment areas. Coyotes exist primarily near housing areas and the airfield, probably due to wolf predation. Beavers were found in virtually all the base lakes except Fish and Triangle, as well as Ship and Sixmile creeks and the cooling pond at the golf course through 2007 but in recent years found only on Ship Creek in the Golf Course and Sixmile Lake. 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 nearer the Chugach Mountains.. Wolverines, too, are found more frequently near the mountains on JBER.

6-3e(3) Wolves

An incomplete study conducted on EAFB and FRA during 1998-1999 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 north pertion of JBER and ranged as far north and west as Palmer Hay Flats State Game Refuge (40 miles north of the base) and the Point Mackenzie area on the west shore of Cook Inlet. Through winter 2005-2006 the Elmendorf pack continues to use the base. Wolves are known to have denned and raised pups on FRA near Eagle River flats. In addition to the two organized packs, there have been regular reports of lone wolves or pairs, particularly since 1995. As of 2009-2010 at least two packs remain on JBER.

6-3e(4) Bears

JBER is home to 35-40 black bears, not including cubs of the year, (Bostick 1997, Kleckner 2002) and a 2007 minimum of 18 brown bears (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 bears 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, off-base, but one sow was recorded denning within a 1.0 km of the Elmendorf airfield, where she birthed two cubs.

6-3e(5) Marine Mammals

Cook Inlet Beluga whales are seasonally present in Cook Inlet adjacent to JBER, and frequently seen in the summer at the mouths of Sixmile Creek and Eagle River and in Eagle Bay especially during salmon abundance. Harbor seals (*Phoca vitulina)*, harbor porpoises (*Phocoena phocena*), and orca or killer whales (*Orcinus orca*) are uncommon in upper Cook Inlet, but are sighted occasionally. Steller sea lion are sighted on rare occasions. These species are all protected under the Marine Mammal Protection Act, and the National Marine Fisheries Service has proposed the Cook Inlet population of beluga whale for listing as a threatened species.

6-3e(6) Moose

As the largest member of the deer family, moose are the most visible wildlife species found on base. Because of their size and the frequency with which they wander through the housing areas, moose are the first major wildlife species newly-arrived personnel are likely to see. JBER shares the North Anchorage Moose Herd (NAMH) with portions of Chugach State Park. Of 500-600 animals, an estimated 30 to 120 animals are found on the EAFB portion of JBER, depending on the time of year, with highs occurring in the late spring calving season and early summer. Moose may calve in just about any non-developed area of the base and sometimes very close to base facilities. Some members of this herd are migratory and spend only part of the year on EAFB. The onset of subfreezing temperatures once motivated them to move toward higher elevations and warmer temperatures. Fencing along the Glenn Highway now funnels them through north FRA before finding passage to the Chugach Mountains. The population trend in this herd is generally stable.

6-3f 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.

6-3f(1) Northern Pike

The northern pike (*Esox lucius*) is 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 1980's promptly dispersed the pike population throughout the drainage, and suspected human introductions added to their distribution spread. Pike are now found in the Otter lake system and were reported in Clunie Lake. Although pike have been reported in Fish and Green Lakes no pike have been confirmed. A pike was also reported off base in Ship Creek near its mouth. Current pike management and monitoring includes angler education, regular lake surveys, and test netting.

6-3f(2) Rock Pigeon

The rock 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. In the last 10 years pigeons have been aggressively removed as they are detected.

6-3f(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 1970's 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. The breeding population on JBER increased 3-4-fold between 2005 and 2006. 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 BEZ but efforts to stem the spread of starlings will also occur outside the BEZ.

6-3f(4) JBER-Richardson

From USAG-AK 2007-2011 Integrated Natural Resources Management Plan Volume II, Annex B Watershed and Wetlands Management:
http://www.usarak.army.mil/conservation/INRMP_Final/USAGAK_INRMP_07-11_volume_II_annex_B_watershed_and_wetlands.pdf

Fish: In 2001, northern pike were illegally introduced into Otter and Clunie lakes on Fort Richardson. Natural resources staff began a preliminary study in 2004 to assess pike numbers, age and size distribution in these lakes. 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 and will continue annually.

Mammals: The introduced house mouse was captured in Fort Richardson'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 coexist with native small mammal populations. Norway and black rats have not been recorded on JBER. Future small mammal monitoring will continue to document unusual occurrences such as this one.

Feral cats are effective predators, directly compete with native mammals, are considered invasive species and exist in small numbers on JBER. Efforts are taken through the pest management program to eliminate feral cats. Stray dogs also exist and are controlled through pest management and the post veterinarian clinic.

Birds: Pigeons and European starlings exist in the Anchorage area and on Fort Richardson. They have not been documented on training lands by Range and Training Land Assessment field staff but do occur in the cantonment area. Pest management personnel are responsible for their control.

Plants: In 2000, USAG-AK Range and Training Land Assessment coordinators met with other Alaska land managers (National Park Service, U.S. Forestry Service, Bureau of Land Management, and University of Alaska Fairbanks) to discuss Alaska's weed management

concerns. This was the first meeting among Alaska's plant scientists to assess invasive weed concerns. Area agencies decided a cooperative and coordinated effort within the state was needed to monitor and manage invasive plants, and the Committee for Noxious and Invasive Weeds Management was formed. The main goal of Committee for Noxious and Invasive Weeds Management is to heighten the awareness of the problems associated with non-native invasive plants and to bring about greater statewide coordination, cooperation and action to halt the introduction and spread of undesirable plants. The committee holds monthly teleconference meetings and an annual conference. JBER is a regular participant in these conferences and has presented its invasive plant monitoring efforts via poster and oral presentations.

6-3g Threatened or Endangered Species and Species of Concern

There are no known federally listed threatened or endangered species within JBER lands. However, federally listed threatened or endangered species do exist in marine habitat directly adjacently to JBER. Threatened, endangered, and candidate species identified by USFWS (2010) or NOAA-NMFS (2010) suspected or recorded in Upper Cook Inlet Project Area can be found in Table 5 below. Additionally, the following section provides the guidelines for management of those species.

Table 6. Threatened, endangered, and candidate species identified by USFWS (2010) or NOAA-NMFS (2010) suspected or recorded in Upper Cook Inlet Project Area.

Common Name	Scientific Name	ESA Status	Location Description
Beluga Whale (Cook Inlet DPS)	*Delphinapterus leucas*	Endangered	Occupies Cook Inlet waters and waters of North Gulf of Alaska (NMFS 2008a)
Steller Sea Lion* (Western AK DPS)	*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 (USDI 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 (USDI 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 (USDI 2010b)
Chinook salmon*: Lower Columbia River (spring) Puget Sound Snake River (spring/summer) Snake River (fall) Upper Columbia River (spring) Upper Willamette River	Onchorhynchus tshawytshca	 Threatened Threatened Threatened Threatened Endangered Threatened	These stocks range throughout the North Pacific. However, the specific occurrence of listed salmonids within close proximity to Elmendorf AFB is highly unlikely (NMFS 2010).
Steelhead*: Lower Columbia River Middle Columbia River Snake River Basin Upper Columbia River Upper Willamette River	Onchorhynchus mykiss	 Threatened Threatened Threatened Endangered Threatened	These stocks range throughout the North Pacific. However, the specific occurrence of listed salmonids within close proximity to Elmendorf AFB is highly unlikely (NMFS 2010).

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

6-3g(1) Cook Inlet Beluga Whale (*Delphinapterus leucas*)

The beluga whale is a small, toothed whale in the family Monodontidae, a family it shares with only the narwhal. Belugas are also known as ‘‘white whales’’ because of the white coloration of the 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 Cook Inlet beluga whales

(CIBW) may be found in the Conservation Plan (NMFS 2008) 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 whales. This decline was mostly attributed to the subsistence harvest (through 1998); however, even with the 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 Endangered Species Act (ESA), the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (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 (DPS) 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 under the Endangered Species Act (ESA). Final ruling on this decision is expected in spring 2010.

Issues:

Eagle River Flats

In a preliminary draft environmental impact statement (EIS) prepared in accordance with the National Environmental Policy Act (NEPA), U.S. Army Garrison Fort Richardson considers an alternative that, if implemented, would reinstate year-round live-fire training at Eagle River Flats (ERF) Impact Area. Because the actions considered under this alternative could potentially affect the Cook Inlet beluga whale, now an endangered species under the ESA, USAG Fort Richardson is proposing to engage in Section 7 consultation with NMFS. This Biological Assessment (BA), based on the best information available to the Department of the Army, summarizes the proposed action at Eagle River Flats Impacts Area and presents existing and proposed measures to prevent or mitigate potential impacts.

After careful study, the Army has determined that the resumption of year-round live-firing at ERF Impact Area is likely to adversely affect Cook Inlet beluga whales in light of noise impacts associated with certain high explosive munitions training. USAG FRA requests that NMFS concur with this determination and initiate formal consultation under Section 7 of the ESA. The BA has been submitted to NMFS and is currently awaiting a BO from NMFS.

Ongoing military activities

An assessment of all ongoing JBER activities (excluding Eagle River Flats, which is currently being assessed) is being reviewed by both Elmendorf Air Force Base and Fort Richardson. Both the USAF and USARAK are committed to the protection of the beluga whale. If it is found that one or more activities may affect CIBWs, a Biological Assessment will be completed and consultation with NMFS will occur. This will occur cooperatively as JBER and not separately.

Port of Anchorage

The Port serves 85 percent of the population within 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 (MTRP). The MTRP 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 bases and training facilities. The designation requires the Port to provide the military with 25 contiguous acres for their operations within 24 hours notice.

The MTRP will enlarge docking facilities, loading facilities, working space and road and rail transportation. The Biological Opinion for the MTRP considered the direct, indirect, and cumulative effects of the project on the Cook Inlet beluga whale. The proposed action is expected to result in direct and indirect impacts to these whales. It is estimated thirty four (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 will 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 the cumulative impacts to this population, does not suggest the current trends in this population would be altered.

6-3g(2) Protection of the Cook Inlet Beluga Whale

The Endangered Species Act (ESA), (Title 16 United States Code, Sections 1531-1544), requires protection and conservation of federally listed threatened and endangered (T/E) plants and animals and their habitats. Conservation includes the use of all methods and procedures which are necessary to bring any T/E species to the point where the measures pursuant to the ESA are no longer necessary.

6-3g(2)i ESA Management Goal for CIBW. Management goals include but are not limited to:

a. Minimize impacts to CIBW from military training
b. Minimize impacts to CIBW critical habitat
c. Minimize impacts to, protect and enhance where possible the 5 Primary Constituent Elements (PCEs) identified in the proposed critical habitat (74 FR 63080).
d. Monitor occurrence of CIBW and other marine mammals on JBER controlled waters and lands
e. Evaluate the 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 possible. If "take" cannot be avoided, JBER will enter into formal consultation with NMFS to obtain a permit as required by the MMPA and ESA.

6-3g(2)ii CIBW Conservation Measures. The following conservation measures will be implemented for the protection of the CIBW as well as other marine mammals in Cook Inlet:

a. Enforcement of ESA and MMPA by JBER Conservation Enforcement Program through:

i. Close coordination with NMFS Enforcement

ii. Routine training of JBER Civil Engineer Group

iii. Restriction of boat launching from JBER lands in Knik Arm, with exception of national security or activities coordinated with NMFS

iv. Regular shoreline patrols of Knik Arm at beach access points during salmon runs

v. No tracked or wheeled maneuvering is 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 will not be crossed during summer. All appropriate state and federal permits will be obtained prior to any in-water activities occurring in anadromous waterways.

b. Educate base residents and visitors on presence and protection of endangered species and marine mammals through:

i. Kiosks at all (two) JBER shoreline access sites

ii. Inclusion of species information and ESA restrictions in Newcomers' brief

iii. Briefing for Commanders, range control, and flight operations

iv. Regular news media articles on any aspect of the JBER activities to enhance CIBW primary constituent elements or their protection

v. A JBER recreation access control program that specifies restricted areas and activities

c. Monitor the following:

i. Seasonal/daily use by CIBW off shore and in Eagle River as outlined in protocols identified in Appendix H. Incorporate improved methods and technologies allowing for greater detection and ethological sampling to include but not limited to photo-identification of individuals, the use of high-definition cameras (including FLIR), DIDSON, and dipping hydrophones. Continue to work cooperatively with NMFS to monitor beluga whales in Eagle Bay and Knik Arm.

ii. CIBW take through mitigation agreements with NMFS

iii. Salmon escapement on or through JBER and smolt production on JBER spawning grounds

iv. Conduct creel surveys of fisherman at Sixmile Creek and Eagle River (on base)

v. Stormwater discharges , specifically focusing on deicer and suspended solid (sediment) concentrations, identified in the current JBER SWPPP

vi. Noise levels (in-air and in-water)

d. Pursue enhancements such as:

i. Replacing Sixmile Creek fish ladder (funded by MTRP wetland mitigation funds)

ii. Creating wintering ponds on or near lower Sixmile Creek or ponds in southeast corner of ERF

iii. Enhancing spawning substrate in Upper Sixmile Lake (funded by MTRP wetland mitigation funds)

iv. Building Upper Sixmile Lake fish passage bridge

v. Enhancing Otter Lake/Creek silver salmon population by conducting northern pike (*Esox lucius*), an invasive species, control

vi. Conducting stream bank restoration and erosion control projects on all anadromous streams on JBER to minimize effect on beluga whale habitat and their prey

e. Protective Actions for Firing in ERF Impact Area:

i. Live-fire activities may never intentionally target wildlife.

ii. Harassment of fish and wildlife is prohibited. Any action that disturbs fish and wildlife is considered harassment by federal and Alaska State law. Harassment includes such things as pursuit with vehicles or aircraft, feeding, and shooting of wildlife. Vehicles, watercraft and aircraft, including helicopters, may not be used to herd/chase wildlife off the ranges or training areas. Individuals who harass fish and wildlife are subject to prosecution. Properly coordinated firing into target areas will not be considered harassment of migratory birds not listed under ESA (50 CFR Part 21 – military readiness training exemption). State and federal permits to haze wildlife from the target area may be pursued to reduce adverse affects.

iii. Units will not fire munitions outside military reservation boundaries. Surface danger zones (SDZs) may not extend beyond military reservation boundaries.

iv. Munitions containing phosphorous will not be fired into wetlands.

v. 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 during unfrozen conditions. The habitat protection buffers are defined for each weapon system and munitions type.

vi. There will be no firing across or into navigable waters unless listed in the Federal Register as a "Restricted Area".

vii. Units will not fire into a 500 meter habitat protection buffer along the Eagle Bay shoreline in ERF Impact Area.

viii. Range Control will not place new targets within the defined habitat protection buffers and will cease using any old targets within these buffer areas.

ix. ERF Impact Area is permanently off limits to maneuver training and all recreation.

x. Recreational activities will be permanently prohibited in ERF Impact Area.

xi. JBER will not provide recreational boat access to Knik Arm and Eagle Bay waters.

xii. JBER will prohibit rafting access to ERF Impact Area but may allow rafting above the route bravo bridge. The take out point for Eagle River rafters is 4 kilometers upstream from the mouth of the river approximately 100 meters upstream of Route Bravo Bridge.

xiii. JBER will continue water quality monitoring in Eagle River and Eagle Bay in conjunction with regulatory agencies until absence of munitions constituents is jointly validated.

xiv. JBER 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.

xv. Eagle River will remain unobstructed to normal passage of beluga whales and prey species through the entirety of 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.

f. *Mitigation Measures for Year Round Firing in ERF (if selected)*:

i. CEANC marine mammal observers will be in position prior to and throughout training exercises to ensure that marine mammals are not present where they could be harassed or harmed due to training activities.

ii. CEANC marine mammal observers will verify the presence or absence of CIBW and other marine mammals in Eagle River prior to firing to determine applicable prescribed protection buffers for the specific training exercise.

iii. JBER will consider monitoring suspended sediment loads in Eagle River resulting from firing in conjunction with regulatory agencies. Any erosion or sedimentation occurring under the proposed action would, however, only affect waterways that are already characterized by high natural turbidity from glacial sediments, and would not significantly alter the quality of this habitat.

iv. Military units will cease firing all HE munitions into ERF Impact Area during the peak spring and fall bird migration periods, as determined by JBER wildlife biologists. Based on twelve years of raw data provided by the U.S. Fish and Wildlife Service, the Army proposes to prohibit live firing with HE munitions from approximately mid April to mid May and August to late October. Some minor variation in these closures would be expected from year to year to accommodate actual numbers of birds present during the identified periods. JBER will inform NMFS and USFWS of firing closure dates on a seasonal basis. While this prohibition is primarily enacted to protect migratory birds, the timing of the fall migratory period coincides with peak beluga activity in Eagle River and will serve to minimize the potential for exposing beluga whales to excessive noise levels.

6-3g(3) Other Threatened or Endangered Species of Cook Inlet

The following species 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).

6-3g(3)i Steller sea lion (Eumetopias jubatus)

The Steller sea lion is the largest member of the sea lion family (Otariidae), with the males weighing more than 1,700 pounds. The species feeds on schooling fishes, octopus, and squid, and inhabits rookeries and haulouts on islands. While the Steller sea lions range extends from the Pacific coast of Russia, along the U.S. coast of Alaska, and British Columbia, Canada in the north, to central California in the south, approximately 70 percent of the world's Steller sea lions are found in Alaska. However, the Alaskan portion of the population is estimated to have declined by approximately 70 percent since the mid-1970s. Potential factors behind the decline include environmental change, disease, shooting, and direct mortality caused by commercial fishery operations, which also reduce food availability for the species.

The Steller sea lion is protected under MMPA and ESA. The population east of longitude 144 degrees W(around Cape Suckling, Alaska) is listed as threatened under ESA, while the population west of that longitude was reclassified as endangered, in 1997. While critical habitat has been designated for major rookeries and haulouts throughout Alaska, none is designated in Cook Inlet.

6-3g(3)ii Steller's eider (Polysticta stelleri)

Averaging 43 to 47 centimeters (17 to 18.5 inches) long, Steller's eiders are the smallest eider species. The species winters throughout the Alaska Peninsula and eastern Aleutian Islands, and breeds during spring and summer in the Arctic coastal plain and the coastal areas of northern Alaska. Steller's eiders dive for marine mollusks and other invertebrates in the winter, and feed on insect larvae in freshwater ponds during the breeding season. While the worldwide population of this species declined by

approximately 50 percent between the 1960s and 1980s, the causes for decline are unknown. Possible causes for the decline include lead poisoning from ingesting spent lead shot; predation by ravens, gulls, and foxes; loss of nesting habitat; increased shipping traffic; marine contaminants; and hunting. In 1997, FWS listed the Alaska breeding population as threatened. The species is also an Alaska Species of Special Concern, and hunting of eiders is regulated under the Migratory Bird Treaty Act. Critical habitat under ESA is designated for Steller's eider in the Yukon-Kuskokwim Delta, Kuskokwim Shoals, Seal Islands, Nelson Lagoon, and Izembek Lagoon. No critical habitat is designated for this species in Cook Inlet.

6-3g(3)iii Yellow-billed loon (Gavia adamsii)

The yellow-billed loon (Order Gaviiformes, Family Gaviidae) is the largest of the five loon species, and similar in appearance to the common loon (*Gavia immer*). Yellow-billed loons are most easily distinguished from common loons by their larger yellow or ivory bill. During the non-breeding season, yellow-billed loons lose their distinctive black and white plumage and molt into dull, light brown feathers.

Yellow-billed loons nest near freshwater lakes in the arctic tundra of Alaska on the Arctic Coastal Plain (ACP), northwestern Alaska and St. Lawrence Island; in Canada east of the Mackenzie Delta and west of Hudson Bay; and in Russia on a relatively narrow strip of coastal tundra from the Chukotka Peninsula in the east and on the western Taymyr Peninsula in the west, with a break in distribution between these two areas.

Yellow-billed loons nest exclusively in coastal and inland low-lying tundra, in association with permanent, fish-bearing lakes. Lakes that are able to support breeding loons have abundant fish populations; offer depths greater than two meters (six feet); are large (at least 13.4 hectares [ha]); are often connected to streams that may supply fish; feature highly convoluted, vegetated, and low-lying shorelines; and provide both clear water and dependable water levels

The wintering range includes coastal waters of southern Alaska from the Aleutian Islands to Puget Sound; the Pacific coast of Asia from the Sea of Okhotsk south to the Yellow Sea; the Barents Sea and the coast of the Kola Peninsula; coastal waters of Norway; and possibly Great Britain. Occurrence on or around JBER lands and activities are only expected to occur in the wintering period (USFWS 2009).

6-3g(3) iv Kittlitz's murrelet (Brachyramphus brevirostris)

Kittlitz's murrelet is a small diving seabird that is closely associated with glacial habitats along the Alaska mainland coast. The only North American population occurs in Alaskan waters from Point Lay south to northern Southeast Alaska (Endicott and Tracey Arm) (USDI FWS 2006c). Records indicate that the distribution once reached as far south as LeConte Bay (Agler et al. 1998, Webster 1950). Recent surveys found that these murrelets were distributed from Icy Bay to Endicott Arm with the highest density in Icy Bay and none observed in LeConte Bay (Kissling et al. 2007). The largest breeding populations are believed to be in Glacier Bay National Park and Preserve, Prince William Sound, Kenai Fjords, and Icy Bay (Kendall and Agler 1998). The Kittlitz's murrelet population has shown a significant decline in Prince William Sound,

Glacier Bay and in the Malaspina Forelands (USDI FWS 2006c).

Kittlitz's murrelet congregate near tidewater glaciers and offshore of remnant high-elevation glaciers during the breeding season. Breeding sites are usually chosen in the vicinity of glaciers and cirques in high elevation alpine areas with little or no vegetative cover (van Vliet 1993). Nesting habitat in Alaska is believed to be nonvegetated scree-fields, coastal cliffs, barren ground, rock ledges, and talus above timberline in coastal mountains, generally in the vicinity of glaciers, cirques near glaciers, or recently glaciated areas. Recent surveys completed in Southeast Alaska found that Kittlitz's murrelet used a greater variety of habitat then previously acknowledged including glaciated fjords on the mainland and exposed areas along the outer coast in addition to more protected inner fjords (Kissling et al. 2007). During winter and spring, the marine distribution of Kittlitz's murrelet is farther offshore (USDI FWS 2007b).

Prey consists of fish including sand lance (*Ammodytes hexapterus*), herring (*Clupea pallasi*), capelin (*Mallotus villosus*), and sandfish (*Trichodon trichodon*), and euphausiids, amphipods and small crustaceans (Day et al. 1999). They forage extensively near the outflow from glaciers, both tidewater and retreated glaciers with turbid glacial streams, and primarily within 656 feet (200m) from shore (Day et al. 1999). Higher densities of murrelets were observed where tidewater glaciers were stable or retreating and with adjacent uplands dominated by ice. Along the outer coast abundance was associated with distance to shore (within 200 m) and shallow waters (10 fathoms or less) (Kissling et al. 2007).Due to the Kittlitz's murrelet association with glacial habitat, this species occupies only very specific areas.

The Kittlitz's murrelet was designated as a candidate species in May 2004 because of concerns with significant population declines in three of its core populations; central Prince William Sounds, Malaspina Forelands and Glacier Bay. Although causes for decline are not well known, they likely include habitat loss or degradation, increase adult and juvenile mortality, and low recruitment and glacial retreat and oceanic regime shifts (Federal Register 2004).

In March of 2009, the Commissioner of the ADFG was petitioned to list the Kittlitz's murrelet. Petitioners cited concerns with rapidly declining global population size and highly restricted distribution that make this species vulnerable to extinction from land and sea-based threats including global warming, oil spills, mortality in the gillnet fishery, and disturbance from vessel traffic (Center for Biological Diversity 2009, p. 1)

6-3g(3)v Salmon and Steelhead listed species

Listed stocks of salmon and steelhead are only occasionally present in the waters of Alaska where they may feed on prey resources originating within marine and estuarine waters. Critical habitat has not been designated for these fish species in Alaskan waters. It is unknown whether they actually occur in upper Cook Inlet. Protection of prey species as identified under Cook Inlet Beluga Whales would provide protection measures for these species should they occur here.

6-3g(4) Species protectd by Marine Mammal Protection Act

All marine mammals are protected under the Marine Mammal protection Act. The species identified by NMFS that are occasionally documented by NMFS are: minke whale, gray whale, killer whale, harbor porpoise, and harbor seal. Primary local stressors for these species are considered to be the same as the Cook Inlet Beluga Whale. Management goals and conservation measures for the Cook Inlet Beluga Whale are expected to be adequate protection of these species listed.

Table 7. Additional Upper Cook Inlet species protected by Marine Mammal Protection Act.

Common Name	Scientific Name	Location Description
Minke Whale	*Balaenoptera acutorostrata*	Widely distributed throughout the world, commonly found from the poles to the tropics but prefer the open sea. They may on rare occasions be found in Cook Inlet with no known sightings in Knik arm.
Gray Whale	*Eschrichtius robustus*	May on rare occasions be found in Cook Inlet with no known sightings in Knik Arm.
Killer whale	*Orcinus orca*	Observations by NMFS from 1975 to 2002 indicate only occasions that killer whales were in Knik Arm, however they are observed a few times a year in the rest of Cook Inlet (Shelden et al. 2003).
Harbor porpoise	*Phocoena phocoena*	Considered infrequent occurrence in Knik Arm.
Harbor seal	*Phoca vitulina*	Considered infrequent occurrence in Knik Arm.

6-3g(5) Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." 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.

A former federally listed threatened species, the bald eagle, is common locally with at least 6 pairs nesting on or adjacent to JBER lands. It receives protection under both federal (Bald and Golden Eagle Protection Act) and state law.

Mitigation Measures for Year Round Firing in ERF (if selected). In response to proposed continuation of year-round firing into the Eagle River Flats 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 the training units target with HE rounds any portion of the ERF Impact Area that lies within ½ mile of any active bald eagle nest.

6-3g(6) Peregrine Falcon

Recently de-listed species, the American peregrine falcon (*F. p. anatum*) (1999) and Arctic peregrine falcon (*F. p. tundrius*) (1994), may pass through the area during migrations.

6-3g(7) Species of Special Concern

Some of the above species are included on this list generated by state and federal agencies. ADF&G compiled a list of species that are of special concern to state and federal agencies in addition to those on U.S. and Alaska threatened and endangered species lists. The compilation list is located at the ADF&G website: http://www.sf.adfg.state.ak.us/statewide/ngplan/files/Appendix7.pdf . Birds of Conservation Concern 2008 (USFWS 2008) identified 4 species that were not complied on this list that were also added. Table 7 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.

Table 8. Species of Special Concern Recognized for JBER, AK.

Common name	Scientific name	JBER Status	Designating Agencies
American golden plover	*Pluvialis dominica*	Migrant	USFWS
American peregrine falcon	*Falco peregrinus anatum*	Migrant	SOA, USFWS, BLM
Arctic peregrine falcon	*Falco peregrinus tundrius*	Migrant	SOA, USFWS
Arctic tern	*Sterna paradiaea*	Breeding	USFWS
Beluga whale, Cook Inlet population[1]	*Delphinapterus leucus*	Adjacent population in marine waters and lower Eagle River	SOA, NOAA
Blackpoll warbler	*Dendroica striata*	Breeding	SOA, BLM
Brown bear, Kenai population	*Ursus arctos kenai*	Adjacent population	SOA
Gray-cheeked thrush	*Catharus minimus*	Migrant	SOA, 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	SOA, 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
Short-billed Dowitcher	*Limnodromus griseus*	Breeding	USFWS
Solitary sandpiper	*Tringa solitaria*	Breeding	USFWS

[1] – Federally listed as Endangered

7. NATURAL RESOURCE INVENTORY, MONITORING, MANAGEMENT, AND RESEARCH

7-1 Inventory and Monitoring Programs

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

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

7-1a Monitoring Priorities

Monitoring priorities of JBER natural resources must consider cost and practicality of monitoring methods and whether the species selected to be monitored will be directly affected by the management activities proposed. Priorities at JBER will focus on:

(1) Long-term changes to ecosystems

(2) Forest health

(3) Management indicator species trends

(4) Management activities and their effects on the ecosystem

(5) Water and air quality

(6) Quality and quantity of habitat

(7) Mitigation

JBER-Elmendorf has selected the MIS method to aid in monitoring ecosystem health (Sidle, M. and L. Suring. 1986). Monitoring priorities of biological resources should also be established based on the criteria listed below (Leslie et al. 1996).

(1) Biological rarity

(2) Evidence of decline

(3) Immediacy of threats

(4) Actively managed populations

(5) Invasiveness

(6) Importance of a species or community across its range

JBER-Richardson has used the Ecosystem Management Process to determine priorities in monitoring ecosystem health. To be included for management in the ecosystem management program, a species must occur in at least one of four categories:

(7) The species is of conservation concern, as determined largely by population declines noted broadly throughout the species range (not necessarily in Alaska) or from conservation priority species lists produced by the U.S. Fish and Wildlife Service, Alaska Department of Fish and Game, and especially specialist working groups (for birds, the national Partners-in-Flight Watch List, the Alaska Audubon Watch List, Boreal Partners-in-Flight Working Group, Alaska Shorebird Working Group, and Alaska Loon Working Group, and for vascular plants, the Alaska Natural Heritage Program,).
(8) The species has socioeconomic importance as a locally hunted game animal.
(9) The species is ecologically important in ecosystems as a predator.
(10) The species is ecologically important in ecosystems as prey.

7-1b Objectives

(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.

(2) Provide the means to implement adaptive management by providing both current information and predictions (based on trend analysis) concerning natural resources status and future management strategies.

(3) Ensure that monitoring is done in a scientific fashion, with measurable pre and post treatment results and experimental controls.

(4) Document monitoring methods and results and document resulting adaptive management actions.

7-2 Soils

7-2a Soil Inventory

As mentioned in Chapter 3, Anchorage area soils were mapped in 1979 by the U.S. Soil Conservation Service for the Corps of Engineers as part of the Metropolitan Anchorage Urban Study. The original survey was incomplete, as only the portion of the installation north of the Elmendorf Moraine was mapped. Soils were re-inventoried by the NRCS in 1997, and details of that survey may be found in their interim report (Wikgren 1997) and summarized in Chapter 3.

7-2b Soil Productivity

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

JBER-Richardson's soils are shallow, immature and deficient in the primary plant nutrients, especially nitrogen and phosphorous. In addition, they often exhibit low water retention capability, making them a primary limiting factor for vegetative growth during dry periods. In

depressions and saturated areas, such as wetlands, surface horizons may be covered with partially decomposed herbaceous vegetation called peat.

7-2c Soil Management

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

7-2d Soil Conservation

Soil is damaged through compaction and erosion. Compaction is not 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 and disturbed stream banks.

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

Erosion control best management practices have been incorporated into JBER-Elmendorf's March 2006 Storm Water Pollution Prevention Plan as an addendum (W. Gilpin, 673 CES/CEANQ). Best management practices address methodologies, techniques, and equipment and personnel requirements. Storm water pollution prevention and erosion control are closely tied. It also includes the roles and responsibilities of all partner agencies and/or groups participating in those activities.

7-2e Gravel Resources

JBER supports most base-wide construction and paving maintenance with local gravel resources. Gravel resources have also been provided the POA and the US Army Corps of Engineers. A JBER Elmendorf gravel extraction and reclamation plan is currently in the development phase (B. Woods, 673 CES/CEC). All extraction sites will be required to meet best management practices and reclamation requirements outlined in this plan. Development and reclamation of borrow sites will be coordinated with BLM and AK Department of Natural Resources as required. The extraction plan will also be subject to NEPA review processes.

Gravel extraction sites range in size from less than a quarter acre to pits in excess of 50 acres. Historically, gravel extraction occurred in most land management units, the exception being the EOD Creek unit. Primary extraction sites are currently located within the Cantonment, Moraine and Kettle Lake units. Currently approved and active is a gravel extraction program for the POA that will eventually affect a 97-acre proposed Cherry Hill Borrow Site (Cherry Hill Material Extraction and Transport Environmental Assessment, January 2006 and corresponding Finding of No Significant Impact/Finding of No Practicable Alternative, March 2006) and 255-acre proposed North End Borrow Site (North End Runway Material Extraction and Transport Environmental Assessment, May 2006, and corresponding Finding of No Significant Impact, June 2006).

JBER Elmendorf in 2006 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. Details of current activities and the

future plan will be added as an appendix to this document when it is complete (expected in 2007.)

7-3 Water

7-3a Water Quality

Water quality reflects environmental pollution, including erosion. Maintaining clean water is an important objective of this INRMP and a critical part of ecosystem management.

In the 2001 INRMP we reported: "The quality of surface water on EAFB appears to have remained in good condition." and suspecting neither degradation nor improvement. Through 2006 those conclusions remain valid for all of JBER. Ground water monitoring data continue to indicate localized shallow aquifer contamination which is not impacting deeper aquifers. The Bootlegger Cove formation seems an effective barrier between the aquifers (Brabets 1998).

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

7-3b Surface Water Quality Monitoring

Pollution of water from sources other than erosion is tracked and managed by 673 CES/CEAN. In March 2006, 673d Civil Engineer Squadron, Environmental Quality (673 CES/CEANQ) completed the updated Storm Water Pollution Prevention Plan (SWPPP) for EAFB which specifies frequency and location for required monitoring. In the SWPPP, 673 CES/CEANQ monitors stream discharge of suspended particles for storm drainage management. Sampling locations on JBER are indicated in Figure 9. JBER Elmendorf currently meets NPDES requirements. (March 2006 SWPPP for Elmendorf AFB).

Water samples were collected from the Eagle River at three locations on two occasions. Sampling locations were Chugach State Park Campground, Bailey Bridge, and the take-out point above the Route Bravo Bridge (Horne Engineering Services Inc. 1996). The first sampling effort occurred on May 26, 1995, and the second in August, 1995. Since problems have not been found, there has been only limited monitoring of surface waters at other locations.

In 1994, a comprehensive evaluation of Eagle River Flats was conducted to address water quality of these ponds (CH2M Hill 1994b). The salinity level varied from 1 to 46 parts per thousand (ppt). Salinity in most ponds was below 10 ppt. Tidal flooding of Eagle River Flats infuses ponds with saltwater and sediments from Eagle Bay. Elevation determines frequency of floods, varying from mean sea level (msl) to 18 feet above msl. Flooding may occur daily during high tides in areas less than 12 feet above msl. In areas from 12 feet to 13 feet above msl, flooding occurs only with the highest tide each month, and in areas above 13 feet, flooding occurs only during extremely high tides (CH2M Hill 1994).

7-3c Drinking Water Quality Monitoring

The JBER water treatment plant draws surface water from Ship Creek and filters and treats the water before delivering it to residential and industrial sites on JBER (Pacific Air Forces 1998). To maintain the water quality JBER-Richardson restricts development along Ship Creek, and

training is restricted in the vicinity of both Ship Creek and the north fork of Campbell Creek (USARAK 1998). JBER-Richardson's Land Rehabilitation and Maintenance (LRAM) program is used to prevent problems with water quality.

Two freshwater aquifers underlie most of Fort Richardson. These aquifers flow west from the Chugach Mountains to the Cook Inlet and are recharged by groundwater originating from precipitation in the mountains. The two aquifers lie in different soil strata, and are separated by a 60 to 200-foot layer of impermeable Bootlegger Cove Clay. The upper, unconfined aquifer lies in a 30 to 100-foot 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 1994b).

The lower, confined aquifer lies in a 100 to 200 foot-layer of sand and gravel. The impermeable clay above produces artesian conditions and protects the lower aquifer against seepage and pollutants from the surface, thus the 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 from 200 feet to 400 feet below the surface. Wells drilled into the aquifer can produce up to 1,500 gallons of water per minute (CH2M Hill 1994b).

Industrial activities associated with JBER-Richardson 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 now being monitored intensively, and there has been no indication of deep groundwater pollution. Pollution has been minor, localized, and there has been no significant risk to human health. Recently, water quality has tended to improve as DoD restoration projects mitigate earlier damage to the quality of groundwater.

Water quality testing for drinking water is taken on JBER at about 100 monitoring wells. Ground water levels are monitored each month, and extensive chemical testing is conducted on a quarterly basis. JBER-Richardson will continue to monitor ground waters for the next five years.

7-4 Wetlands and Riparian Areas

7-4a Wetlands Inventory

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

Wetlands were re-inventoried in 1995, again by USFWS's NWI team, as part of an Air Force-wide contract to re-delineate wetlands. Plots were located and locations documented by Global Positioning System (GPS). Plots were classified using Classification of Wetlands (Fish and Wildlife Service Observation (FWS/OBS)-79/31, December 1979). This re-survey found a total of 1,534 acres more wetlands than the original survey, including all the types previously noted, but also including larger areas of forested wetlands, primarily black spruce bogs.

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

JBER-Richardson's surface water resources are diverse and include numerous streams, lakes, ponds, and a saltwater tidal bay. The quality of surface water on Fort Richardson appears to have remained good throughout the Army's occupation of the area. There is no reason to suspect that these waters have either degraded (beyond localized, temporary sedimentation) or improved. Most streams on JBER-Richardson flow from headwaters in the Chugach Mountains to the 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 groundwater seepage from aquifers into streams. Snowmelt typically begins in April and reaches its peak in June; stream flow 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).

7-4b Wetlands Monitoring

Natural resources staff will monitor recreational use of wetland and riparian areas. Changes to recreational use will occur if there are signs of degradation occurring at these sites. Wetlands are scheduled in the Automated Civil Engineering System, Project Management (ACES-PM) to be re-inventoried in 2012 in preparation for actions identified in the JBER 50-Year plan.

7-4c Wetlands Management

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

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

JBER's policy concerning wetlands is to protect and conserve wetlands in such a manner that no net loss of wetlands occurs. All projects, including construction projects that may have an effect on wetlands must be coordinated with the Environmental Planner (673 CES/CEAO). Construction activities that take place in or near wetlands must utilize suitable protective devices such as silt curtains to minimize silt movement as a result of construction or repair work. JBER complies with all regulatory requirements pertaining to wetlands, including provisions of Air Force Instructions, the Clean Water Act and NEPA. Impacts to wetlands are minimized through the EIAP. From a natural resources standpoint, wetlands comprise critical wildlife habitat, not only for common wetlands species such as waterfowl and beaver, but as seasonally important feeding areas for both moose and bears as well as numerous smaller species. Because so much of JBER's wetlands are less than an acre in size, they frequently are overlooked when conducting planning using aerial photos and GIS coverages. On-the-ground checks during the planning process are critical to ensure that protection of these wetlands is not overlooked. If wetlands are selected for logging, all activities must occur during the winter to minimize damage by heavy equipment. It is also recommended that logging be restricted to selective type cuts.

Education is an important aspect of wetland management. The staff of the 673 CES/CEAN will incorporate wetland conservation education into environmental awareness programs. To that end, project managers will be educated to coordinate early with CEAN to assess adverse impacts of their projects and to seek timely permit applications.

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

Some wetland protection conflicts with the Elmemdorf BASH plan. Those water bodies within the WEZ 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 west 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 POA 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.

7-4d Riparian Area Management

Riparian areas 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, bank stabilization efforts. Portions of all above, but Moonshine Creek, are listed as anadromous streams with ADF&G. Any activities occurring in the stream during salmon presence (eggs to adults) must be coordinated with the Habitat Division of the ADF&G, which issues a permit. Construction work is often timed so as to minimize in-stream work during these periods.

7-5 Vegetation

7-5a Inventory and Monitoring

An extensive initial survey of JBER-Elmendorf vegetation and vegetation types was conducted as part of the 1982-1983 biological survey. Vegetation types were mapped from aerial photography and were then ground-truthed. Sample plots were established, and all trees, shrubs, and herbs found were identified. Plant cover and abundance were described, and physical characteristics of the site such as site and soil moisture, presence and depth of peat and organic layers, presence of fire scars, and level of disturbance were recorded by written and photographic record. A low intensity timber survey was also conducted as part of this survey. All photos, data, and collected material are on file at the USFWS Herbarium in Anchorage. A vegetation map and report were produced describing vegetation types, trends, and vegetation analysis (Figure 7).

A re-inventory of vegetation was conducted in 1999 (Lipkin, R. 2001) and an associated project was the establishment of permanent long-term vegetation monitoring plots. A similar inventory of JBER Richardson is available in Lichvar and Raccine, 1995.

7-5b Monitoring

CEANC contracted Alaska Natural Heritage Program in 1999 to establish long-term vegetation monitoring plots (LTVMP) and to conduct the initial collection of data from these plots (Tande, G, et al 2001). Thirty LTVMP were established, a minimum of three in each of 6 major vegetation types of at least 300 acres. Establishment and characterization of LTVMP includes a

botanical inventory, the collection of satellite plot data, and micro-plot data on trees, shrubs, moss, lichens, and graminoids. Tree mortality information is also collected. Each LTVMP can be located by GPS, is permanently marked, and site conditions recorded by written and photographic record.

The LTVMP program calls for re-inventory of vegetation characteristics of 6 plots every year, resulting in the complete inventory of 30 plots over 5 years. The intent is to provide clear information and trends in vegetation changes over time in response to succession, bark beetle and other forest health problems, fire, man-caused disturbance, status of old growth components, and climate changes. LTVMP also serve as the basis for wildlife plot sampling that includes breeding bird surveys, moose browse surveys, and small mammal surveys.

Forest resources are an obvious component of the base's flora. Forest inventory, monitoring and management programs are presented in section 7-6.

Similar vegetation plot inventories were established in JBER-Richardson in association with the ITAM program. Blending the programs in coming years will be a highly ranked componenet of vegetation monitoring objectives.

Mitigation Measures for Year Round Firing in ERF (if selected). A proposed USARAK action to resume year-round HE firing into Eagle River Flats (ERF) impact area may have adverse effects on vegetation and wetland ecosystems. Overall, it is likely that the wetland vegetation would change over time from primarily an undisturbed sedge meadow to primarily a disturbed, cratered area near the targetable areas targets. However the influx of glacial sediment into ERF will eventually fill the craters and vegetation will reestablish, covering the scars, as observed with existing scars within ERF. In essence, the wetland is self-repairing. In response, mitigation measures may be undertaken by JBER and could include vegetation monitoring sites. Documenting significant changes to the vegetation and the overall estuary/mudflat ecosystem at these sites may provide insight into adaptive management actions to minimize adverse impacts.

7-5c Vegetation Management

7-5c(1) Vegetation Management Objectives

(a) Maintain or improve plant and vegetation biodiversity

(b) Promote forest ecosystem health

(c) Identify and control invasive plant species that pose a risk to ecosystem health

(d) Maintain old growth stands and ecosystems

(e) Restore disturbed areas to natural vegetation

(f) Maintain, restore, or improve the quality/quantity of wildlife habitat for wildlife species

(g) Reduce fuel loads in beetle-infested stands

(h) Maintain or improve the aesthetic quality of outdoor recreation areas

(i) Conduct a sales program to dispose of forest products made available as the result of natural resources management practices and development

(j) Maintain, improve, and if necessary restore wetlands, riparian areas, and flood plains

(k) Establish cooperative agreements for forest management with the BLM and Alaska Department of Natural Resources' Division of Forestry (ADNR DOF)

(l) Manage improved and semi-improved lands in such a way as to provide an aesthetically pleasing landscape for people.

(m) Where feasible, convert developed lands to semi-developed, and semi-developed lands to undeveloped lands in accordance with AFI 32-7064

(n) Protect soils from wind and water erosion

(o) Minimize pollution

(p) Maintain landscaped grounds so as to minimize manpower, equipment, and financial resources required

7-5c(2) Noxious Plant/Invasive Species Management

Noxious and invasive plants known to occur on EAFB include but are not limited to those presented in Appendix H. In accordance with Alaska Statutes 03.05.010, 03.05.030 and 44.37.030 AK Department of Natural Resources Division of Agriculture maintains a statewide list of prohibited and restricted noxious weeds. That information is available at http://www.dnr.state.ak.us/ag/ag_pmc.htm. JBER strives to prevent the introduction and spread of noxious and invasive species on the base through equipment cleaning practices and requirements, especially of contractor equipment originating off-base. For FRA portion of JBER see: http://www.usarak.army.mil/conservation/INRMP_Final/USAGAK_INRMP_07-11_volume_II_annex_B_watershed_and_wetlands.pdf

7-5c(3) Vegetation Research Results and Needs

Results.

Floristic Inventory of Vascular Plant Species (Lipkin, R. 2001)

GOAL: Identify any rare vascular plants, document any species not previously identified and, secondarily, identify any non-native plants in selected disturbed areas.

This single season survey added 99 species to the EAFB plant list, now totaling 301 taxa (Appendix E). Among those, five were considered rare (S3) by the Alaska Natural Heritage Program State Ranking. The rare plants were found in the kettle lake fens (2), lake shores of Sixmile and Hillberg (1), and the saltmarsh 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 the disturbed sites.

Establishment and Characterization of Long-term Monitoring Sites (Tande, G., et. al. 2001)

GOAL: 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 layer for Geobase.

The project established 30 plots, collected baseline site description data for 24 plots and established a Long-term Monitoring Manual. The plots represented six major vegetation types; 12 sites are located within the dominant old-growth white spruce/birch mixed forest.

In 2008 the Asset Management Flight of 3d Civil Engineer Squadron on EAFB contracted with the Alaska Natural Heritage Program, Environment and Natural Resources Institute at University Alaska Anchorage to revisit 5 of Elmendorf's 24 long-term vegetation monitoring plots (LTVMP) which were established and initially measured in 1999 (Klein, et al. 2008). The objective was to make comparison of the vegetative community structure between years and

identify notable changes in structure and identify any vegetation community health issues. In 2008, five LTVMPs were re-visited and analyzed. The primary observation was old growth forest plots were shrubbier in 2008 than in 1999 and most of the spruce bark beetle-killed trees, prevalent in 1999, were no longer standing. Canopy coverage in the shrub layer increased in the beetle-killed plots, probably as a result of the reduced canopy of white spruce. The black spruce forest plot sampled had a dramatic decrease in dwarf shrubs and the birch forest plot sampled had an increase in confers and decrease in deciduous trees. Infestations of highly invasive orange hawkweed were noted north of 46th Street. The revisited plots represented only 3 of 5 dominant vegetation communities on the base. Researchers recommended more samples to include the lesser vegetation communities and the remaining 25 plots should be sampled within the next 5 years.

Identification and Characterization of Disturbed Alder Sites (Tande, G. S. Klein and J. Michaelson. 2001).

GOAL: 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.

Invasive Terrestrial Plant Species Survey

GOAL: To develop a current inventory of invasive vascular plants present on EAFB, develop map of IS distribution, clarify risk from each species, and propose management/control strategies.

During June and July 2007 HDR field crews conducted surveys of EAFB to identify presence, distribution, and density of terrestrial invasive plant species (HDR Alaska, 2007). The effort was two-fold; conduct search for flowering European bird cherry (*Prunus padus*) during June along drivable routes near riparian or wetland areas, and then visiting 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.

Invasive species management recommendations were prioritized by comparing invasiveness rank, developed by the Alaska Natural Heritage Program (AKNHP), 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*), and cheatgrass (*Bromus tectorum*), bird vetch (*Vicia cracca)*, Canada thistle (*Cirsium arvense)*, and European bird cherry (*Prunus padus*). 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.

Invasive Aquatic Invasive Species Survey

GOAL: To develop a current inventory of aquatic IS of vascular plants and mollusks present in EAFB lakes and streams, clarify risk from each species, and propose management/control strategies.

During July 2008 HDR field crews conducted surveys of EAFB to identify presence and distribution of aquatic invasive plant and mollusk species (HDR Alaska. 2008). 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 invasives to include prevention, monitoring, and education are provided.

BASH Vegetation Description

GOAL: To collect vegetation measurements of shrub habitat that will deter waterfowl, raptor and gulls and that will meet moose habitat compensatory obligations from construction and fencing activities. The shrub habitat standards will be applied to those non-cantonment fields outside the newly installed airfield security fence. (See Section *7-7m(2) Results (2001-2009)*)

Vegetation Research Needs.

- JBER mapping of Invasive vegetation and control efforts
- Update vegetation mapping for JBER
- Complete remaining EAFB Long Term Vegetation Monitoring Plots before 2013
- Invasive species control plan

7-6 Forest Management

7-6a Forest Management Overview

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

7-6b History of Forest Management

7-6b(1) Past Forestry Practices

Elmendorf AFB

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

A personal-use woodcutting program was started in the early 1970s. The removal of dead and downed wood from designated areas averaged less than 100 cords per year prior to 1987. No fees were charged during this time. In 1987, a fee schedule was initiated for the sale of personal-use forest products. In December of the same year, a trial personal-use Christmas tree cutting program was undertaken. The response to the program was favorable, with 550 permits sold for $5 a tree. Overstocked stands of young spruce provided the source for the trees, and the cutting program served as a thinning/release of the remaining trees. Both the woodcutting and Christmas tree programs have grown. In 1989, two areas (in need of clearing for mission-related construction) were made available for removal of green timber through a $10 permit. Through this program, 295.5 cords of salvage wood were purchased. During 1997-2006 numerous construction projects in forest habitat added substantially to firewood salvage opportunities. The bulk of timber harvest receipts (Table 11) were a result of these construction projects. The personal-use woodcutting and Christmas tree programs continue to be well supported by base personnel.

Commercial logging started in 1992 with approximately 31 acres being logged on the bench land above Upper Sixmile Lake (Figure 10). The second timber sale occurred in 1995, which consisted of approximately 38 acres. The sale area was out of sight of the ski area and about 1/4-mile north of Oval Lake, just below the ridgeline. A third sale, located near Green Lake (approximately 40 acres), was initiated in 1997. Because there were no bidders on this contract, the sale never occurred. All three sales were located in old growth, mixed spruce-hardwood forests. Limited personnel and budget have restricted the number of sales.

In support of the BASH program, EAFB has cleared 550 acres of various timberlands since 1995. Forest areas attracted moose and other wildlife that were at risk to get on the airfield. Wood was salvaged and sold as personal-use firewood. These areas act as extensions of the runways in emergency situations.

Ft Richardson

Data documenting past forest practices for Fort Richardson are held at that the USAG-AK Natural Resource Forestry Office.

7-6b(2) Historical Timber Surveys

Elmendorf AFB

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

Fort Richardson

Timber surveys involving an initial timber cruise, using point sampling of all commercial timber types has occurred. Inventories were conducted by forestry crews from the USAG-AK Natural Resource Forestry Office. Historic records are held at that office.

7-6c Forest Management Objectives

JBER

(1) Discourage/prevent spread of the alder and blue joint grass vegetation types

(2) Maintain old growth stands and unique forest types wherever possible

(3) Retain the option of harvesting forest lands by a variety of means including site conversion, thinning, patch-cuts for wildlife, and commercial logging

(4) Harvest all areas having saleable forest products prior to conversion to non-timber land uses

(5) Develop a timber use program to accurately track personal and commercial harvest

(6) Conduct a personal-use forest product sales program and make 400 cords of firewood and 500 spruce Christmas trees available each year for personal-use by base personnel

(7) Conduct urban forest inventory and develop urban forestry plan to complement this plan and the base landscape plan

JBER- Richardson

Forestry and wildland fire management goals and objectives all contribute to one or more of the overall natural resources program goals of stewardship, military training support, compliance, quality of life, and integration. Forestry and wildland fire management goals and objectives are:

7-6c(1) Stewardship

- Manage vegetation and timber in support of ecosystem management objectives.
  - Maintain and enhance the health, productivity and biological diversity of forest and woodland ecosystems.
  - Maintain a current inventory of forest and vegetative resources.
  - Maintain a current forest stand map.
  - Improve wildlife habitat through timber stand improvement, prescribed burning, mechanized vegetation removal and hand thinning.
  - Maintain ecosystem functionality.
  - Sustain production of forest products.

- Maintain forest health.
  - Conduct forest health monitoring.
  - Control forest pests.
  - Conduct timber salvage operations.

7-6c(2) Mission Support

- Maintain a diverse forest to enhance a varied military training environment.
- Manage vegetation and timber in support of military range upgrade projects.
  - Conduct timber sales to remove timber from project sites.
  - Implement forest management practices through timber stand improvement, timber management, timber sales, and timber salvage cuts.
  - Support training area redesign maneuver corridors.

- Protect military facilities.
  - Reduce forest hazard fuels around military facilities.
  - Maintain forest fuel inventory.

- Reduce wildfire starts through wildfire prevention.
    - Fire danger rating system based on Fire Weather Index.
    - Maintain and enforce USAG-AK regulations.

- Control wildfires through suppression activities.
    - Report wildfires.
    - Conduct initial response.
    - Coordinate with Alaska Fire Service during fire fighting operations.

7-6c(3) Quality of Life

- Manage vegetation and timber to enhance recreational opportunities.
    - Provide quality recreational opportunities.
    - Provide firewood for local military and civilian population.
    - Provide Christmas trees.
- Conduct Public Outreach.
    - Educate surrounding public with FireWise Program.
    - Apply annually for Tree City USA.
    - Conduct annual Arbor Day celebration.

7-6c(4) Compliance

- Employ standard forestry practices to meet and comply with Migratory Bird Treaty Act, Eagle Protection Act, Clean Water Act, National Environmental Policy Act, and National Historic Preservation Act.
    - Update annually USAG-AK timber policy.
- Meet annual forestry reporting requirements.
    - Submit annual master Report of Availability.
    - Submit Report of Availability for each timber sale.
    - Submit annual Forestry Annual Work Plan.

7-6c(5) Integration

- Involve resources agencies in planning for forest management and the public in review of the plan.
    - Update forest management plan annually and revise every five years.
    - Ensure forestry projects meet multiple objectives.

- Conduct wildland fire planning.
    - Update Integrated Wildland Fire Management Plan annually and revise every five years.
    - Participate in Alaska Interagency Fire Management Plan.
    - Create burn plans for each prescribed burn that meet multiple stewardship, mission objectives, and safety objectives.

- Minimize restrictions to training from forest management policies and issues.

7-6d Biological Factors

7-6d(1) Biodiversity/Forest Health Factors

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

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

7-6d(2) Role of Fire

Forest and wildland fire management is an extremely important tool to protect, maintain, and enhance military training environments in JBER ranges. Without forest and wildland fire management, vegetation communities become much less diverse, and animal species normally associated with certain successional stages find the environment unsuitable. Forest and wildland fire management rejuvenates these ecosystems and supports the military mission.

Traditionally, fire has been present in the boreal forest system and is an important ecological process in shaping the development of that ecosystem. The opportunity to conduct prescribed burns in JBER 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. Because of proximity to Anchorage and mission requirements, fire has been prevented and largely excluded from the forest ecosystem on EAFB for many years. This is likely the main reason that so much of the forest ecosystem has become old growth stands, and may be a contributing factor to the increases in alder and blue joint grass as well. Unfortunately, due to narrow burning windows and stringent air quality standards, it is difficult to re-establish fire in this ecosystem. The ADEC will issue 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.

The Forestry and Wildland Fire Management Plan is a component of the original U.S. Army Garrison Alaska (USAG-AK) Integrated Natural Resources Management Plan Volume II, Annex C. This plan covers the management, maintenance, protection, and improvement of forest vegetation on JBER-Richardson. This plan meets the Public Law 106-65 requirement for a forest management plan on military withdrawn lands in Alaska as outlined in the Bureau of Land Management Fort Wainwright and Fort Greely Resource Management Plans (Bureau of Land Management and U.S. Army 1994b/a). This plan meets the Army requirement for an Integrated Wildland Fire Management Plan and supports the Alaska Interagency Fire Management Plan.

7-6d(3) Stand Ages

JBER-Elmendorf

The commercial timber stands ages range from 25 to 225 years, with age classes unevenly distributed. Nearly half of the stands (2,860 acres) are over 175 years of age and are in an advanced state of decline. The remaining stands are 50 to 125-year-old (3,191 acres). There are no stands in the 125 to 175 year age class. Most of the 50 to 125-year-old stands were established after natural or man-caused fires, which burned between the turn of the century and the mid 1930s. The stands less than 50 years old were established after site disturbances during or after World War II and the early years of installation development.

Fort Richardson

Stand data from Fort Richardson currently is not associated with age ranges. Data for commercial stands can be found in section 7-6f(1) of this report.

7-6d(4) Forest Disease/Insect Problems

The primary forest insect problem on JBER is the spruce bark beetle. This insect has traditionally been a problem in south-central Alaska, with infestation outbreaks occurring periodically. A major outbreak began on Fort Richardson in 1991-1992, and spread to Elmendorf AFB and portions of Chugach State Park. Mature white spruce (over 6-8 inches in dbh) are most vulnerable to infestation by this insect. Spruce beetles infest trees by boring holes in the outer bark and laying eggs in the inner bark. Once hatched, the larvae feed on the inner bark causing a disruption in nutrient flow. Severe infestations result in destruction of the inner bark, effectively girdling the tree and killing it. It is estimated that more than 80% of the mature white spruce on Elmendorf AFB were killed by 2001 and approximately 80 percent of the mature white spruce of Fort Richardson were killed by 1999. This resulted in an unacceptable level of fuel loading and has created the potential for large catastrophic fires.

The natural resources office was contacted by several sawmill operators who requested permission to buy the beetle killed spruce and remove it. This mutually beneficial arrangement has resulted in the removal of most of the dead trees. The affected areas will be monitored to determine the effect on the more open stands and whether there will be changes in vegetation and associated animal life.

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

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

7-6e Legal Factors

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 AF lands."

The BLM retains vegetative rights for about 58% of Elmendorf's forest lands and 96% of Fort Richardson's forested lands under various Public Land Orders (See Appendix C). Any management activity involving forest management or removal of vegetation on those lands must be coordinated through the BLM. Timber receipts from forest sales on BLM lands must be transferred to the BLM for deposit in the General Fund. A certain percentage of these funds may be returned to JBER in return for administering these timber sales. Proceeds of sales from lands owned by the Air Force are retained by the Air Force and deposited in DOD accounts. This money is then available for use by JBER for forest management activities. The BLM is mandated by law to retain funds from timber sales on lands under their jurisdiction.

The following procedures will be followed:

(1) Any commercial timber sales should be restricted to the portion of the base owned by the Air Force, with timber receipts going to the Air Force

(2) Two compartments will be established for personal-use wood sales. Permits for Compartment 1 would be good for Air Force Lands only and proceeds would go to the Air Force. Permits for Compartment 2 would be good for BLM lands only and proceeds would go to the U.S. Treasury

(3) All timber sales on BLM lands will be coordinated with the BLM

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

7-6f Forest Management Factors and Strategies

7-6f(1) Commercial Forest Lands

7-6f(1)I JBER-Elmendorf

Stand types. Of the 13,455 acres of land controlled by the installation, approximately 57%, or 7,708 acres, is commercial forest land (CFL). A breakdown of forest types found on base is contained in Table 7. Timberlands cover 6,176 acres of all CFL. The remaining 1,532 acres are presently out of timber production. Most of this acreage is covered with blue joint grass and Sitka and thin-leaved alder. Together, they effectively prevent the establishment of birch, aspen and poplar, and reduce the establishment of white spruce. Other portions of the nonproductive CFL are kept in the shrub stage due to operational requirements such as antenna fields and moose habitat management.

Table 9. Commercial Forest Lands by Vegetation Type for JBER-Elmendorf, Alaska, 2006.

Stand Type	Acres
Timberlands	
Paper birch-white spruce	4,078
Balsam poplar	543
Paper birch	542

Stand Type	Acres
Quaking aspen-white spruce	410
White spruce	323
Black Cottonwood-white spruce	280
Shrub lands	
Alder/bluejoint grass	1,532
Total	7,708

7-6f(1)ii JBER-Richardson

The Fort Richardson Ecological Management Unit contains approximately 61,997 acres of forest and non-forest lands. Forestlands in the project area occupy 51% of the land area or 31,626 acres. Non-forestland amounts to 49% of the total project land area or 30,371 acres. The forested lands contain 30,878 acres of commercial forestland. Commercial forestlands are those lands containing sawtimber and poletimber size classes.

Table 10. JBER-Richardson Forest Timber Type.

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%**	

Commercial Forested land information can be found at USAG-AK 2007 – 2011 Integrated Natural Resource Management Plan Volume IV, Prescriptions, PG2.3.2.6 Forest Resources, pg 135.

7-6f(1)iii Management Compartments and Stand Designation of JBER.

Base forest lands have been divided into two, compartments based on land ownership. Compartment 1 includes fee simple lands which is owned (fee simple) by the JBER. Compartment 2 includes vegetative rights in which are owned by the BLM (Figure 4). Stand divisions are based on topography, the dominant forest types present, and silvicultural needs.

7-6f(1)iv Forest Inventory.

JBER-Elmendorf

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

JBER-Richardson

Timber surveys involving an initial timber cruise, using point sampling of all commercial timber types has occurred. Inventories were conducted by forestry crews from the USAG-AK Natural Resource Forestry Office. Historic records are held at that office.

7-6f(2) Forest Management/Harvest Activities

7-6f(2)I Forest Planning.

During the next five years, construction activity on JBER will be moderate with above normal acreage being taken out of forestry production. In the remaining wildland, periodic monitoring of permanent vegetation plots will be established. No commercial sales are planned at this time.

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

7-6f(2)ii 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. This method 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.

The following (Table 10) white spruce and hardwood harvest acreage represent saw, pole, and pole/saw timber types; the majority is in the pole/saw type.

Table 11. JBER Estimated annual timber harvest:

Harvest Timber Type	Potential Harvest Land	Rotation Age	Regeneration Time	Total Rotation Length	Estimated Annual Harvest	50% of Ten 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

Under an ecosystem management based system, harvest levels are determined by management actions, with wood products produced as a by-product of those activities. Harvest levels will normally be far below those levels allowed for maximum sustained yield. It may be desirable to harvest at these lower levels due to factors such as poor local market for firewood, status of trees damaged by the beetle infestation, funding restrictions for site prep and regeneration work, lack of manpower to conduct timber cruising and timber-stand improvement work, etc. Due to these factors; as well as considering temporary or permanent habitat loss since last estimates, 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; it is recommended that no more than 50% of the ten year estimated annual harvest within a ten year period.

*7-6f(2)iii Forest Harvest Methods***.**

JBER-Elmendorf

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

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

JBER-Richardson

The Forest Management Plan for Fort Richardson updated in 2001 is on file USAG-AK Natural Resource Forestry Office. Currently Fort Richardson does not manage for timber harvest. However, they do manage for forest protection habitat improvement, habitat loss from construction, and supporting mission activities. These are classified as silviculture activities and can be found at USARAK INRMP 07-11 volume II annex C forestry, section C.2.1.5.1.

7-6f(3) Forest Management/Harvest Programs

*7-6f(3)I Commercial Sales***.**

Due to the current state of the market as well as other considerations, commercial sales may or may not occur during this planning period. If commercial sales occur, they may be located on Air Force or BLM lands. Sales on BLM lands will be coordinated with the BLM. Most

commercial sales will likely be done for the purpose of clearing sites for development. Where possible, sales will be timed to coincide with improved market conditions.

7-6f(3)ii Personal-Use Sales Program.

Personal-use sales of timber products will continue, with a goal of 400 cords and 500 Christmas trees per year. In some cases, Natural Resources Office personnel may thin sites, and the felled trees made available to woodcutters. In other cases, Natural Resources Office personnel may mark small (5 acre) stands for group selection or clear-cutting to create small openings for wildlife use. Other areas may be opened to woodcutting on an occasional basis after windstorms or accumulations of dead/downed wood occur. Much of the firewood sold in recent years has been generated by the numerous development projects that resulted in forest clearing. In most cases the contracts required salvageable trees to be cut and stacked for salvage.

Although woodcutting permits are currently $30 per cord, this is well below market value. Consideration will be given to raising the fee to $40 or $50 per cord. This would make up a good deal of the financial shortfall to be used for forest enhancement and regeneration. FRA currently offers free woodcutting permits. Once Elmendorf AFB and Fort Richardson become JBER sales of timber, firewood, and Christmas trees will be required to comply with AFI-32-7064 and as such be provided at existing prices on Elmendorf AFB.

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

7-6f(3)iii Regeneration.

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

Historically, the two most recent commercial clear-cuts required artificial site regeneration to bring the stem counts up to adequate levels. Both the Oval Lake and Upper Sixmile Lake sites required approximately 1000 seedlings each. 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.

Artificial regeneration was also used to compensate for spruce bark beetle damage that killed most of the mature white spruce. Between 1998 and 2003 approximately 20,000 white spruce seedlings were planted as Boy/Girl Scout projects.

Regeneration Goals

- Any new construction should look to build on already disturbed areas
- Any disturbed areas not being utilized should be reforested provided that it is within land use designation prescription
- New disturbances should ensure adequate wildlife corridor/habitat management

- 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.

Reforestation plans are to be developed for sites regenerated after harvest or disturbance. A reforestation plan outlines the objective of the regeneration project and additional treatments needed if the objective is not being met. The plan defines site preparation, regeneration technique, seed/seedling source, planting technique, spacing, and target stems per acre at maturity. The plan discusses the stand type and composition to be achieved at the target year. Stand maintenance/improvement treatments are outlined. Natural Resource staff will periodically conduct site visits to ensure minimal regeneration standards and the objective of the reforestation plan is met. The reforestation plan is a part of the forest land use plan. 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. Further information on Fort Richardson's INRMP regeneration requirements can be found at USARAK INRMP 07-11 volume II annex C forestry, section C.2.1.5.2. (http://www.usarak.army.mil/conservation/INRMP_Final/USAGAK_INRMP_07-11_volume_II_annex_C_forestry.pdf) These requirements will be implemented on JBER-Richardson.

7-6g Wildfires

Wildfire potential does exist, but wildfires are rarely a significant problem. High wildfire potential conditions, caused by severe drought, occur about once every 20 years (USARAK 1998). A few fires occur at JBER each year; however, in most cases these fires are small and easily suppressed. The JBER Wildlfire Management Plan is presented in Appendix K and more information is available at Fort Richardson USAG-AK 2007-2011 Integrated Natural Resources Management Plan Volume II, Annex C Forest and Wildland Fire Management C2.2.2.6.4 or U.S. Army Alaska Regulation 350-2. Fire restriction information can be found in Appendix X of this report.

7-6g(1) Wildfire Prevention

JBER-Elmendorf

The main causes of fire are military activities, the railroad, and recreation. Most of the military activity occurring on Elmendorf AFB in the wildland areas is non-combustible. Military activities on the airfield and other built-up areas will follow guidelines and procedures that are in place to prevent fires from occurring. The EAFB Fire Department takes weather readings twice daily during the fire season (June-September). This information is used to calculate Fine Fuel Moisture Content (FFMC) which is passed to Elmendorf Natural Resources in the form of a fire danger rating. The fire danger rating is posted on signs at the two entrances to the wildland areas.

Other potential sources of wildfires are recreational activities. During times of high fire danger, all fires are restricted to designated fire pits or barbecue areas found mostly around Green Lake, Lower Sixmile Lake, and the family camp (FAMCAMP) area. At other times, such as during the winter, campfires are not restricted due to the low danger of wildfire. Fires caused by

catalytic converters from some vehicles are occasionally a problem. Off-road restrictions, which are described in Section 11-5, will reduce the potential of fires from off-road vehicles.

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

Increasing fuel loads on EAFB is a concern and could lead to large fires, which would be difficult to control. In some areas, dead and dying timber and a build-up of understory and associated litter, has increased the wildfire potential. Timber harvesting or prescribed burns can help reduce the fuel load. Planned burns are difficult to organize. The prescribed burning window (which occurs between loss of snow cover and green-up) is very narrow and, in some years, does not occur. Additionally, air quality permits must be obtained from the Municipality of Anchorage that limit when prescribed burns can occur to certain days based on air quality. If these days of clear air quality do not occur within the prescribed burning window, or the area is too wet during this time, a prescribed burn cannot be implemented.

7-6g(2) Wildfire Suppression

Fire suppression responsibility lies with the JBER Fire Department. If the fire exceeds the capabilities of the base fire department, the fire chief or senior fire official can request assistance from the Alaska Department of Natural Resources, Division of Forestry. The Division of Forestry has wildfire suppression responsibility for all areas in the southern part of the state regardless of ownership.

EAFB Fire Department 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 EAFB. The many wetland areas, major roads, military facilities, and Cook Inlet will help minimize fire spread of most wildfires.

JBER-Richardson

Although wildfires are a concern at Fort Richardson, 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 Fort Richardson since 1950 (Jorgenson et al. 2002). Severe drought conditions occur about once every 20 years, and, in normal years, there is an average of less than five wildfires. These fires are usually mission-related, small, and easily contained. Fire probably had a more important influence on ecosystem functions in the Anchorage area during pre-settlement times. Wildfires were found to be prevalent in the 1800s and early 1900s. Forty eight percent of Fort Richardson over the past 200 years has been affected by fire (Jorgenson et al. 2002). This was indicated by the occurrence of early to mid-successional forest stages that have developed since the fires in the 1800s and early 1900s (Jorgenson et al. 2002).

There is some concern over the spruce bark beetle that killed most of the larger white spruce in the North and South Post training areas. The dead spruce has resulted in high fuel load conditions on the forest floor. Additionally, the death of the larger spruce trees has allowed areas to be taken over by the grass Calamagrostis spp., another potential fire risk (U. S. Army Alaska 2002b).

The North Post is classified for full and critical fire management options due the high value of resources at risk from fire, in addition to the post's proximity to Anchorage, Eagle River, and Elmendorf Air Force Base (Alaska Wildland Fire Coordinating Group 1998). Most of the North Post is classified for critical fire management. The training areas along Knik Arm are classified for full fire management. Many military resources at North Post are at risk from wildland fire. Cultural resources staff identified sites in the North Post area, but management options related

to wildland fire have not been determined. The North Post is bounded by Elmendorf Air Force Base, private parcels, railroad lands, and Native Corporation lands (U. S. Army Alaska 2002b).

The South Post has portions classified under full and limited fire management. Most of the South Post is under full fire management because the area is mainly used for military training and small arms ranges. The alpine zones are classified for limited fire management because of their remote location. Many military resources are at risk from wildland fire in the training areas of the South Post, including two small arms complexes. Additional surveys are needed to ascertain sites where ordnance has been used and disposed. Cultural resources staff identified sites in the South Post area, but management options related to wildland fire are pending. The South Post is bound by private parcels and state lands (U. S. Army Alaska 2002b).

The JBER Fire Department provides the initial response for wildfire suppression, which has traditionally been confined to areas behind the small arms complex. Because of the extensive mortality of white spruce in the area, fire prevention activities were conducted in 1999 and 2000 to reduce fuel loads adjacent to the small arms ranges (U. S. Army Alaska 2001b).

When necessary, the Bureau of Land Management reimburses the Alaska Division of Forestry to suppress wildfires in the southern half of the state, including Fort Richardson. The Alaska Fire Service also provides training for wildfire suppression at Fort Richardson. U. S. Army Alaska and Elmendorf AFB have a mutual aid agreement for fire suppression (U. S. Army Alaska 2001b).

Table 12. Fires > 1 Acre on JBER Richardson.

Date	Alaska Fire Service #	Fire Name	Acres	Cause [1]	Management Option
06/06/1956	31	Eagle River #2	2	Human	N. A.
07/08/1958	67	Beach Lake	25	Human	N. A.
04/19/1969	9078	Mile 15	2	Human	N. A.
06/05/1970	9191	Fire Lake	5	Human	N. A.
06/20/1989	B038	Not assigned	5	Human	Full
08/13/1993	Not assigned	Fort Rich Br	5.3	Human	Full
05/13/1999	B075	Bravo	5	Human	Full
05/12/2000	A079	Small Arms	1	Human	Full

[1] Other, Military, Recreation, Incendiary, and Blasting categories were changed to Human. Source: Alaska Fire Service, personal communication 2002.

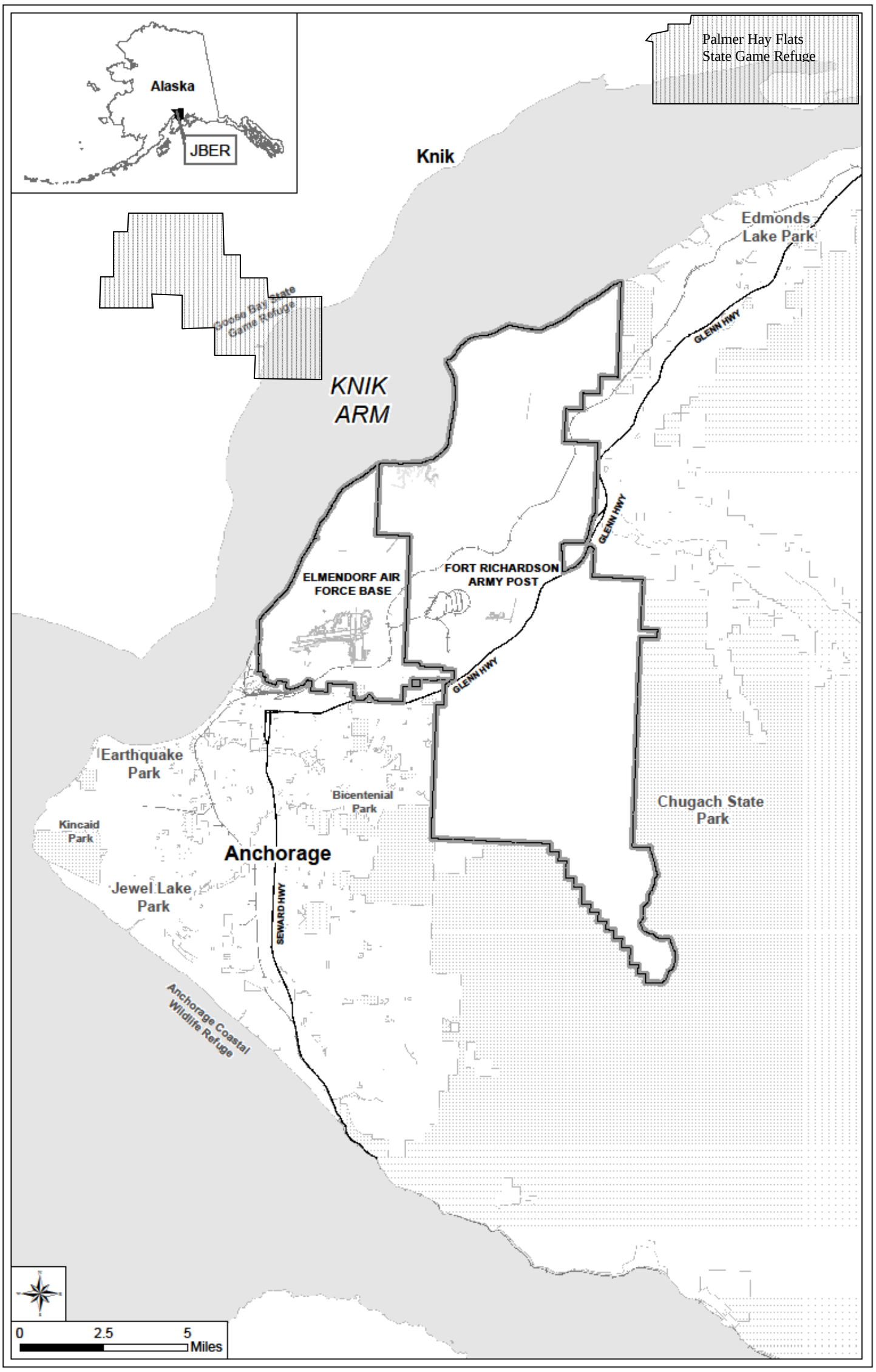

Figure 2. General location of Joint Base Elmendorf-Richardson, Alaska.

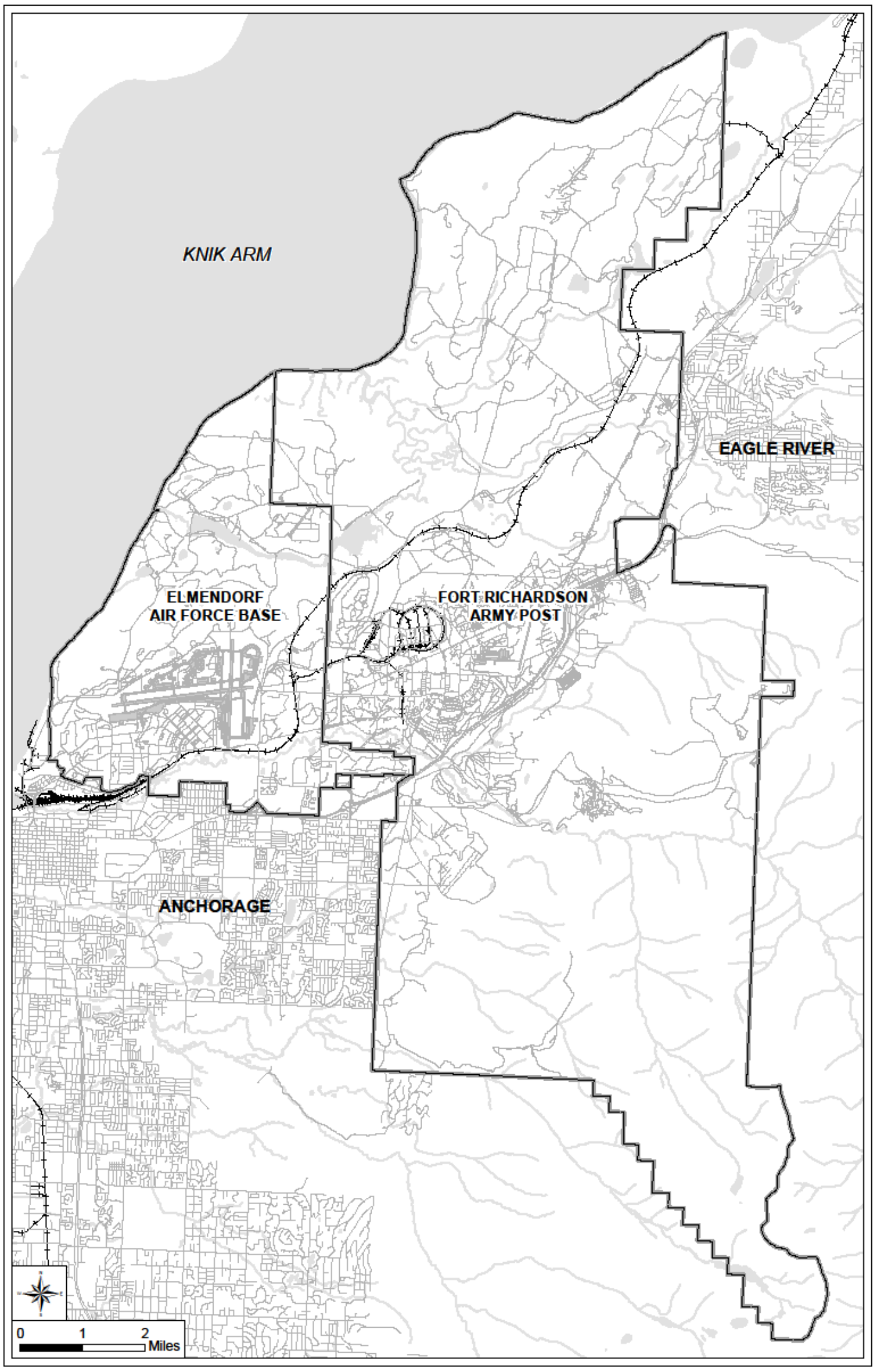

Figure 3. Facility map of Joint Base Elmendorf-Richardson, Alaska.

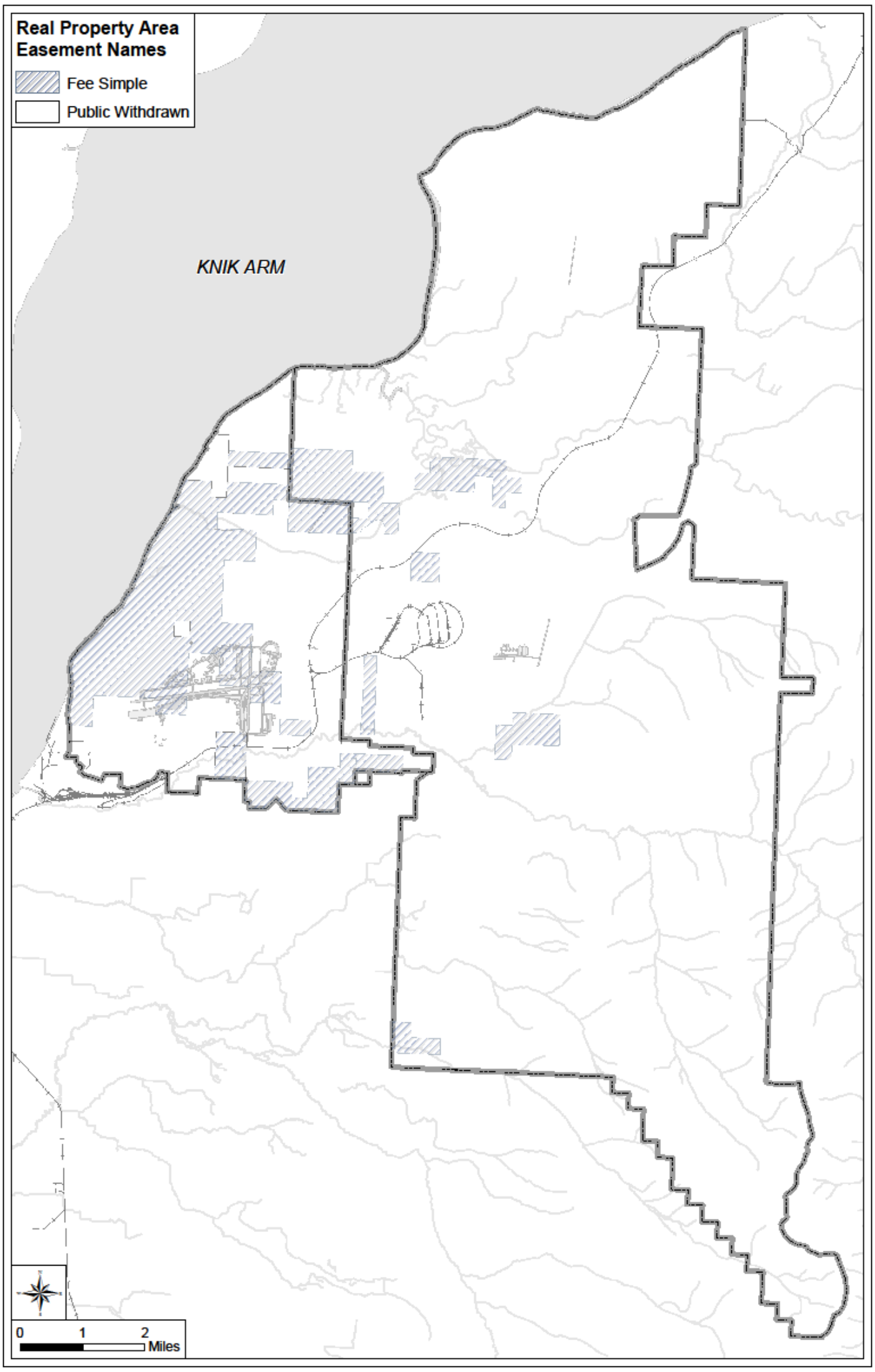

Figure 4. Land jurisdiction on JBER, Alaska.

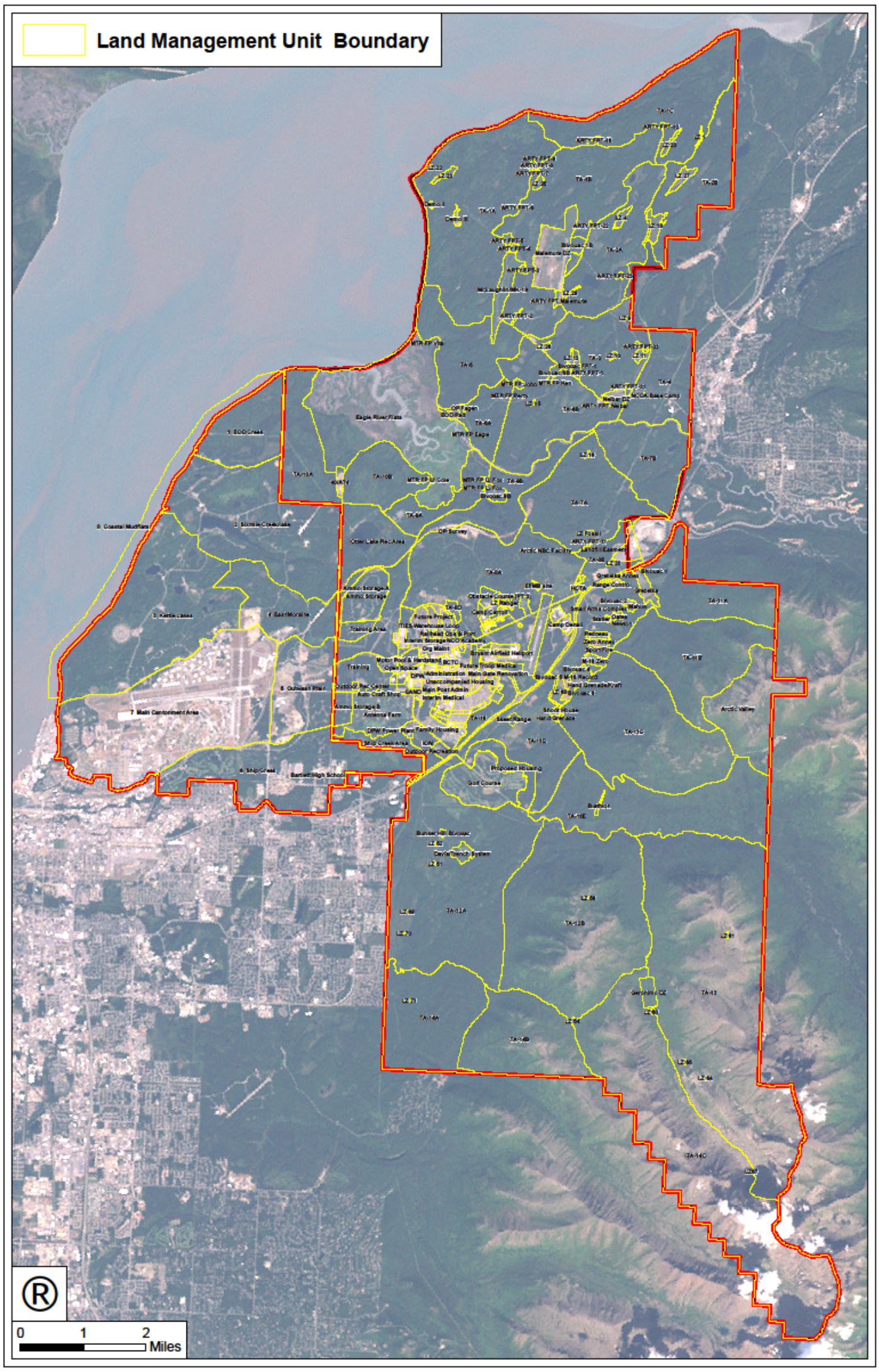

Figure 5. Land Management Units, JBER, AK, 2009.

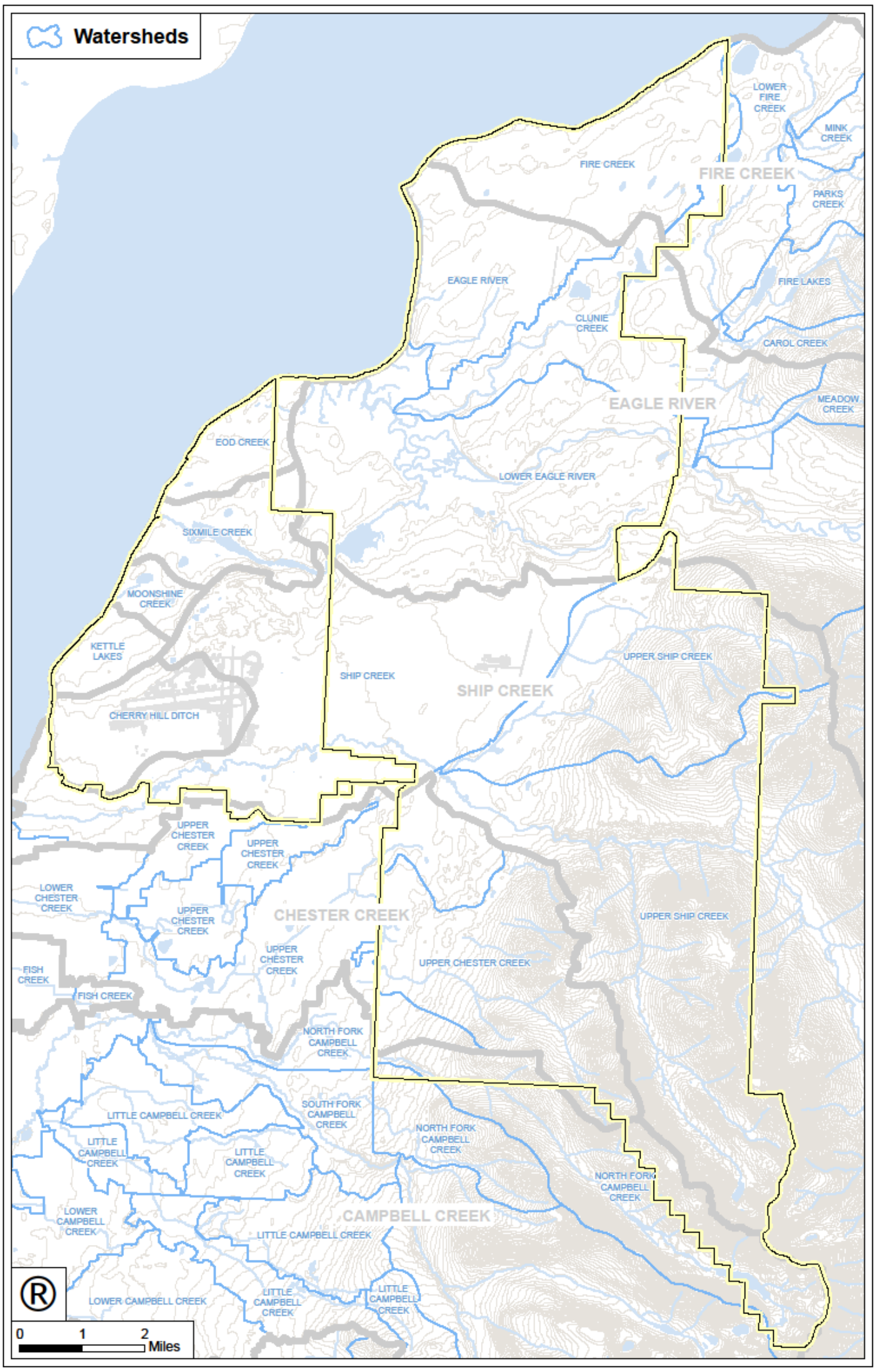

Figure 6. Watersheds, surface waters and topography of Joint Base Elmendorf-Richardson, AK.

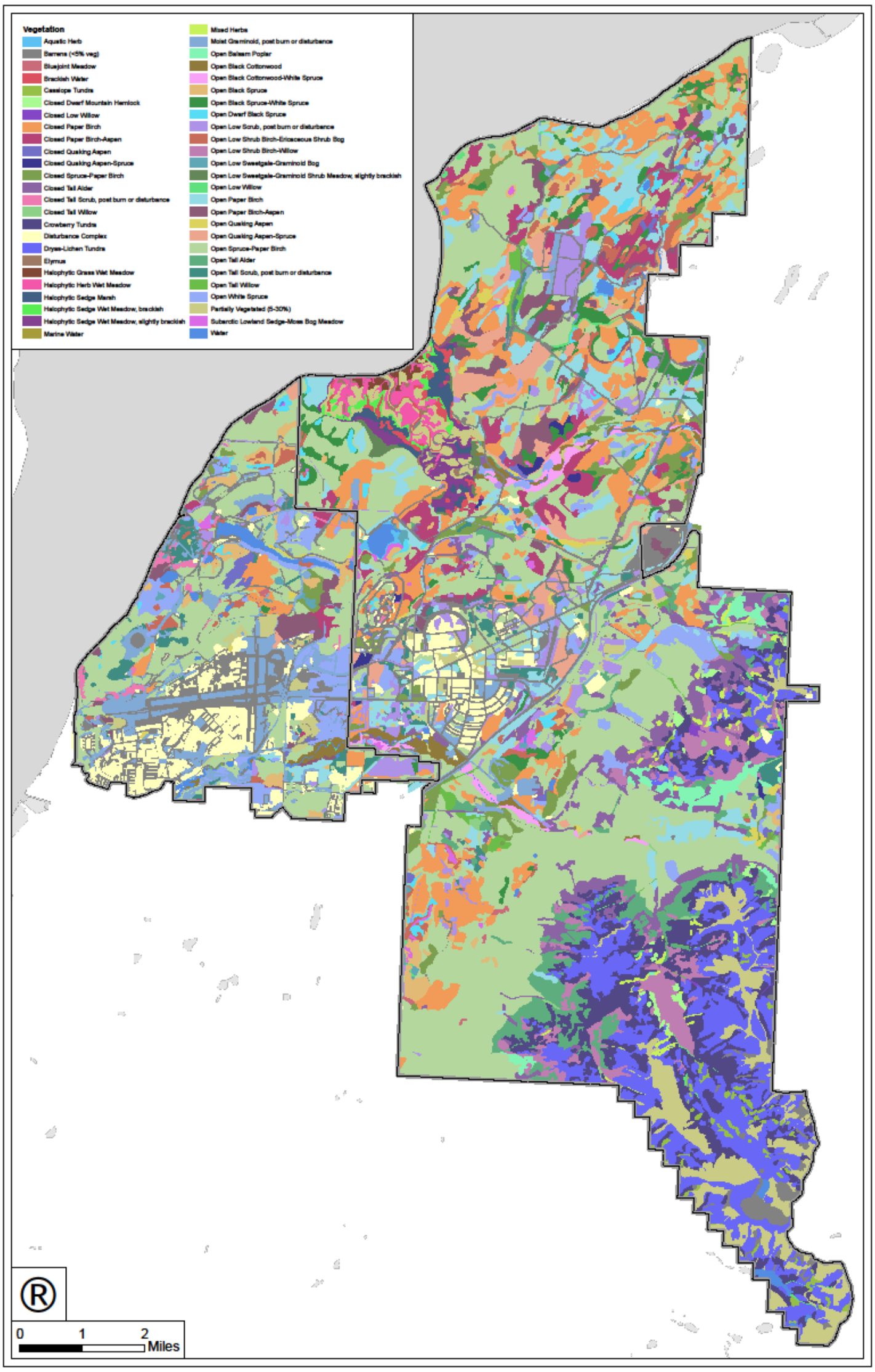

Figure 7. Vegetation classification for JBER, AK, 2000.

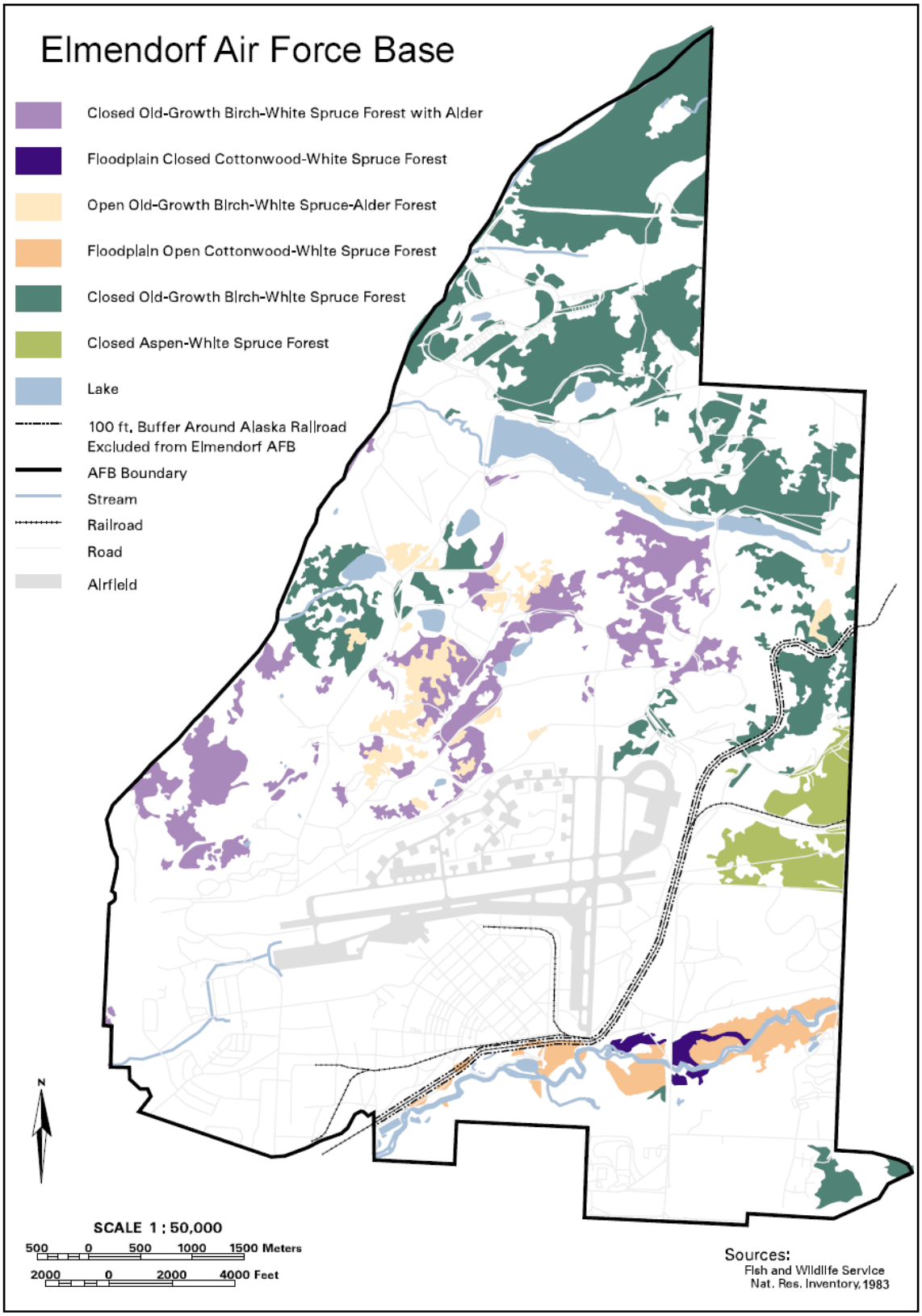

Figure 8. Old growth vegetation, JBER-Elmendorf, AK, 2000

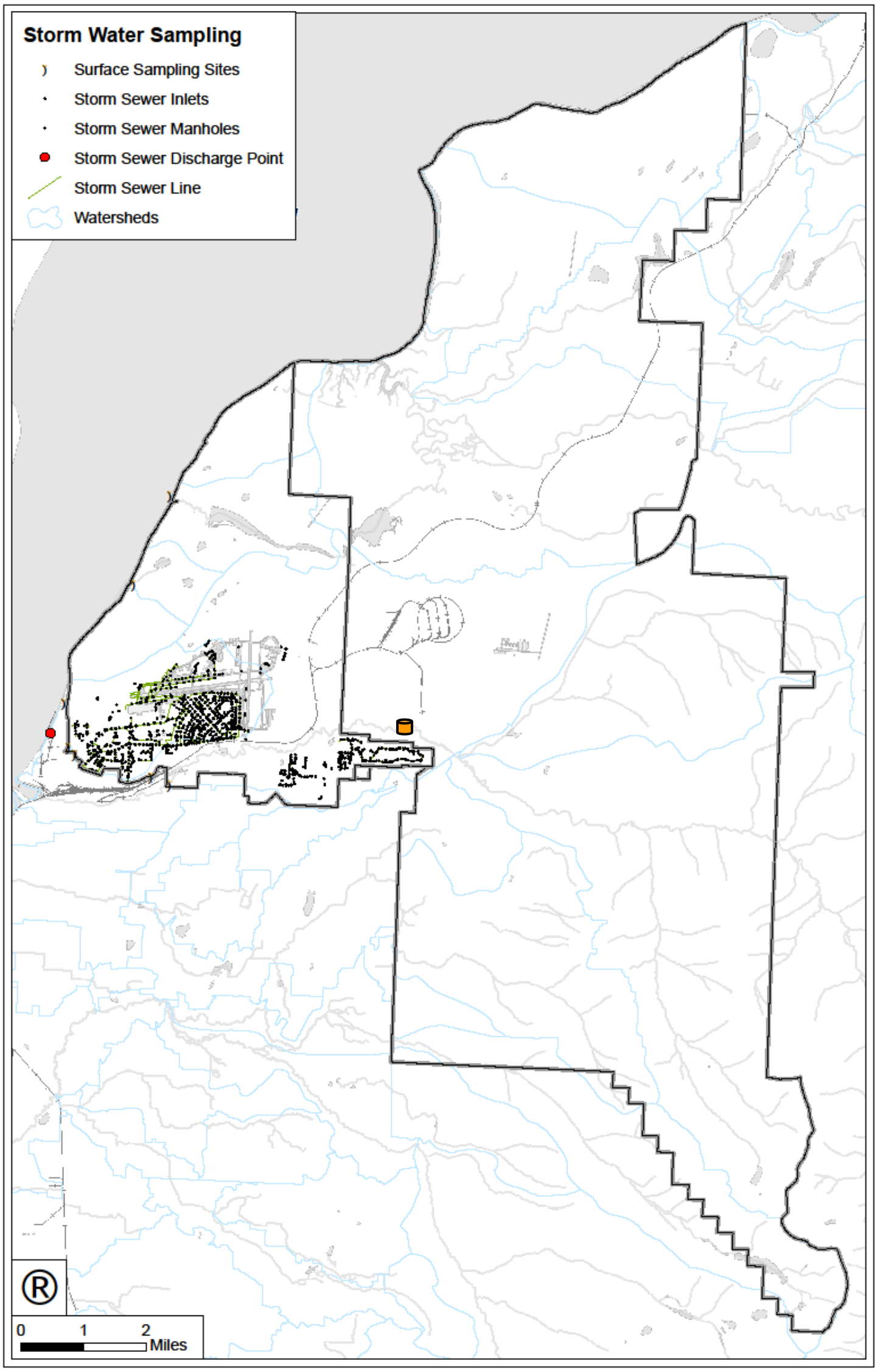

Figure 9. Storm water sampling sites, JBER (Storm Water Pollution Prevention Plan, 2009)

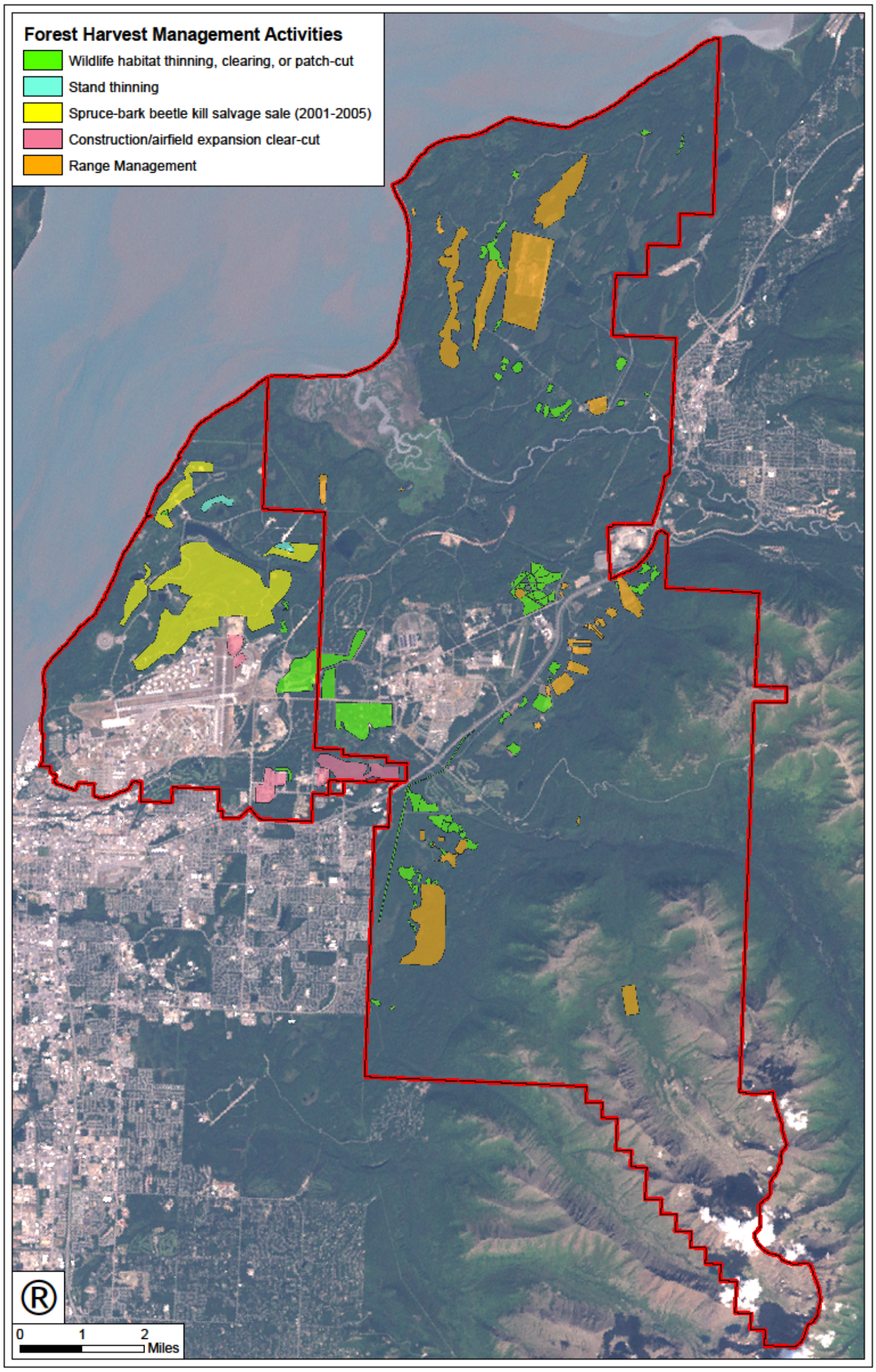

Figure 10. Forest harvest/management activities on Joint Base Elmendorf-Richardson, Alaska 1978 to present.

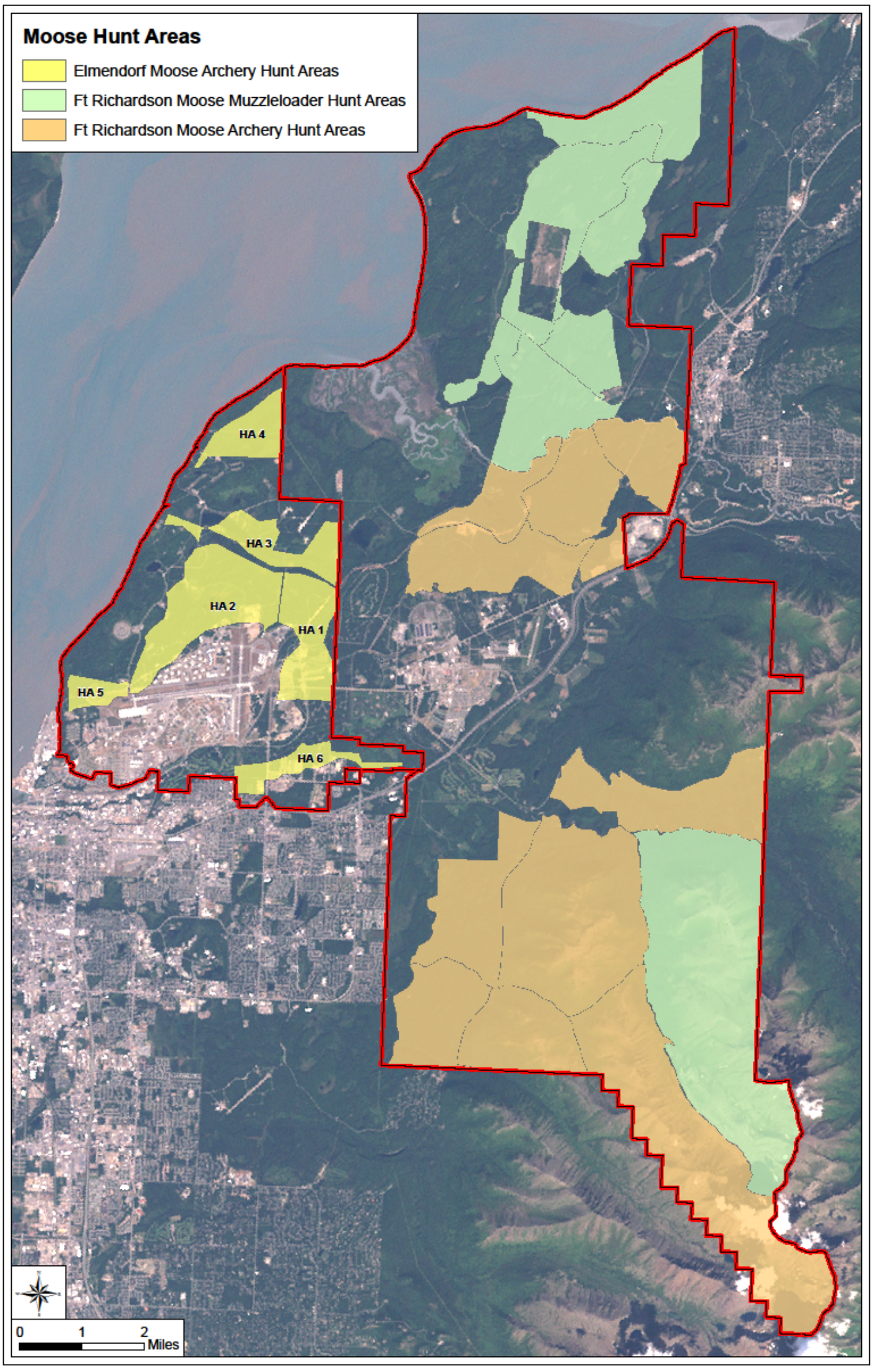

Figure 15. Moose hunt areas JBER, Alaska 2009.

7-7 Fish and Wildlife

7-7a Fisheries and Wildlife Management Objectives

(1) Protect, conserve, and manage fish and wildlife and their habitat as vital elements of an integrated natural resources program

(2) Ensure species are well distributed throughout suitable habitat

(3) Protect and conserve endangered and threatened species and their critical habitat

(4) Conserve migratory bird populations through adoption of DoD Partner's in Flight objectives

(5) Identify and monitor status of key and indicator species and species of concern or special legal status

(6) Manage moose and its winter habitat with the objective no more than 80% utilization of preferred winter browse (Salix, Betula and Populus) and to maintain a calf:cow: bull ratio of at least 50:100:35

(7) Maintain or enhance wetlands valuable to waterfowl and other wildlife in areas removed from the WEZ, reduce open-water wetlands within the WEZ and mitigate the their loss with wetland creation or meaningful enhancement

(8) Provide improved opportunities for wildlife-based recreational activities (consumptive and non-consumptive)

(9) Minimize human-wildlife conflicts and their impacts to the mission and base personnel and facilities

(10) Establish partnerships with other land and wildlife management agencies to facilitate landscape scale management of wildlife species and ecosystems

(11) Establish individual population and habitat objectives which are measurable and monitor them

(12) Integrate wildlife/habitat issues into land-use planning and decision-making processes

(13) Minimize fragmentation by promoting natural landscapes and connectivity of habitats

(14) Improve health and diversity of aquatic ecosystems

(15) Restore damaged or degraded fish habitat

(16) Minimize impacts to and emphasize wild, self-sustaining fish populations

(17) Implement objectives of Executive Order 12962, including:

-Increase access for recreational fisheries

-Provide fish passage for anadromous species

-Restore native fisheries and improve fish habitat (unless conflicts with human safety would result)

7-7b Multiple Species Monitoring

7-7b(1) JBER-Elmendorf Management Indicator and Keystone Species

As indicated in section 1-5b, JBER-Elmendorf has chosen to monitor ecosystem biodiversity and health through monitoring management indicator species. The featured species for EAFB are moose, black bear, sockeye salmon and common loons due to their representation of Alaska wilderness. All four species are also included as MIS used for monitoring ecosystem health.

MIS selection occurred during the development of the 2001-2006 EAFB INRMP. The species shown in Table 11 reflect the species selected for the 2001-2006 period and changes made in the 2006 INRMP revision.

Moose, beaver, black bear, and sockeye and silver salmon were selected largely on the basis of their importance to the ecosystem (keystone species) or to man (e.g. economic, wildlife conflict issues) and their sensitivity to management activities currently underway. In the case of black bear the selection was not based on ease of population monitoring.

In spite of cyclic populations, the snowshoe hare was selected due to its close relationship with lynx, as well as other furbearers, and its ease of monitoring. Snowshoes are also a keystone species as a major prey species for numerous predators. Hares reflect the presence of shrub habitats or early successional forest habitats.

Goshawks, loons, olive-sided flycatcher and rusty blackbirds were selected due to continent and regionally decreasing populations, their listing as sensitive species, or utility as indicators of ecological integrity. Townsend's warbler, selected during 2000, was dropped because of its rarity on EAFB (one record during 2003-2006). Townsend's warbler habitat preferences may be related to proximity to low elevation mountain slopes (H. Griese observations).

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.

Wood frogs were added during 2003 for their global sensitivity to environmental health and specifically to wetlands with emergents.

Macro-invertebrates, which were selected as MIS for aquatic systems in 2000, were narrowed down to dragonflies and damselflies (Order Odonata). A study is needed to identify baseline presence and distribution as well as the identification of an effective monitoring strategy. Notable is their importance as food to rusty blackbirds during nesting (H. Griese, 673 CES/CEAN, observations).

Canada geese and Bohemian waxwings, while not previously considered MIS, are species that pose BASH risks, and their population levels on base reflect effectiveness of BASH reduction management and procedures. Waxwings are primarily present in fall and winter months when they feed on berries produced by landscape vegetation around the cantonment area. Berry producing ornamentals, while prevalent in the cantonment area, are now being discouraged in all landscaping plans within the BEZ/WEZ.

7-7b(2) Species with Legal Constraints

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 EAFB is necessary to support future BASH actions.

See section *6-3g(1) Cook Inlet Beluga Whale* for CIBW management needs.

Table 13. Species Considered/Selected for Management Indicators Species for JBER-Elmendorf, AK.

Ecosystem/Habitat Type	Species Selected	Supplemental Species
Forested Early Succession	Snowshoe hare, moose	White-crowned sparrow
Forested Late Succession	Black bear, olive-sided flycatcher, northern goshawk, cavity nesting owls	Townsend's warbler, porcupine
Riparian/Wetlands	Beaver, wood frog, rusty blackbird	Yellowleg (spp) sandpiper, northern waterthrush
Aquatic	Sockeye salmon, common/arctic loons, macro-invertebrates (Odonata)	American dipper, silver salmon

7-7b(3) JBER-Richardson Priority Species

Currently, the management priority species list generated for Fort Richardson contains 94 species comprising 35 birds, 32 mammals, 4 fish, 1 amphibian, and 22 vascular plants. Short lists were developed to focus management to 25 high priority species on Fort Richardson (Table 12). The species on these lists are deemed most important for management and overlap with federal and state species of concern lists.

This prioritization process uses a set of ten ranking criteria that address each species' biology and ecology relative to its response to human-induced disturbances and alterations of habitats (high ranking species are likely to be less common and/or more susceptible to impacts). Each species was given a score of 1–3 for each ranking criteria and values were summed for all ten criteria, which resulted in high values for high-priority management species. This short list of high priority management species will be used in most cases for impact assessment and conflict resolution in land-use issues.

Once priority species are identified, habitat preference data are determined and created to maintain spatially explicit data for each species in a Geographic Information System. The determination of habitat preferences for the rare, threatened, endangered, priority species and species of concern is an ongoing process, and will be continually refined as additional data are discovered or new data are collected from knowledge-gap studies recommended by the Ecosystem Management Plan.

Habitat preferences (coded in a Geographic Information System as negligible/low, medium, or high use) for each rare, threatened, endangered and priority species, as well as species of concern, were assigned using the combined knowledge of many biological field workers

familiar with Alaska (area agencies including USFWS, Alaska Department of Fish and Game, U.S. Forest Service, etc), local knowledge of the natural history, and published and unpublished data on habitat use per species. These data were then incorporated into ecotype (habitat) classes created for FRA by ABR, Inc. Jorgenson et al. 2002). The final product is a map of each species with key habitats highlighted that is used for management and land use recommendations.

Table 14 . Priority Management Species for JBER-Richardson, AK.

Group	Species
Mammal	Beluga Whale
Mammal	Harbor Seal
Mammal	Wolverine
Mammal	Brown Bear
Vasc. Plant	*Viola selkirkii*
Mammal	Black Bear
Mammal	Marten
Mammal	Lynx
Mammal	Gray Wolf
Mammal	Dall's Sheep
Bird	Olive-sided Flycatcher
Bird	Great Gray Owl
Bird	Common Loon
Vasc. Plant	*Taraxacum carneocoloratum*
Vasc. Plant	*Saxifraga adscendens ssp. Oregonensis*
Mammal	Meadow Jumping Mouse
Mammal	Little Brown Bat
Bird	Sandhill Crane
Bird	Boreal Owl
Mammal	Moose
Bird	Golden Eagle
Amphibian	Wood Frog
Bird	Trumpeter Swan
Bird	Bald Eagle
Mammal	Snowshoe Hare
Bird	Northern Goshawk

7-7c Monitoring Methodology of Management Indicator Species (MIS) and Other Selected Species

7-7c(1) Dragonflies and Damsel Flies

Macro-invertebrates were identified as important indicator species during the development of the MIS process. Likewise they have been identified in the ADF&G Comprehensice Conservation Stategies Conservation Action Plans.(http://www.sf.adfg.state.ak.us/Static/Statewide/NG_plan/PDFs/Freshwater_Invertebrates.pdf) 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. Baseline data for this group of insects, however, is absent for this area of Alaska and the military lands specifically. There is a current need to conduct a baseline survey and a need to develop a species monitoring protocol.

7-7c(2) Salmon

Sixmile Creek Salmon. Sockeye and coho salmon, as well as other salmon species, have been annually censused at the Sixmile Creek fish weir since 1988 (Appendix G.8). In 1998, this weir was moved to near the entrance to Lower Sixmile Lake. Sockeye and coho salmon are censused at this location. Pink and chum salmon, near intertidal spawners, are censused 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 will continue to be monitored annually, but out-migrating smolt monitoring will become periodic following the 2006 season.

Chester Creek Adult Coho Survey. JBER personnel conduct 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. Streamside salmon surveys wre also conducted in tandem with the collection of brown bear hair for the brown bear population estimation component of the brown bear telemetry project.

Surveys are typically conducted weekly in August and September. The surveys employ a minimum of two observers, both equipped with wading equipment, polarized sunglasses and GPS 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. JBER personnel conduct 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. 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 for Chester Creek except that they are conducted weekly from June until October.

7-7c(3) Northern Pike (Invasive)

Northern pike have been confirmed in two lakes, Otter and Gwen, on Fort Richardson although Gwen Lake experiences heavy winter die-off and is currently not thought to harbor pike. Pike are not indigenous to south-central Alaska and can have devastating effects on ecosystems that have not adapted to their presence. Indigenous 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 primary objectives for this project are to monitor for the presence/absence of pike in post lakes and to remove as many pike as possible from water bodies harboring pike. The secondary objective is to delineate potential prime pike spawning and rearing locations in all post water bodies.

Monitoring for the presence of pike in Fort Richardson waters consists of review of annual Alaska Department of Fish and Game fish harvest reports, angler interviews and visual surveys

of the water bodies themselves. Fish harvest reports are 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 the presence of pike in Fort Richardson lakes (Otter, Gwen, Thompson, Walden, and Clunie) are conducted by Army personnel on an annual basis. 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 electro-fishing 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.

7-7c(4) Wood Frogs

With global declines in amphibian populations, there is a growing concern for the single species of frog found in Alaska. Current frog population survey techniques are spring calling counts conducted during the peak period of breeding activities for the species. Methodology outlined by the North American Amphibian Monitoring Program, currently being used for EAFB, requires following a survey route that visits a pre-designated stops near wetland areas during mid-PM. Calling frogs are enumerated if few or categorized by relative density. This technique is subject to numerous variables. Survey effort has been focused on collecting a baseline data set for future comparison. These actions are detailed in the ADF&Gs Conservation Action Plans (http://www.sf.adfg.state.ak.us/Static/Statewide/NG_plan/PDFs/Amphibians.pdf)

7-7c(5) Loons

Common and Pacific loons are visually monitored each year, including nesting success using Alaska Loon Watch volunteers (Appendix G.4). Loon Watch volunteers report their results through USFWS. ADF&G Conservation Action Plan for loons: (http://www.sf.adfg.state.ak.us/Static/Statewide/NG_plan/PDFs/Waterbirds.pdf)

7-7c(6) Raptors and Owls

See the ADF&G Conservation action plans for these species at (http://www.sf.adfg.state.ak.us/Static/Statewide/NG_plan/PDFs/Raptors.pdf)

Eagles. Bald eagles are casually monitored each summer, and conservation agents and field crews report nest locations to CEANC. No information on nesting success rates is available, and little written data exists. A database of known active and inactive nesting sites is being developed by the Raptor study contract awarded 2006 and will soon be entered into the Geobase.

Northern Goshawk. Other raptors, including goshawks, will be inventoried as part of the same Raptor Study contract (eagles). This study will provide baseline data on raptor populations that is currently unavailable. See study results at section 7-7m(2) Results (2001-**2009**).

Owls. Owls are monitored with breeding season call surveys using techniques following a number of similar studies. We followed techniques recommend by Andres (2001). Breeding season for owls can cover February through May in south-central Alaska. Surveys are conducted on established routes that provide coverage of most of EAFB (Appendix G.6). There

are four routes with 10-12 stops on each. Counts are conducted beginning 2 hours following sunset until the route is completed. Listening at each stop occurred for 8 minutes. Number and direction of owls heard or seen are recorded on maps. Each route should be counted at least 3 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. These surveys have been instrumental in identifying the presence of these difficult to observe species.

7-7c(7) Geese/Waterfowl

Fall counts of feeding Canada geese on EAFB have been conducted since 1989. Beginning in 1995, spring counts were conducted as well. These counts are used both as a rough population trend estimate and in terms of response to management activities. Since 1995, considerable data has been compiled concerning geese dispersal. This effort, though modified from original monitoring efforts, is on-going through the dispersal reports provided by USDA-APHIS Wildlife Services. Wildlife Services maintain that database. A contract needs to be developed to generate a goose-use index for EAFB using the available BASH data.

Eagle River Flats Waterfowl Monitoring. 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 to be patterned after standard Department of Interior aerial survey techniques. Approximately 10 parallel transects will be flown twice, in opposite directions, during each survey. Transect lines will run generally in a north/south direction from tree line on the south side of Eagle River Flats to the coast of Knik Arm on the north. Due to considerable variability of water conditions, lighting conditions, and numbers of birds on Eagle River Flats the transect endpoints are not fixed points and may vary depending on conditions. The controlling factor will be complete coverage of suitable habitat for waterbirds in Eagle River Flats with good visibility under existing conditions at the time of the survey. Surveys will be conducted at maximum altitude of 75 meters and airspeed of 100-150 km/hour. Surveys will be started on the west side of Eagle River Flats and proceed inland. The observer will sit on the right side of the airplane and count all waterbirds on the right side out to a maximum of 200 meters. The pilot will initiate 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 will turn and fly 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 will initiate the next transect at a distance not to exceed 200 meters to the side of the previously used visual landmarks and establish new visual landmarks for the next transect. This procedure will be repeated until the entire Eagle River Flats area has been surveyed.

Mitigation Measures for Year Round Firing in ERF (if selected). Resumption of year round firing of HE munitions on Eagle River Flats Impact area, as described in the proposed action (DEIS) will strive to minimize adverse affects on birds using ERF. Twelve years of waterbird survey data collected by USFWS biologists were evaluated to establish peak periods of waterfowl and other birds using ERF. While beginning and ending of peak migration will vary slightly between years firing closures during the periods of mid-April through mid-May and August through late October will protect most birds. Firing closure dates may be adjusted in-season, with coordination with USFWS, to minimize bird mortality while optimizing training requirements. Target areas will be designated in areas that provide buffers to Eagle River, Otter

Creek, Eagle Bay, pond habitat and other white phosphorous remediation sites. In spite of these precautions birds may be incidentally killed by munitions. This is not inconsistent with 50 CFR Part 21. Using practical and feasible technology and methods, bird mortality will be estimated by trained observers during daylight firing periods. If mortalities become unreasonably high by numbers or for individual species of special concern, coordination with USFWS and ADF&G will strive to identify methods of hazing to reduce mortalities.

7-7c(8) Bohemian Waxwings

This bird is a gregarious berry feeder during fall and winter months. Flocks can become as large as several thousand birds in good berry habitat. The flocks are tightly packed when feeding and flying. The size and persistent presence of large flocks near the airfield are of BASH concern. Beginning in 2003 their spatial and temporal use of the cantonment area, as well as behavior and habitat selection, have been documented by weekly highway vehicle survey routes that systematically cover the full extent of the base cantonment are south of the airfield. Surveys are conducted during mid to late day and take approximately one hour. Their numerical trend is presented in Appendix G.5.

7-7c(9) Olive-sided Flycatcher and Rusty Blackbird

These passerines can most easily be monitored with breeding bird surveys through a combination of point counts and roadside surveys (Appendix G.5.). Point counts conducted following protocol similar to variable circular plots (Reynolds, R. T., J. M. Scott, and R. A. Nussbam. 1980.) are conducted at the 30 long-term vegetation monitoring plots on the north side of base. Point count surveys are conducted during 10-20 June from ½-hour before sunrise to approximately 0800 on most days. Sampling at each site lasts 10 minutes and birds heard or observed are recorded by direction and distance. Breeding bird roadside counts are conducted along a 25 mile route with 50 stops at 1/2–mile intervals (Robbins, C.S., D. Bystrak, and P.H. Grissler. 1986). Birds seen and heard are recorded at each stop for only 3 minutes. However, the count is repeated each month for April, May and June. The roadside count more fairly represents the complete breeding season but is weighted toward developed areas while the point count represents more of undeveloped habitats. In addition to fixed stop breeding bird surveys, wetland areas, potential breeding habitat for rusty blackbirds, is visited through the breeding season by staff and Loon Watch volunteers to record rusty blackbird breeding activities. ADF&G Conservation action plans are found on pages 18 and 33 in: http://www.sf.adfg.state.ak.us/Static/Statewide/NG_plan/PDFs/Landbirds.pdf

A study of rusty blackbirds on Alaska DoD lands was conducted by USFWS and funded through the DoD Legacy Resource Management program beginning in 2007 (Matsuoka, et al. 2009). Researchers found that JBER lands were relatively important for this declining species with 21 and 23 nests found during 2007 and 2008, respectively. Nesting sites were selected near (mean =30m) relatively large water bodies in small spruce trees (predominantly black spruce). Protection of spruce stands near water bodies from Christmas tree cutters and vandals is desirable for conservation of this species.

7-7c(10) Beluga Whale

See Appendix H Cook Inlet Beluga Whale Observational Study .

7-7c(11) Black Bear

Black bears are difficult to monitor and the technique can be expensive. Possibilities for monitoring 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, CEANC monitors both nuisance bear activity and bear sightings on base, 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 set up and calculations can be easily performed using the Lincoln-Peterson estimator. Data useful for population estimates are not currently available.

7-7c(12) Lynx/Snowshoe Hare

Lynx and snowshoe hare are currently being inventoried through winter track surveys (Golden 1993). A common practice is to conduct hare pellet group counts to complement inventories for snowshoe hare, and to use inventories for snowshoe hare levels to support, or even replace, lynx population censuses. We currently conduct only winter track counts using volunteers. Procedures and results are detailed in Appendix G.3.

Snowshoe hare populations are known to be cyclical and most directly affect lynx populations, but are also known to affect populations of other furbearers such as coyotes, and foxes. Snowshoe hare are closely tied to early forest successional stages and can also serve as an ecological indicator in this respect. Hares can also influence populations of owls and goshawks.

7-7c(13) Beaver

Beaver are censused every year through inventory of caches and lodges. This survey is conducted in the fall, and is conducted entirely by foot. Once lodges are counted, an estimated number of beaver per lodge is applied to get an overall population estimate (Sinnott 1995a). Beaver harvest statistics can also be used as a rough trend indicator of population levels from year to year. These data are available through the Anchorage office of ADF&G and EAFB harvest is summarized in Appendix G.2.

7-7c(14) Moose

Monitoring of this EAFB key and indicator species requires population number and composition to assess productivity. Consequently winter browse utilization must also be monitored to ensure habitat-population levels are compatible.

The JBER moose herd is typically aerially surveyed each fall by ADF&G and JBER Natural Resources staff (Appendix G.1). 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. Written reports in the form of data summaries and Memoranda of Record dating back to the early 1980s are available in the FRA Natural Resources Office. Surveys are divided into 14 sub-units, with portions of 4 sub-units comprising EAFB. Data taken by aircraft observers includes bulls by size (small/medium/large), cows with calves, and cows without calves. The summary of survey data through 2009 are presented in Appendix G.1. Observed numbers are adjusted using Sightability Correction Factors generated during the survey, and data analysis follows procedures described in Gasaway (1986). Bull:cow and calf: cow ratios are calculated. These two ratios represent standard metrics for overall herd health and productivity, as well as response to management activities.

Little information exists on locations of critical winter habitat, and moose habitat quality has not been systematically quantified. Habitat utilization was historically visually assessed during field activities. Moose utilization of browse was measured in nine selective high browse density areas on EAFB following the 2005-2006 winter and found moose browse utilization rates of 35 to 79% where browse was tall enough to not be covered by snow (Anderson et al. 2007). A 2009-2010 study of moose movement and habitat utilization on JBER will shed light on critical winter habitat areas.

Moose habitat assessment should be formalized but set up to optimize results with available staff resources. Future monitoring of long-term vegetation monitoring plots will also incorporate quantifying browse intensity.

7-7c(15) Small mammal (FRA)

JBER personnel have conducted small mammal inventories on FRA, using a combination of live (Sherman live traps and pitfall) and museum special snap traps, on a small portion of Army land with more inventory work needed during the 2007-2001 time frame.

Areas to be sampled are determined by natural resources personnel in coordination with Range Control, with plot numbers and locations within each area 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 consists of 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). The specimens are then placed in an iced cooler within one hour of collection and frozen within 3 hours in order 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. Ecto- 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 C). All data are entered into the Museum database and USAG-AK databases. Results can be found in Peirce, K. N. 2003. *A Small Mammal Inventory on Fort Richardson, Alaska, Final Report*.

7-7c(16) Bats

Acoustic monitoring will be the primary means utilized to sample bat community presence, composition, relative abundance, and activity levels. Mist netting surveys will be used to capture bats to verify species identification, for species specific data collection and to record reference calls. Field surveys will be conducted during periods of frequent bat activity (approximately 1 June - 1 October).

Bat echolocation calls will be monitored and recorded using ultrasonic bat detectors (Anabat II® or Petterson D240x) in conjunction with an electronic Interface Module unit and laptop computer or remotely using ultrasonic bat detectors in conjunction with sound activated cassette tape recorders. Remote detector units will be housed in black PVC boxes and strapped to trees 3-4 meters above the ground with the microphone of the detector directed at a 45-degree angle from the ground. An IBM compatible computer and Anabat6 or Sonobat software will be used to create, display, compare and analyze sonograms (Time vs. Frequency) of recorded bat echolocation calls. For the purpose of data analysis, a call sequence will be defined as a series of bat calls with duration of greater than 0.5 ms consisting of more than two individual echolocation calls. Calls recorded in the field will be compared to calls of known identity or "reference calls," allowing genus specific features of bat echolocation calls to be discriminated and, in some cases, species specific differentiations will be made.

Mist net surveys. Mist net surveys may be conducted by qualified natural resources staff in accordance with ADF&G permit requirements. Because mist net surveys for bats are more successful over water sources such as ponds and streams where bats forage and drink, mist netting surveys will focus on the water sources within the survey area that appear most conducive for capturing bats. Avinet® 9m and 12m length nets and Avinet® 3 piece net pole sets or equivalents will be used. Three nets, with spacing of approximately 30 meters as determined by site logistics, will be opened at sunset and kept open for three hours or until at least one hour passes without a bat capture. Nets will be arranged to maximize capture success and will be centered on the best available foraging habitats in the survey site area. Mist nets will not be deployed on nights with inclement weather such as low temperature or precipitation. Captured bats will be removed from mist nets, placed in 100% cotton drawstring bags and transported to a central area located 20-40 meters from the nets for processing. Species-specific identification will be determined using published dichotomous keys. For each captured bat the species, sex, reproductive status, mass, forearm length, age class, capture time, net number, direction of flight and air temperature at time of capture and will recorded. Juveniles will be distinguished from adults by a lack of ossification of the third metacarpal-phalangeal joint. To further discriminate between Myotis species, additional data will be taken such as tragus length, thumb length, right rear foot measurements, as well as calcar keel and fringe presence. Every effort was made to ensure the welfare of captured bats and to prevent individuals from escaping the nets. To monitor the presence of insects available as potential prey for bats during the mist net survey periods, insect traps constructed of four inch (10.16 centimeter) diameter black ABS tubing smeared with axle grease will be deployed at acoustic survey sites. Traps will be suspended 1-2 meters above ground level. All captured insects will be removed from traps, stored in alcohol and later identified to Family level using published dichotomous keys. Through 2010 no surveys have been conducted.

7-7d History of Fish and Wildlife Management

Fish and wildlife inventory. Wildlife habitat, as well as an in-depth species survey, was documented in the 1982-1983 Natural Resources Inventory (Rothe et al. 1983). The USFWS did this inventory for the 21st Combat Support Group/DEEV (Engineering Design Section), EAFB, under an Interagency Support Agreement.

Fish. In an effort to obtain better information on the size of salmon runs returning to the Sixmile Creek drainage, annual salmon counts were initiated in 1988. Counts were conducted by establishing a weir in the creek that blocked salmon migration. The fish behind the weir were

netted, counted and passed to the upstream side on a daily basis at the height of the run. Counts were conducted every other day when the number of fish in the trap averaged less than 20 fish per day. In 1998, the weir was moved to the Sixmile Lake outlet into Sixmile Creek where reds continue to be counted, however, pinks, chums and silvers that have yet to reach the lake are counted now by stream walks, instead of at the weir. The last stream-walk of the fall coincided with the opening of the weir, usually during mid-September.

Salmon habitat has been improved through the removal of obstacles such as beaver dams and flood debris that occur in base 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.

Fish stocking. The stocking program on EAFB began in 1953 when rainbow trout fry were stocked in Green Lake. The following two years, other fish species, including cutthroat trout and steelhead (Salmo spp.), were stocked in both Green Lake and Lower Sixmile.

The emphasis in the 1950s stocking procedures was on stocking fry and/or fingerling trout to create a viable self-supporting fishery. This was eliminated when ADF&G decided that the absence of natural salmonid reproduction in most Anchorage lakes and periodic winter overkill problems necessitated the use of a put-and-take program to maintain area fisheries. Prior to 1981, fingerlings available for stocking were used in remote lakes outside of the Anchorage basin. This preempted the option of planting fingerings in EAFB lakes with the expectation that they would grow to a sufficient size to be caught during the next few fishing seasons. Currently, the ADF&G Elmendorf fish hatchery located on Ship Creek produces fish for stocking lakes in the Anchorage Bowl area. The Elmendorf hatchery was originally designed to use heated water from the Elmendorf power plant. That plant was decommissioned in 2005, and the hatchery is currently going through process and facility modifications to meet the fishery demand. EAFB will continue to allow ADF&G to lease the land at the hatchery site and will consider plans for hatchery expansion. Stocking levels in response to the loss of hot water from the power plant have diminished as a result of the slower growth rate of trout. In 2006 landlocked salmon were not stocked in base lakes because the entire cohort of fingerlings at the Fort Richardson hatchery was destroyed due the presence of disease.

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 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 any edge effects that may have existed, fertilized, and implemented other procedures as outlined in the BASH Plan . However in 2008 3 WG/SEF, as OPR, revised 3WI 91-212 to include a vegetation management plan that included objectives for shrub habitat outside the airfield security fence line if not in lawn near buildings, sidewalks and streets. The objective strives to minimize raptor feeding areas by replacing grass cover, attractive to rodents, with small trees and shrubs. This habitat conversion would offset 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 Elmendorf portions of the Eagle River and Anchorage CBC are compared to the remainder of the count areas relative density

and diversity of birds can indicate the attractiveness relative effectiveness of the BASH program can add to the interpretation of activities recorded by USDA-APHIS 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 more commercially available "wood duck" boxes were erected in 2009, all within ¼ mile of a large water bodies north of Hilberg Lake to avoid conflicting with BASH objectives.

Bears. A cooperative study of black bears on EAFB and FRA, involving Air Force, Army and ADF&G personnel, was initiated in 1989 with wildlife funding obtained from HQ USAF and U.S. Army Alaska (USARAK). The objective of the six-year study was to identify seasonal migration patterns, ranges, and den areas, as well as obtain information on animal size, age and general health (Bostick 1997). A secondary objective of the study was to try different methods of discouraging bears from frequenting areas of the base where they are not wanted, such as housing areas and garbage dumpsters. The study resulted in recommending management changes. The base has attempted to minimize bear problems by dumpster modification and collection combined with a public education program. All newcomers to the base are informed of conflict prevention measures at the weekly newcomers' briefing.

Wolves. Wolves have been periodically sighted on EAFB since the late 70s and early 80s (Rothe et al. 1983). Beginning in 1995, wolf sightings dramatically increased and wolf-human and wolf-dog conflicts began to become common on the installation. Those conflicts increased again beginning in 2007. A telemetry study initiated in 1995 revealed that at least two wolf packs, totaling about 15 animals, used the base on a regular basis. However, high mortality among young wolves panicked participants from both installations causing the study to end prematurely. A single wolf from each pack was again collared during 2009/2010 as a componenet of a wildlife movement corridor study.

Beaver. Beavers have caused damage by plugging culverts and waterways, and cutting trees that pose risk to structures and vehicles. Areas where beavers have created problems have 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 the individual animals. When it is imperative that the animals be removed, depredation permits were obtained, and volunteer trappers, the base conservation agents or USDA-APHIS, Wildlife Services contractors removed of the beavers. In the previous 10 years, approximately 5 to 15 beavers have been removed annually.

Moose. Moose were not available for hunting on EAFB prior to 1990. At the request of the ADF&G, an archery hunt for moose was initiated in 1990 as a means of helping to reduce moose numbers on military lands. The normal permit hunts on FRA alone were not effective enough in reducing moose numbers, due to movement of the moose onto EAFB lands during the hunting periods. The number of permits issued started at 15 with high hunter success. Annual harvest levels averaged 12 moose.

Moose habitat improvements have come about through timber sales, right-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 equipment. In the previous 10 years less than 25 acres were treated to benefit moose and other beneficiaries of early succession forest habitat.

7-7e Fisheries Management

7-7e(1) Strategies

(a) Conduct study to determine total take of salmon from predation, fishing, and poaching

(b) Protect fish habitat on Ship Creek through bank stabilization project

(c) Monitor fishery through creel checks and expand to include saltwater fishery

(d) Plant fish only in systems without self-sustaining wild populations

(e) Use results of lake stocking study and other monitoring efforts to manipulate stocking schedules

(f) Conduct habitat improvement projects such as improving trout and salmon fry rearing habitat

(g) Evaluate and incorporate applicable conservation action plans from the ADF&G Comprehensive Wildlife Conservation Strategy

7-7e(2) Sixmile Lake System

Upper and Lower Sixmile lakes, and the one-mile stretch of Sixmile Creek that connects them to the Cook Inlet, are and will be managed as one system. This anadromous system is home to annual runs of sockeye salmon, pink salmon, and small numbers of silver salmon each year. It is also home to rainbow trout and three-spine stickleback. Lower Sixmile Lake is the only one of the base lakes that is not stocked (Upper Sixmile Lake is stocked occasionally with triploid (sterile ranbow trout). These lakes are managed as a trophy trout fishery, and rainbows to 27 inches have been taken from this system. Trout populations in both lakes appear to be stable, and adequate spawning takes place. Management efforts will focus on improving data on salmon runs and lake productivity, and improving spawning habitat and passageways for migratory salmon. When CIBW became listed as endangered salmon were identified as primary constituent elements to their critical habitat that comes up to the mouth of Sixmile Creek. The importance of salmon, especially coho, 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.

7-7e(3) Landlocked Lakes and Ponds

Landlocked lakes include Spring, Hillberg, Fish and Triangle lakes. Green Lake is also included, although it has a small stream connecting it to the ocean. This stream is very shallow and has not supported anadromous fish in recent times. These lakes vary in size between 3 and 124 acres (Table 4). Most are relatively shallow. Fish Lake has been known to completely freeze in the winter. Winter oxygen levels and lack of spawning habitat are problems in all the kettle lakes, and limits trout. For this reason, these lakes are routinely stocked with fish. Other bodies of water, which have only small fish, include the golf course cooling pond and Oval Lake.

On JBER-Richardson 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 the last 10 years. Though they have small streams at their outlet there is no recent evidence of anadromous fish reaching the lakes.

Thompson and Waldon lakes are smaller in surface area than Green Lake and not as deep as Otter or Clunie lakes. They are therefore marginal in supporting over-wintering fish stocks.

Some years in these lakes are total failures with no fish surviving over winter. Gwen Lake and Dishno Pond are shallow water bodies (eight feet or less) that rarely have fish survive the winter.

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 the winter-killed fish stocks. Rainbow trout (stocked by Alaska Department of Fish and Game) released in Gwen Lake grow faster and put on weight at higher rates than in any other lake in south-central Alaska. Rainbow trout concentrate along the shores of Fort Richardson lakes in the spring and attempt to spawn, but due to inadequate spawning habitat, no spawning takes place in lakes. Past studies of Fort Richardson 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.

7-7e(4) Streams/Rivers

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

Sixmile Creek. This one-mile stretch of stream connects Lower Sixmile Lake with the Cook Inlet. Management activities include salmon censuses (lake mouth weir and stream walks), conducted annually since 1988, Sixmile Lake smolt out-migrations surveys since 2003 and limited access to protect from erosion. No fishing is allowed in this stream upstream from the high tide marker at the mouth of the creek where it runs into the Cook Inlet.

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

Chester Creek. USAG-AK partnered with the United States 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 of Chester Creek.

North Fork Campbell Creek. North Fork Campbell Creek is open to catch and release trout fishing but closed to salmon fishing. Three species of salmon adults or smolts have been recorded within JBER waters, Chinook, coho and sockeye. ADF&G sport fish staff annually conducts stream walks to estimate adult salmon escapement. The abundance of these salmonids attracts numbers brown bears during the spawning by adults. Continued efforts by ADF&G and CEANC are encouraged to document trend in salmon populations and spawning habitat selection as State management activities change.

Eagle River. Although Eagle River on and above JBER access areas provides fishing opportunites, ADF&G has very little information on fish populations using that system. The importance of this system for CIBW demands research effort to document and monitor fish

species present in this system. CEANC will encourage efforts by ADF&G to document salmon populations in this system..

7-7e(5) Saltwater Shoreline

This twenty-mile stretch of shoreline falls under state jurisdiction below the tide line for management purposes. Air Force management activities are limited to enforcement of saltwater fishing regulations and protection of marine mammals and salmon habitat only as it occurs from within JBER boundaries.

7-7e(6) Anadromous Fisheries

Both Ship Creek and the Sixmile system support anadromous fisheries. In an effort to obtain better information on the size of salmon runs returning to the Sixmile drainage, annual salmon counts were initiated in 1988. Counts were conducted by establishing a weir in the creek, which blocked salmon migration. The fish behind the weir were netted, counted and passed to the upstream side on a daily basis at the height of the run. Counts were conducted every other day when the number of fish in the trap averaged less than 20 fish per day. Beginning in 1995, a fish trap type of counter was installed. This reduced the necessity of handling fish and resulting fish mortality. A fish ladder is in place where the creek enters Lower Sixmile Lake. A new and improved culvert/fish ladder between Lower and Upper Sixmile Lakes was installed in 1996. Culvert cleaning, a tedious and dangerous activity, and occasional beaver control work was necessary at this culvert/fish ladder. In August 2004 a beaver/brush baffle was added to the culvert. The culvert modification allows adult and young fish passage while greatly diminishing requirements to clear the culvert of debris (Figure 11). Sockeye salmon numbers in the Sixmile drainage have generally decreased since 2001. Salmon appear to be fully utilizing all existing spawning beds in the lakes. Late arriving salmon have been observed reworking spawning beds used by the early arriving salmon. This results in the destruction of the earlier eggs, reducing the number of salmon fry produced by the run. Over-spawning by returning salmon may cause periodic reductions in the number of fish in future salmon runs. Most spawning takes place in Upper Sixmile Lake and a small portion of Lower Sixmile near the culvert.

ADF&G fishery enhancement programs for silver and king salmon have resulted in increased numbers of fish returns to Ship Creek. However, this has only a minor effect on EAFB, due to the presence of coffer dams at the EAFB power plant water intake structure, which prevents all but a few salmon from migrating onto the base.

7-7e(7) 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 considered. Trout fisheries in other lakes depend on the stocking program, as little spawning habitat exists in those lakes. Occasionally larger fish are caught, but it is believed that the majority of stocked fish are caught each year.

7-7e(8) 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 four currently on JBER-Richardson and five on JBER Elmendorf. Stocking numbers are based on state-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 rainbow trout and landlocked salmon. The four JBER-

Richardson lakes accounted for nearly 20% of the total angler effort in the Anchorage Management Area from 1995-2004.

Fish are stocked in JBER-Richardson's lakes throughout the year, but most commonly between mid May and September. Stocking levels in Otter Lake have been drastically reduced due to the discovery of northern pike in that lake. Stocking levels in other Fort Richardson lakes for 2006-2011 are expected to remain at current levels, although they may be adjusted to reflect current angler use trends or fish availability.

The average number of rainbow trout stocked in JBER- Richardson's lakes annually from 1999-2005 was just over 23,500 fish. Included in these totals are an additional 1,000 trout that Otter Lake receives annually to support a kid's fishing derby. For this same time period, the average annual number of landlocked salmon stocked in Clunie Lake (the only FRA lake to receive landlocked salmon during this period) was approximately 1,430 fish.

Stocking rainbow trout on JBER-Richardson is largely considered a "put and take" fishery. Ice in the winter often locks up a large percentage of the available oxygen in shallow lakes. The ice cover also prevents free oxygen exchange at the surface. Both of these factors contribute to an oxygen deficient environment that can result in 100% mortality of salmonid species in the lake. Gwen and Waldon lakes experience such total winter loss of all stocked fish nearly every year while Clunie and Otter lakes are thought to successfully over-winter a large percentage of fish annually.

Current practice is to stock the five JBER-Elmendorf landlocked lakes with about 7250 six-to-eight inch rainbow trout in late May. Hillberg and Green lakes are stocked in fall with about 2000 landlocked king salmon. A 1998-1999 study on the effects of lake stocking contracted to ADF&G produced recommendations to manipulate stocking schedules. It should be possible to alleviate pressure on the trout fishery by manipulating stocking schedules. Although it was not possible to change the timing of the stocking program because of ADF&G hatchery scheduling, this objective can be partially completed by changing the distribution of the stocking allotment among the lakes.

The stocking program is operated at no cost to JBER through an MOU. Because the hot water source generated by the base power plant ended when the plant was closed in October 2005, the Memorandum of Agreement MOA is currently (2006) being renegotiated with a good faith agreement to continue stocking base lakes until the new MOA is completed and signed.

7-7e(9) Freshwater Fishing

JBER stocked lakes, plus portions of Ship Creek and Eagle River, Chester and North Fork Campbell Creek are open to fishing under state regulations and bag limits. Sixmile, and EOD creeks are closed to fishing. A state license is required, and base licenses were instituted on EAFB in 1999. On FRA a USARTRAK permit isrequred. No fee is currently required fising. Public access to EAFB is based on the current security status of the base. Access is only allowed during normal or routine security operations. MCAs conduct occasional creel checks. However, these checks have proven inadequate by themselves to estimate local harvest levels.

7-7e(10) Saltwater Fishing

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 673 CES/CEAN. Fishing at this location is popular. Exact numbers of salmon harvested here are unknown. 673 CES/CEAN will investigate a better or more intense method of sampling in order to gather this information. Enforcement of fishing regulations at this site is complicated due to land status.

7-7e(11) Fish Habitat Improvement

The focus of fish habitat improvements will be on increasing the amount of trout and salmon fry rearing habitat available in base lakes and streams. For salmon with a freshwater rearing phase, juvenile rearing habitat is most often the limiting factor. Winter and summer temperatures and low water can also be factors. Improving salmon habitat in the Sixmile Creek drainage could allow both trout and salmon numbers to increase to a new carrying capacity level. Primary criteria for selection will be those areas degraded due to human impacts. These improvement projects will eventually increase salmon fishing opportunities on base.

Mitigation funds from lost wetlands by the Port of Anchorage as the extract gravel from EAFB lands and then fill on mudflats of Knik Arm are being made available for salmon and wetland enhancement on EAFB lands. The Sixmile Watershed Enhancement Proposal includes several projects to include: 1) a fish ladder replacement at the mouth of Lower Sixmile Lake; 2) wetland pond development next to Sixmile Creek; 3) enhancement of spawning beds in Upper Sixmile Lake streamlets; and 4) repair/replacement of Upper Sixmile Lake culvert. Mitigation funds will be released by the Corps of Engineers beginning December 2010.

7-7f Fisheries Research Results and Needs

7-7f(1) Salmon Habitat Mapping

Fish habitat locations and status werre relatively unknown prior to 2000. Visual observations of salmon re-using spawning beds 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) Majority of spawning habitat is in Upper Sixmile Lake along northwest bank and in the roadside gravel footprint.

(c) 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, under cut 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 4000 spawning adult sockeye salmon.

Should escapement exceed 4000 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).

7-7f(2) Sixmile Lake Productivity Survey

During summer 2003 Alaska Natural Heritage Program was contracted to conduct a study of Sixmile Lakes 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 ago by Rothe et al. (1983). However, the 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 suggest that they warrant further study. Zooplankton measurements taken during 2003 were inconclusive and should be repeated. Low smolt survival ratios reported from Desire Lake on the Kenai Peninsula were attributed to low zooplankton production, and the authors suggested nutrient enhancement 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, especially considering the unseasonably warm, dry summer that occurred in 2004. Fry rearing throughout 2004 should outmigrate during spring 2005. It will be interesting to note if higher than average water temperatures recorded during summer 2004 will have noticeable affects on size and productivity of age-1 and age-2 outmigrants in 2005.

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 currently 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 the author observed fry trying to jump and/or swim up the concrete foot of the fish ladder to return to the lake without success. A fish ladder that allows for fry/smolt passage into the lake is highly recommended."

7-7f(2) Fisheries Needs

- Sixmile Creek fish ladder that allows for fry/smolt passage into the lake
- New culvert/bridge between Upper and Lower Sixmile lakes to allow juvenile fish to pass upstream
- Distribution of invasive northern pike
- Composition and temporal distribution of fish in Eagle River as they relate to CI Beluga Whales.

7-7g Fisheries/Aquatic System Conflict Issues

7-7g(1) Ship Creek Fish Passage Project.

In recent years, there has been 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, which traverses through EAFB and FRA. 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. The ADF&G has secured funds for a feasibility study to investigate the two

spillway dams on EAFB and FRA. Data gathering for this study began in the summer of 2006. Study was completed in 2007. The 3WG/CC provided a letter to ADF&G arguing this action was not in the best interest of the AF nor public safety. No additional actions have occurred since that letter.

Salmon are clearly beneficial to the natural ecosystem and have inherent values to the community. Although restoring fish passage in Ship Creek complies with biodiversity objectives and goals for Elmendorf, the action may require a thorough assessment of potential conflicts generated by fish presence. These conflicts may include:

(a) Increases in fish would likely increase bear activity, and would likely increase bear-human encounters (extensive new housing areas have been constructed near Ship Creek)

(b) Increases in fish would attract poachers/trespassers

(c) Dam removal or modification may increase erosion downstream of the dams, including potential negative impacts to Eagleglen Golf Course on EAFB

(d) Modifications could alter groundwater hydrology and potentially affect contamination plumes

(e) Inadequate habitat for spawning and smolt over-wintering

(f) Increased bird (gulls and eagles) presence negatively affecting BASH program

Removal/modification of Ship Creek dams and restoring fish passage is a complex issue and requires a thorough NEPA analysis.

Sources: ADF&G letter to Air Force `dated October 28, 2005
Air Force letter to ADF&G dated December 7, 2005

7-7g(2) Trout/salmon stocking shortage

ADF&G Sport Fish hatcheries at both EAFB and FRA used heated water, a by-product of steam generation by both installations' power plants. During 2002 and 2005 both power plants were decommissioned eliminating the inexpensive source of hot water to the hatcheries. The result was slower growing fish. Fisheries managers made the decision to cut in half the stocking allocation to area lakes until hatcheries can be upgraded to meet past stocking rates. Although improvements to the hatcheries and annual heating costs will substantially increase the cost to raise fish, the stocking of EAFB lakes is part of the larger Southcentral Alaska stocking program and will be subject to stocking rates resulting from changes to hatchery capabilities. Beginning in 2009 both hatchery operations were subtantiay reduced for the next two years while a new hatchery is built and fish once again become available for stocking.

Figure 11. Beaver/debris resistant culvert extension added to fish ladder-culvert, Upper Sixmile Lake, JBER-Elmendorf, 2004.

7-7g Wildlife Management

7-7g(1) Strategies

(a) Establish a long-term management plan for wildlife populations and habitat

(b) Identify and protect essential habitats that provide for nesting/denning travel corridors, and other seasonally important habitats.

*(c)*Restore disturbed areas to productive forests and wildlife habitat

(d) Close roads and trails not needed for mission accomplishment or other purposes to decrease fragmentation

(e)Monitor changes in moose browse availability and berry crops

(f) Improve winter moose habitat through manipulation of plant succession by a combination of the following methods:

(i) Site conversion of disturbed site to early seral stages of productive forest (e.g. reclamation of gravel extraction pits)

(ii) Commercial timber sales with adequate post harvest treatment

(iii) Patch cuts to create wildlife openings

(iv) Coordinate hydro-axing frequency of antennae fields, rights of way, firebreaks, etc to optimize browse availability

(v) Prescribed burning

(vi) Minimize fencing requirements that exclude or funnel moose from important habitat, but promote effective exclusion from airfields

(g) Develop a management program for beaver which includes best practices such as protecting large trees and beaver proof culverts for damage prevention, supplemented by population control as necessary as a means of preventing damage to facilities

(h) Establish in ADF&G regulations a JBER special management area incorporating existing Fort Richardson Management Area

(i) Initiate or adjust user fees for hunting and trapping, using proceeds for wildlife habitat improvement activities

(j) 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

(k) Conduct aversive conditioning of nuisance or dangerous wildlife and monitor results

(l) Improve efforts to cooperatively manage wildlife by seeking ecosystem management partners and forming joint management initiatives

(m)Evaluate and incorporate applicable conservation action plans from the ADF&G Comprehensive Wildlife Conservation Strategy

(n) Incorporate DOD Partners in Flight migratory bird conservation strategies:

(i) *Inventory & Monitoring*

i. Using national standardized protocols, assess the status and trends of bird populations and habitats, including migrating, breeding, and wintering birds (see 7-7c (5-8));

ii. Monitoring data will be maintained in secure and accessible systems

iii. Identify the habitat conditions needed by applicable species of special concern (SOSC) and understand interrelationships of co-existing species;
iv. Evaluate the effects of management activities on habitats and populations of migratory birds through NEPA processes, AF Forms 813 and 332 and ABW Form 3.
v. Identify bird movement/migration patterns and habitat selection within JBER

(ii) *Habitat Conservation (protection, restoration, and enhancement)*

i. Manage habitat within WEZ/BEZs around airfields to reduce the bird-aircraft strike hazard and minimize unnecessary destruction of birds and nests which will include:
   - Manage vegetation as outlined in 3WI 91-212 BASH Prevention program
   - Coordinate 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 WEZ,
   - Minimize standing water and open water ponds that attract waterbirds
   - Restrict bird feeding and emphasize proper garbage management
ii. Provide for cavity-nesting species through old growth forest and snag tree protection and provide artificial nesting opportunities.
iii. Improve waterfowl nesting habitat on Sixmile, Green, Hillberg and Spring lakes through the installation of nest platforms
iv. Provide signage for protection of important habitat of SOSC

(iii) *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 sharing inventory, monitoring, research, and study data through e-Bird, Avian Knowledge Network, and BBIRD,

(iv) *Cooperation*

i. Allow the USFWS and other partner's reasonable access to military lands to conduct sampling or survey programs
ii. Encourage the use of qualified volunteers from local bird clubs to assist in survey and monitoring programs.
iii. Use existing partnerships and explore opportunities for expanding and creating new partnerships to facilitate combined funding for inventory, monitoring, management studies, and research.

(v) *Outreach & Public Access*

i. Provide outdoor recreation and wildlife viewing opportunities, where appropriate.
ii. Coordinate birding outings in-house, or through local bird clubs.
iii. Promote and distribute outreach and educational materials
iv. Update and reprint "Bird Checklist, Anchorage Area Military Reservations: Elmendorf Air Force base/Fort Richardson."

v. Consider creating interpretive displays along trails describing habitats, wildlife, and the management actions needed to sustain them.

(vi) Integrate (i), (ii), (iii), (iv) and (v) with Initiative; Partners; 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

(vii) Regulations

i. Obtain state and federal permits for depredation activities, scientific collection, and live/dead eagle exhibit

ii. Follow the DoD Migratory Bird Guidance to ensure compliance with obligations in NEPA, the Migratory Bird Treaty Act and the Final Rule on Take of Migratory Birds by the Armed Forces (50 CFR Part 21).

7-7g(2) Wildlife Population Status and Management

JBER-Richardson monitoring data collected over the years for these wildlife groupings have not been assimilated into this document but will be added to the FY12 INRMP development.

Macro invertebrates (Dragonflies and Damsel Flies). Surveys and monitoring programs have not been initiated, but a baseline study is funded for FY11.

Wood Frogs. While wood frog monitoring surveys suggest a well distributed population on JBER, there are aquatic systems with very low densities.(Appendix G.7) Specifically, the seepage areas producing wetlands emptying into Ship Creek between the 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. A wood frog monitoring roadside survey route was established on JBER-Richardson in 2008. Wood frog numbers in seasonal wetlands are highly influenced by standing water levels. A standardized method for monitoring and analyzing results is needed to formalize the management reactions.

Loons. Loon pairs and chick production seem very consistent over the years (Appendix G.4). In recent years (2001-2005) 2-4 common loon pairs nested and fledged an annual average of 2.0 chicks. Over the same period 1-2 pairs nested in any year and fledged an annual average of 0.6 chicks. Management activities currently employed to maintain a productive loon population is public education. Habitat loss and disturbance of nesting loons are primary human causes for abandonment or low production. EAFB boaters are warned with ADF&G furnished signs at all boat launching sites. A primary cause for limitations to higher chick fledging seems to be predation by aerial predators, bald eagles are suspected. Bald eagle populations are currently displaying a stable to increasing trend.

Raptors and Owls. During 2001-2005, 2-3 bald eagle pairs were observed or reported on EAFB and at least one pair just over the border on FRA. 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 base construction projects in the southeast portion of the base. Osprey pairs have increased to two, reflecting an increasing trend in the osprey population in Upper Cook Inlet over the past 20 years. Owl surveys (2003-2005) have produced a stable trend in great horned owls, a declining trend in northern saw-whet owls and an increase in Boreal owls (Appendix G.6). See also Anderson et al. 2008.

Geese. Nesting pairs of Canada geese on EAFB have declined to an annual average of less than 1.0 over the period of 2002-2006 (USDA-APHIS, Wildlife Services). Number of geese being observed on the ground within the WEZ has also decreased substantially since 1995 due to an aggressive BASH program. Numbers of birds observed, hazed and killed are maintained by USDA, APHIS Wildlife Services.

Passerines. Bohemian waxwings (BOWA) numbers feeding on berry producing ornamentals on EAFB during winter months has 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. The average daily number of birds counted between 25 October and 31 December ranged from 495.8 in 2003 to 696.5 in 2004 to 300.6 during 2005. (Appendix G.5) Olive-sided flycatcher (OSFL) calls of territorial males seemed to decline slightly between 2003 and 2004 (14 at 13 sites to 7 at 7 sites) (Appendix G.5). The small sample size may be reflecting variables such as weather and survey timing as well. Rusty blackbirds (RUBL**)** are uncommon in suitable habitat on EAFB. No more than 2-3 pairs of RUBL were observed/suspected over the period of 2003-2006. One RUBL was recorded during breeding bird survey in 2003 (Appendix G.5). However, a cooperative rusty blackbird study lead by USFWS (Matsuoka et al 2010) documented 14-21 nesting pairs annually during 2007-2009 on JBER. Management activities likely to benefit these species include wetland and adjacent spruce forest protection.

Black Bears. Black bears are the most common bear species on EAFB. 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. But conducting a similar study to develop another estimate is unlikely to be funded unless repeatable DNA sampling techniqus are used.

Brown Bears. Increased brown bear sightings on EAFB and the Anchorage Bowl between the years 1978 and 2005 (H. Griese, 673 CEANC, personal observations) indicate that brown bears have become more common. This is likely due to the increasing salmon runs in the area, including Sixmile Creek on EAFB, and restrictive harvest regulations for the Anchorage area and in Chugach State Park set by the Alaska Board of Game. The recent brown bear study resulted in wide ranging estimates of 12-24 bears within the same area.

Bear Population Management. In spite of human-caused mortality, bear populations on the two military bases are believed to be stable or increasing. No population control is currently necessary based on total population numbers, only because an accurate estimate is not available. A preliminary report on the nuisance black bear study completed in 1997 recommended that bear populations for the two bases be held to a total of no more than 40 black bears. The population could be approaching the 40 bear limit.

A MOA for Joint Management of Bear/human Conflicts on military lands near Anchorage, AK (AK-MOA-054) between FRA, ADF&G, USDA-APHIS Wildlife Services and EAFB, was initiated in 1995 and rewritten in 2006. This agreement establishes joint management responsibility and spelled out control actions to be taken against specific types of nuisance bears. Since its approval, a small number of bears have been destroyed under the authority of this agreement. In recent years, however, nuisance bears have been live captured and sent to the University of Alaska Fairbanks for bear hibernation research. Those bears are destroyed as part of the research. This action, as well as stepped up levels of garbage control, public education, and non-lethal aversive conditioning of other nuisance bears, resulted in a significant (but possibly temporary) decrease in nuisance activity from 1995 through 1997(Bostick 1997). Trends in nuisance bear activity seems to be more variable in recent years, reaching relatively high levels during summer of 2006.

Current management concerns and activities include upgrading all base dumpsters and garbage management procedures. One stipulation of the above bear conflict MOA 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.

Lynx/Snowshoe hares. Winter track surveys and observations of animals along base roads suggest a relatively stable snowshoe hare population with a decline in the dependant lynx population. No lynx tracks were recorded in the few track surveys conducted in the winter of 2004-05 while a handful of track set were observed in the preceding winter. Lynx numbers are reported by ADF&G to be at low levels in the cycle in adjacent game management units at this time (W. Taylor, ADF&G contractor, personal communication). Snowshoe hare numbers do not fluctuate as dramatically on EAFB as they do in interior AK or on the Kenai Peninsula to the south. 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.

Beaver. Beaver are common on EAFB, with at least eight active lodges in 2005 (Appendix G.2). The number of active lodges has remained relatively stable in spite of an aggressive annual harvest of 12 beaver. Beaver control is necessary annually in Ship Creek along the golf course and in the cooling pond area, which is within the WEZ where waterfowl habitat is discouraged. Culvert clearing and occasional beaver control work had been necessary at the culvert between Upper and Lower Sixmile Lake. In August 2004 a beaver/brush baffle was added to the culvert. The culvert modification allows adult and young fish passage (Figure 11). A beaver dam in 1996 blocked Sixmile Creek temporarily at approximately stream mile 0.4, causing the death of an estimated 1000 migrating sockeye salmon.

Some methods of discouraging beaver problems, especially with damming culverts, have shown some promise. Even with these techniques, however, beaver population control is commonly required. Beaver control has been conducted in the past by issuance of depredation permits from ADF&G to an MCA, USDA-APHIS Wildlife Services or volunteer depredation trappers. Since depredation trapping occurs as problems arise during the summer, but the pelts are in poor condition. Meat is retained as bear bait or donated to the Alaska Zoo, and pelts are turned in to ADF&G unless the volunteer trapper chooses to keep them. A change to Fish and Game regulations in 1997 allows beaver trapping in certain portions of Unit 14C, including EAFB. 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 the summer handled by depredation permit as they have been in the past. Beaver harvest in recent years has increased under the winter trapper season (Appendix G.2)

Moose. The fall population objective for the North Anchorage Moose herd (NAMH) is 500 moose with a bull:cow ratio of 35:100 and a cow:calf ratios of 50:100 (USARAK 1998). Fall moose numbers on EAFB have been in a slight decline since the early 1990s (Appendix G.1) while herd composition seems to be meeting management objectives.

The population objective for the NAMH is 500 animals, as censused during November. This goal has been deemed too high for the available level of browse by ADF&G. The population goal of 500 is a reduction from past years, and is based on striking a balance between moose hunting and viewing opportunities, and concerns about severe over-browsing in primary wintering areas, increasing numbers of moose-auto collisions, and increased conflicts with people and pets. Changes in the number of moose observed on EAFB (Appendix G.1) could be related to habitat degradation on EAFB and a shift in habitat selection by moose. In general, herd productivity in the EAFB sample has fluctuated from 24-75 calves: 100 cows. In the last 5 surveys the average was 50 calves:100 cows.

Decisions for management actions are coordinated with ADF&G and FRA 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 EAFB is secondary to the overall herd status.

Moose are currently the only species on EAFB subject to a legal hunting season. At the request of the ADF&G, an archery hunt for moose was initiated in 1990 as a means of helping to reduce moose numbers on military lands. The normal permit hunts on FRA alone were not effective enough in reducing moose numbers, due to movement of the moose onto EAFB lands during the hunting periods. The number of permits issued started at 15 with high hunter success but in recent years as success rates declined number of permits increased to 25. In addition a second season of October 15 through 15 November was added. Between 1990 and 2005, an average of 12 animals have been taken annually, however in the last five years the average has dropped to 11, even with more permits being issued. Because of reduced hunter success and a perception of increasing wounding rates, a proficiency skills test was initiated for EAFB and FRA permittees. The results of the testing (Appendix G.1) will be compared to resulting wounding rates.

Hunting is currently permitted in six hunting areas (Figure 12), although hunting areas are subject to closure to manipulate hunter effort. Opening two hunt areas near the cantonment area and base housing has been successful in eliminating individual problem moose prior to the winter. The Alaska Board of Game has also authorized EAFB, with coordination with ADF&G, the use of unsuccessful hunters in the earlier hunts, to hunt moose identified as problem moose through 15 December. The problem moose hunt is by invitation from CEANC and may occur in any area directed by the same.

In addition to hunting mortality, several moose each year are destroyed after being stuck by cars or trains, and one or two are destroyed each winter due to excessive aggressiveness and human conflicts in the main cantonment area. The occurrence of the later has been greatly reduced by the late season hunt and the problem moose invitation 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.

Other Birds and Mammals. Management of other birds and mammals, including small birds, and small mammals such as porcupines and squirrels, is limited to protection from hunting/poaching and protection of habitat. Management activities frequently involve translocation if these species conflict with the BASH program or become a nuisance in housing or facilities. ADF&G wildlife biologists have secured several porcupines from EAFB to participate in a physiological study conducted at University of Alaska, Fairbanks.

7-7h Wildlife Habitat Management

7-7h(1) Forest Wildlife

Moose, as the most numerous, large land mammal on EAFB, are a key or featured species. Landscape-level management is particularly critical for moose. The NAMH range includes EAFB, FRA, and portions of Chugach State Park, as well as most of the Anchorage Bowl in the wintertime. FRA has an extensive moose browse management program. Chugach State Park and Municipality of Anchorage do not actively manage for moose habitat. It is critical that habitat management efforts on EAFB are designed to complement and augment efforts in other jurisdictions within the range of the moose herd. For FRA see also SC4.2.2 Habitat Improvement: http://www.usarak.army.mil/conservation/INRMP_Final/USAGAK_INRMP_07-11_volume_III_supplements.pdf

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.

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

Site conversion on disturbed areas**.** The primary method used on EAFB will be converting large stands of alder or blue joint grass to early seral stages of forest or shrubland through use of prescribed fire, hydro-axing, or other mechanical means, followed by broadcast seeding or planting of desirable browse species.

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

Converting forested areas to early seral stages**.** 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. Personal-use timber sales are well adapted to creating small (less than 5 acres) forest openings for moose, snowshoe hare, and black bears.

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

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

7-7h(2) Forest Wildlife Habitat Management Considerations

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

7-7h(3) Forest Wildlife Habitat Identification, Evaluation, and Management

Forest wildlife habitat management on EAFB will focus on the following strategies:

(a) Habitat improvement areas will be selected primarily based on their status so far as impact and disturbance by humans

(b) Secondary selection criteria will be the optimal distribution of habitat based on landscape ecology parameters such as patch size and connectivity

(c) Identify habitat selection areas based on the above two selection criteria as well as GIS analysis of the following factors:

- Identify high quality browse areas (those with a high percentage of willow and birch/aspen/cottonwood less than 25 years in age)
- Identify areas of low browse quality
- Identify aquatic feeding areas, calving areas, denning areas, travel corridors
- Identify areas with slope greater than 20%, high densities of blue joint grass, or human-wildlife conflict concerns, and eliminate these areas from consideration

(d) Using the above information, select habitat improvement sites and schedule habitat improvement projects

7-7i Waterfowl

Waterfowl habitat management is of two types—that designed to improve habitat, and that designed to remove or make habitat less useful. Habitat for loons is enhanced by placement of artificial nesting platforms on several base lakes. Waterfowl, and in particular, goose habitat, is reduced around the airfield and golf course (LMUs 6 & 7) as part of the BASH program. Grass is allowed to grow along the flightline to discourage geese from roosting, some grass species known to be unpalatable to geese are planted, and grassy fields are broken up by planting trees to discourage use by geese. Where possible, habitat losses associated with these activities will be mitigated off-site in areas where human conflicts are not an issue. More detail concerning this program can be found in the 3WI 91-212.

7-7j Other Birds and Mammals

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

7-7k Wildlife Conflict Management

7-7k(1) Bird Aircraft Strike Hazard (BASH) Program

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

The BASH program consists of 4 sub-programs:

(a) Bird dispersal

(b) Habitat change and management

(c) Reduction of goose populations

(d) Research related to the first three management programs

USDA-APHIS, Wildlife Services has been (1999-present) contracted during the period 1 April-31 October to keep the airfield and the surrounding BEZ and WEZ (primarily LMU 7) clear of birds. 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 may be found in 3WI 92-212 (19 May 2008) Bird and Wildlife Aircraft Strike Hazard (BASH) Program.

EAFB also entered into agreements with USDA Wildlife Services and the NRCS to provide technical support and conduct evaluations of habitat around the airfield. Changes were made in the types of grass planted near the airfield (less palatable species are now planted) as well as adjustments in mowing schedules, which allowed the grass to grow higher to discourage geese.

The USDA's National Wildlife Research Center was contracted to conduct telemetry studies to help determine goose movement patterns in the Anchorage area. A joint-agency task force was formed to conduct goose management in the Anchorage area. In keeping with recommendations made by this task force (Crowley et al. 1997), some geese were translocated and the remaining geese near the airfield are hazed and, as a last resort, shot. These activities were conducted under a depredation permit issued to 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. The population has apparently declined slightly from that estimate but accurate counts for 2004 and 2005 are not available (M. Petrula, ADF&G, personal communication)

Research and adjustment in management techniques for BASH reduction continues, and will remain a high priority tasking for CEANC and the entire 673d Air Base Wing.

Mitigation Measures for Year Round Firing in ERF (if selected). A recent proposal to resume year-round firing of HE munitions in to the Eagle River Flats Impact Area created concerns for increasing risk to aircraft and crew by flushing more birds into the Elmendorf aerodrome. While the 3WI 91-212 BASH Prevention Program established protocol to respond to birds entering the pattern, the preferred mitigation is a system of at least one but preferably two synchronous avian radars that provide real time warning to air operations management staff. This mitigation would provide optimum warning for pilots and the Safety Officer of the Flight (SOF). A feed to the USDA Wildlife Services' laptop would also allow flock following, interception and dispersal.

7-7k(2) Bear Management Program

EAFB has had an extensive bear-human conflict management program in place. The focus of the bear management program has been an aggressive combination of public education, garbage management, and enforcement. All MCAs receive bear safety and nuisance bear procedure training. Selected agents, along with the base biologist, ADF&G biologists, and personnel from FRA, form a Joint-Agency Bear Response Team, which handles nuisance bear problems, responds to reports of bears in developed areas, and conducts aversive conditioning, translocation, and other bear management efforts. EAFB's policy had been to place radio collars on all brown bears on base, 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 EAFB. Future efforts to capture all brown bears may diminish due to low practicability. Black bears that are consistent nuisances are captured, marked, and collared, and are subjected to various non-lethal and lethal control measures based on their history, sex, and reproductive status. All bears found in nuisance situations are captured and marked if possible, and reports of behavior submitted. Nuisance behavior and location is tracked by database. Bears found in housing or developed areas are hazed out of the area, if possible, or tranquilized and moved to the north portion of the base.

The report on this aggressive management program was completed in 1997 (Bostick 1997). It made the following recommendations concerning bear management on military lands in the Anchorage area, including EAFB:

(a) Increased efforts at public education, garbage management, and enforcement of feeding laws

(b) Modify dumpsters in critical areas (such as recreation sites or golf course) to make more bear resistant

(c) Apply risk classifications for known nuisance bears and monitor behavior

(d) Identify worst offenders and target for elimination by translocation (black and brown bears) or capture and euthanasia (black bears)

(e) Consider instituting a limited archery bear hunt if bear populations on the two bases exceed 40. Hunt could be conducted concurrent with the archery moose hunt to take advantage of moose carcasses. Another option is to use bear dogs to send bears up trees and use "wounded warriors" or diabel vets to take the bears with close controls by Conservation enforcement/SFS staff.

(f) Manage bears jointly with ADF&G and FRA. Establish a Joint Advisory Board to make recommendations on an annual basis

Bear-human conflicts have also been addressed in a Joint-Agency Bear Management Memorandum of Agreement (MOA) (Appendix D.). The MOA for Joint Management of Bear/human Conflicts on military lands near Anchorage, AK (AK-MOA-054) between FRA, ADF&G, USDA-APHIS Wildlife Services and EAFB, was initiated in 1995 and rewritten in 2006. This agreement established joint management responsibility and spelled out control actions to be taken against specific types of nuisance bears. In the 2006 re-write EAFB 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.

7-7k(3) Urban Moose Conflict Management

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

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

the property of the state. The Alaska Department of Public Safety maintains a list of charitable organizations in the community, which are contacted on a rotating basis to salvage the meat.

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

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

7-7k(4) Beaver

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

Beaver conflict management will include both preventative measures and population control. Possible preventative measures include painting or fencing large trees near beaver lodges and installation of beaver resistant culverts and dams, particularly along the golf course. Population control will focus primarily along the developed lands bordering Ship Creek. Because of the excessive cost in labor time to live-trap problem beavers, use of killing traps is the preferred method of removal. The ADF&G will issue the base depredation permits for the removal of beaver outside the local Game Management Unit trapping season, as their population in the Anchorage area is very healthy. Where possible beaver will be 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, possess all required state licenses, and who are willing to assist in conducting fall cache surveys.

7-7k(5) Wild and Feral Canids

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

Beginning in 2007 fox trapping around the airfield perimeter was conducted by volunteer nuisance trappers. The objectives are to avoid waste of the furbearer resource by allowing the

harvest during prime pelt seasons, reduce BASH risk, and to provide some limited trapping opportunity for residents. A maximum of two experienced and Alaska Trappers Association schooled trappers are used. The red fox harvest by volunteer trappers for 2007-2009 has been 38 animals.

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

7-7k(6) Birds

The construction of nests by cliff swallows on base quarters creates an annual nuisance and health concern. Their droppings are unsightly and are a growth medium for fungi that cause a respiratory infection known as histoplasmosis. The swallows also are heavily infested with mites that enter the quarters when the birds leave the nest. Although the mites do not attack people, their presence causes considerable distress to quarter's occupants. Cliff swallow nesting has dimished greatly in recent years as a result of a more aggressive removal of nests prior to egg laying (J. Morrill, USDA-Wildife Services Personnal communication)

Control measures include building modifications, removal of food and nesting habitat, and direct removal in the spring during nest construction, with the pest management personnel knocking down nest concentrations under authority of a permit from the USFWS. This is the most effective means of reducing the problem, but has met with criticism when eggs or young are destroyed. Over the next five years, attempts will be made to place nesting platforms to draw swallows away from quarters where they have concentrated in past years. Several different designs will be experimented with to find one that is attractive to the birds.

Gulls are also an occasional problem during nesting season, particularly around warehouses and open bay buildings. Pigeons are also a problem in these areas. They are usually dealt with by personnel from the 773^{d} CES Pest Management section.

7-7l Pest Management

Personnel from the 673d CES Pest Management section are responsible for dealing with small vertebrate and invertebrate pests in base facilities and open areas within the cantonment area, especially the airfield infield, as well as weeds, invasive species and insect control throughout the base lands. The JBER Integrated Pest Management Plan is reviewed by CEANC personnel but the responsibility for completeness and accuracy lies with 773 CES/CEO.

The 2009 3 CES Integrated Pest Management Program was signed signed August 2009 and is good for five calendar years IAW AFI 32-1053. A revision will be done when joint basing is completed. AFI 32-1053 requires CEAN to:

> "3.6.1. Provide program guidance for managing IPM programs in accordance with AFI 32-7064.
> 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.
> 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."

See also FRA pest manamgent details in section B2.5 Pest Management at http://www.usarak.army.mil/conservation/INRMP_Final/USAGAK_INRMP_07-11_volume_II_annex_B_watershed_and_wetlands.pdf

7-7m Wildlife Research Results and Needs

7-7m(1) Results (1995-2000)

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

Black Bear Study. 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 MIS monitoring program. Although not habitat based, this study did provide some insight into bear use of habitat on EAFB, as well as likely travel corridors and seasonal preferences. Study results and management recommendations are summarized in section 7-7k.

Wolf Study (1995).A telemetry study of wolves on EAFB and FRA was initiated in 1995 (Bostick 1995) due to increasing conflicts with humans. Five wolves (4 females and 1 male) were captured and radio collared for the purpose of the study (CEANC files). However, the study came to an untimely end with the death of four of the five animals within months of capture. The high rate of deaths caused concern in FRA natural resources staff and they ended the cooperative trapping effort. They believed the project was responsible for the high mortality. However, these results actually pointed to the high turnover in a pack taking up residence on the edge of an urban setting. A future study designed to collect GPS data from adult wolves should circumvent the high mortality rate while more accurately representing pack activities.

7-7m(2) Results (2001-2009)

Avian Radar (BIRDRAD) Study. Staff of CEANC initiated an unfunded study to document avian migration patterns around the EAFB airfield (H. Griese, in prep) A portable bird radar system (BIRDRAD) purchased by the US Navy through the DOD Legacy program was made available to the base. 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 efficacy of avian radar technology to identify BASH risks following the September 1995 Airborne Warning and Control System (AWACS) aircraft crash that killed 24 crewman. 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 BIRDRAD 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. The risks reached peaks for approximately 1-2 hours beginning one hour

after sunset and again at two to one hours preceding sunrise. Wind, clouds and local freezing temperatures strongly influenced migration patterns. The study results were enlightening to flight operation planners, who modified night time 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.

Brown bear Study. ADF&G was contracted in 2005 to determine brown bear numbers, habitat use, movement corridors and food selection on EAFB and FRA (Farley, et al, 2008). Bears were captured using culvert barrel traps (3 bears) and helicopter aerial darting (8 bears). 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 5 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 were found foraging, rearing young, and denning in close proximity to human development and human presence but seemed to be 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 3 of 5 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.

Bear movement was restricted by the Glenn Highway and the associated game fence, but crossing efforts appeared at Ship Creek and 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 the undeveloped land east of the Elmendorf airfield. The later served as the primary connection between Ship Creek and the undeveloped land north of the airfield and should be recognized as an important movement corridor for EAFB wildlife (Figure 12).

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%). Their attraction to salmon, which if allowed to freely pass the Elmendorf dam on Ship Creek, has the potential for increasing bear-human conflicts, elevating safety risks for humans.

Raptor and Raptor Habitat Study. Anderson, et al. (2008) reported that Environmental Compliance Consultants (ECC) was contracted in 2006 to assimilate historical information on raptors using EAFB, to conduct migration and breeding season surveys, to identify raptor perch attractions within the airfield's bird and waterfowl exclusion zones (BEZ/WEZ) and to recommend appropriate actions to monitor raptor populations and to diminish BASH risks.

ECC analyzed USDA APHIS Wildlife Services raptor observations for the period 1999-2007 for patterns of perching and distribution and identified a preference by raptors for the grassland habitat surrounding the airfield (Figure 13). Overall trends of raptor observations increased during the period (Figure 14), 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 the most preferred perching sites by Red-tailed Hawks, while trees were the primary perches for Bald Eagles, the two most common species.

ECC conducted aerial and ground surveys of EAFB lands and found 25 active and 50 inactive nests. Active nests located during surveys 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 located during surveys 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 to a Environmental Geobase layer. Many nests were located near the airfield.

Among ECC's recommendations were: 1) converting as many grassland sites as allowed witihnin the WEZ 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 BEZ/WEZ; 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 column to USDA-APHIS 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.

BASH Compatible Vegetation Study. Environmental Compliance Consultants (ECC) was contracted to document the compatibility of managing manipulated land areas near EAFB airfield for moose browse and reducing the bird-aircraft strike hazard (BASH) risk (Anderson, et al. 2007). The overriding assumption is 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 (CAG), shrub height, canopy coverage, 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 the early summer of 2006, field personnel sampled a total of 220 2x5m plots in nine pre-designated sample areas, representing 1,596.7 ha (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 CAG 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 Fort Richardson antenna field ranked highest for moose value and lowest for BASH risk. FR was followed by two Alaska Railroad mitigation sites and remnants of enhanced moose habitat in the Moose Crossing housing area.

The 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 north side of the approach zone for 06 would follow in ranking for vegetation manipulation. The landfill area south of DRMO ranked highest for BASH risk based on low percentage of canopy

coverage; however enhancement activities in progress during 2005-2008 are expected to meet manipulation requirements.

Alaska Landbird Monitoring Survey (Arcitc Valley, JBER-Richardson). The summer of 2010 was the second year in which an Alaska Landbird Monitoring Survey (ALMS) was conducted on Fort Richardson. The ALMS grid was established in the summer of 2008 and is run every two years. 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 ALMS 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 at 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 (Figure 3). Species diversity was highest in the grass meadow type in 2008 and the dwarf shrub meadow type in 2010.

Beluga Whale Observational Studies in Eagle Bay and Eagle River 2009 (JBER-Richardson). In 2004, USAG-Alaska entered into a settlement agreement with plaintiffs requiring Army environmental personnel to, among other things, monitor the health and behavior of beluga whales (Delphinapterus leucas) in and around Eagle River Flats (ERF) within the boundaries of Fort Richardson, Alaska. Beluga whales were first observed by USAG-Alaska personnel in 2005 and 2006. Most of these observations were opportunistic as personnel conducted other duties out in ERF. A more concerted effort to observe belugas specifically was started in 2007 using an ad libitum sampling methodology (USAG-Alaska 2007). A more systematic sampling methodology was begun in 2008 (USAG-Alaska 2008) and refinements were made for the 2009 field season. Detailed observations of whales were conducted during the summer of 2009 and the details of these observations are described in this document. USAG-Alaska intends to continue using the current observational protocols with adjustments as needed into the foreseeable future. Observations for beluga whales occurred between June 1 to October 28, 2009. Observers were present for 80 observational days during the 2009 field season. This is an increase from 50 observational days in 2007 and 2008. Observers did not encounter the large number of range closures experienced in previous years, allowing for greater access to ERF and hence, more observation days. During the observational time period between 1 June and 29 October, range closures prevented access to the observation area 32 days out of a possible 112 days or 29% of the time.

In 2009 the majority of observations of belugas occurred during the months of August and September. Unlike in past years, belugas were not observed during the months of June and July. Whales were first observed on 14 August and the last whales were observed on 21 October. A total of 322 hours was spent on this observational effort.

The average length of observations over the course of the field season was 251 minutes and the average length of time that whales were observed was 25 minutes. The average number of whales seen over all observation days was 8.8 (4.3 white, 2.4 gray, and 0.87 calf). Although whales arrived later in 2009 and this resulted in more zeros in the dataset, thereby lowering the average count for the season, the mean number of whales observed when whales were present (August-October) was also lower in 2009

($\bar{x}$ = 11.5) than in 2008 ($\bar{x}$ = 24.5). The maximum number of whales observed in a day ranged from 7 to 71 individuals. There was no significant difference in the mean number of whales observed per month for the months in which whales were present

($F(2,43) = 2.47$, $p = .09$), or for the mean number of whales observed over the course of the day ($F(2,107) = .71$, $p = .49$).

Group color composition ranged from 35-75% white belugas, 14-50% gray belugas and 0-25% calves. Statistical analysis showed a significant difference between percentages of whites ($t(126) = 4.49$, $p < .007$), and calves ($t(90) = 2.76$, $p < .003$) between 2008 and 2009, but not for grays ($t(98) = .77$, $p = .21$).

Observational rates for whales showed a steady decline over the course of the summer season. This decline was true for all color classes of whales as well with the exception of grays in 2008. Observational rates for calves were lowest among all classes in both years (Figures 9 and 10). Data for 2007 was not included in the analysis because calves were not noted during observations at that time and because of the different sampling methodology used that year.

As in past years, there was a steady decline in the numbers of belugas observed as the season progressed. The mean number of belugas observed per month decreased steadily after August in both 2008 and 2009. The mean number of whales observed in 2008 was 15.4 and 8.8 in 2009. These numbers were significantly different, $t(116) = 2.04$, $p < .02$, between years. Analysis of behavioral budgets was not carried out due to insufficient sample sizes.

Analysis was also used to examine differences in the observed whale color classes between 2008 and 2009. The mean number of white whales in 2008 was 8.84 and 4.3 in 2009. The mean number of grays was 3.2 in 2008 and 2.4 in 2009, while the mean number of calves observed in 2008 was .86 and 1.6 in 2009. There was a significant difference between 2008 and 2009 for whites ($t(139) = 3.01$, $p < .001$) and for calves ($t(82) = 1.90$, $p < .03$), but no significant difference between years for grays ($t(139) = 1.01$, $p = .15$).

Whale behavior was quantified for the 2009 field season using the modified sampling design first used in 2008. Analysis focused on the period from August through October, during which the majority of whales were observed. Milling and travelling accounted for the greatest proportion of observed behaviors, just as in 2008. As in 2008, the proportion of time whales spent travelling increased throughout the course of the season. Milling behavior was more commonly seen during the morning hours, while the proportion of time spent travelling increased over the course of the day. These results also mirror last year's data.

Remote camera data has been analyzed for the field season from August to September and yielded a total of 33,446 useable images. Of these, only 13 yielded possible beluga sightings. Of these 13, only two images were confirmed to be whales.

Wolverine Live Trapping (JBER-Richardson) 2009-2010. The winter of 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 for the species. In addition to live trapping, an attempt was made to "trap" wolverines using cameras in order to identify the unique chest patterns of individual animals.

Traps were open for a total of 581 trap nights over the course of this study. 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 3 and possibly 4 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 at several times of the day, however, most wolverines were found at trap sites during the 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 for a total of 104 trap nights. A total of 2,083 photos were taken at these sites. 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 the months of November to March. No wolves were observed at the Stuckagain trap site, though coyotes were common.

7-7m(3) Needs

Black bear monitoring technique. The development of a formal black bear monitoring technique is probably within the capabilities of an in-house solution. MCA agents and staff are fully capable of establishing random scent stations equipped with hair snares and remote camera. Cost to establish these sites, purchase equipments, and to process hair samples can become problematic with declining budgets.

Goose Use Index. Develop an index of goose presence within the WEZ by calculating goose-days/ observation effort. BASH dispersal activities being conducted by USDA-APHIS Wildlife Services, which are recorded by event, will be fed into the formula to develop goose-days for comparison to historical count data for similar periods. The index will be evaluated for effectiveness at measuring BASH program effectiveness.

Dragonfly baseline survey. Conduct dragonfly and damsel fly baseline survey to establish composition, spatial and temporal distribution of Odonata on EAFB. Identify habitat selection correlates. Identify and recommend inexpensive meaningful monitoring program.

Wood frog as indicator species. Investigate the health of wood frog populations on EAFB, thereby evaluating the validity of including wood frogs as an indicator species for base environmental health in the INRMP for EAFB. Establish baseline population levels.

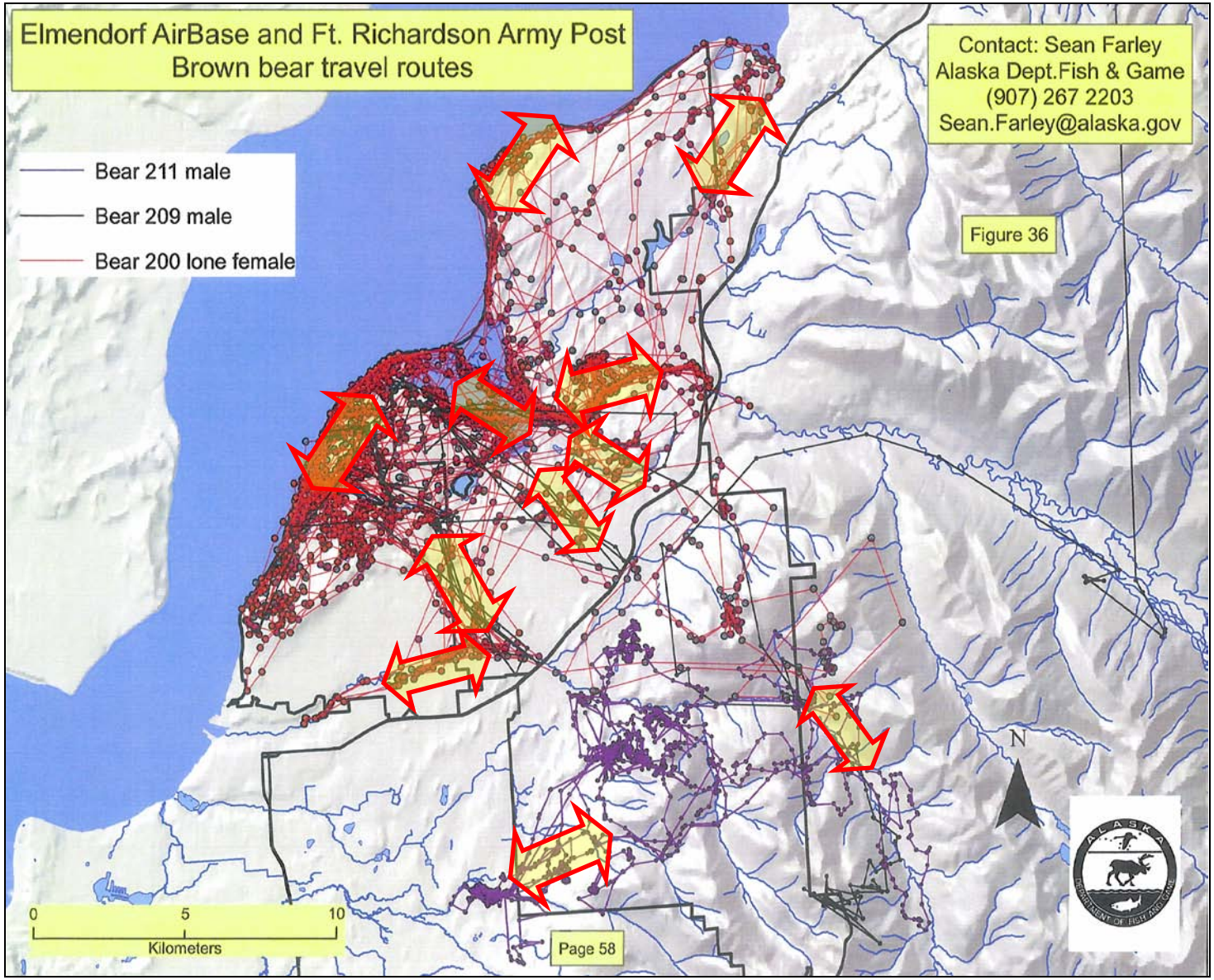

Figure 12. Brown bear movement corridors identified on JBER-north (Farley, et al. 2008)

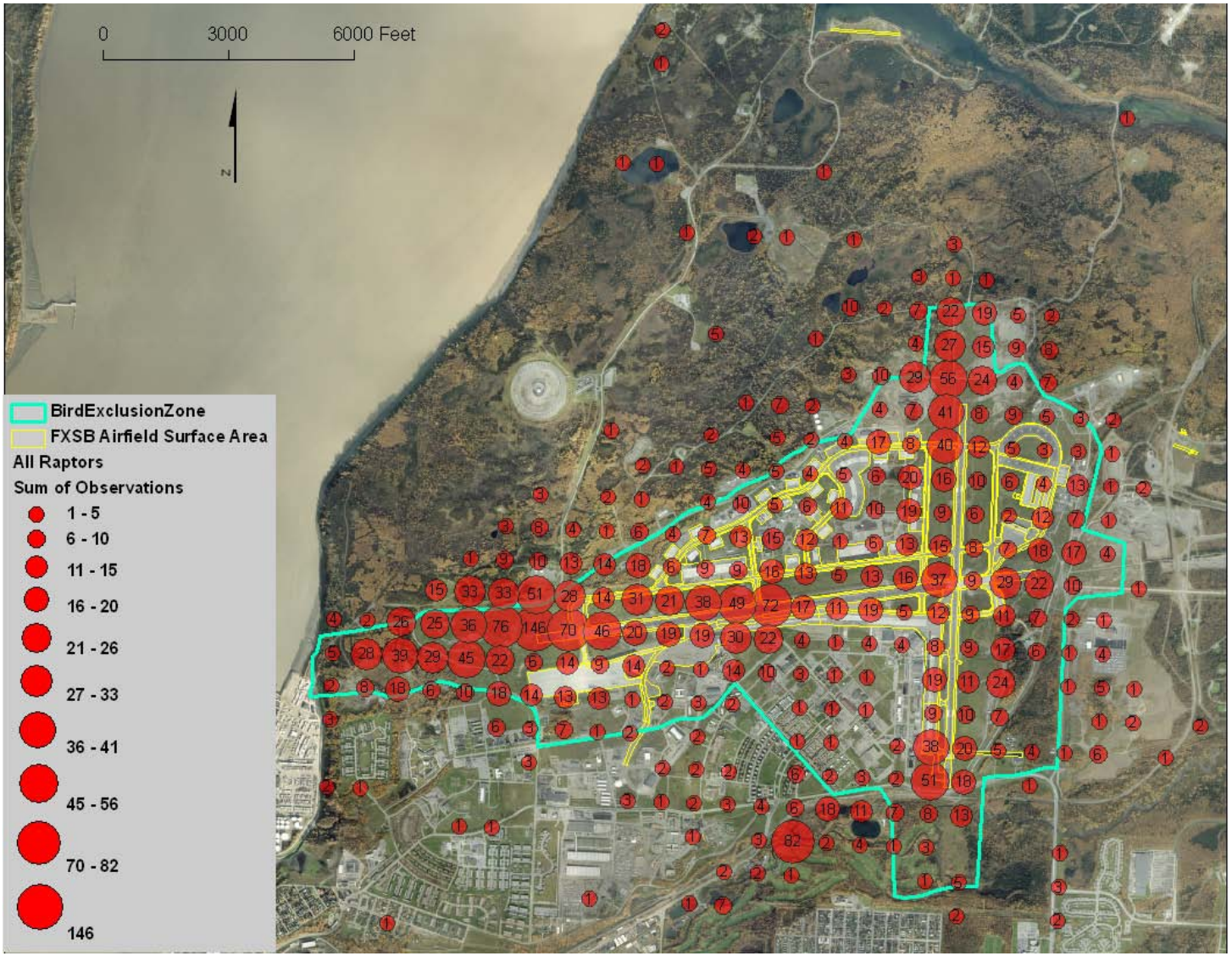

Figure 13. Total Number of Raptors Observed during BASH Operations, 1999-2007, on JBER-Elmendorf, Alaska (Anderson, et al. 2008).

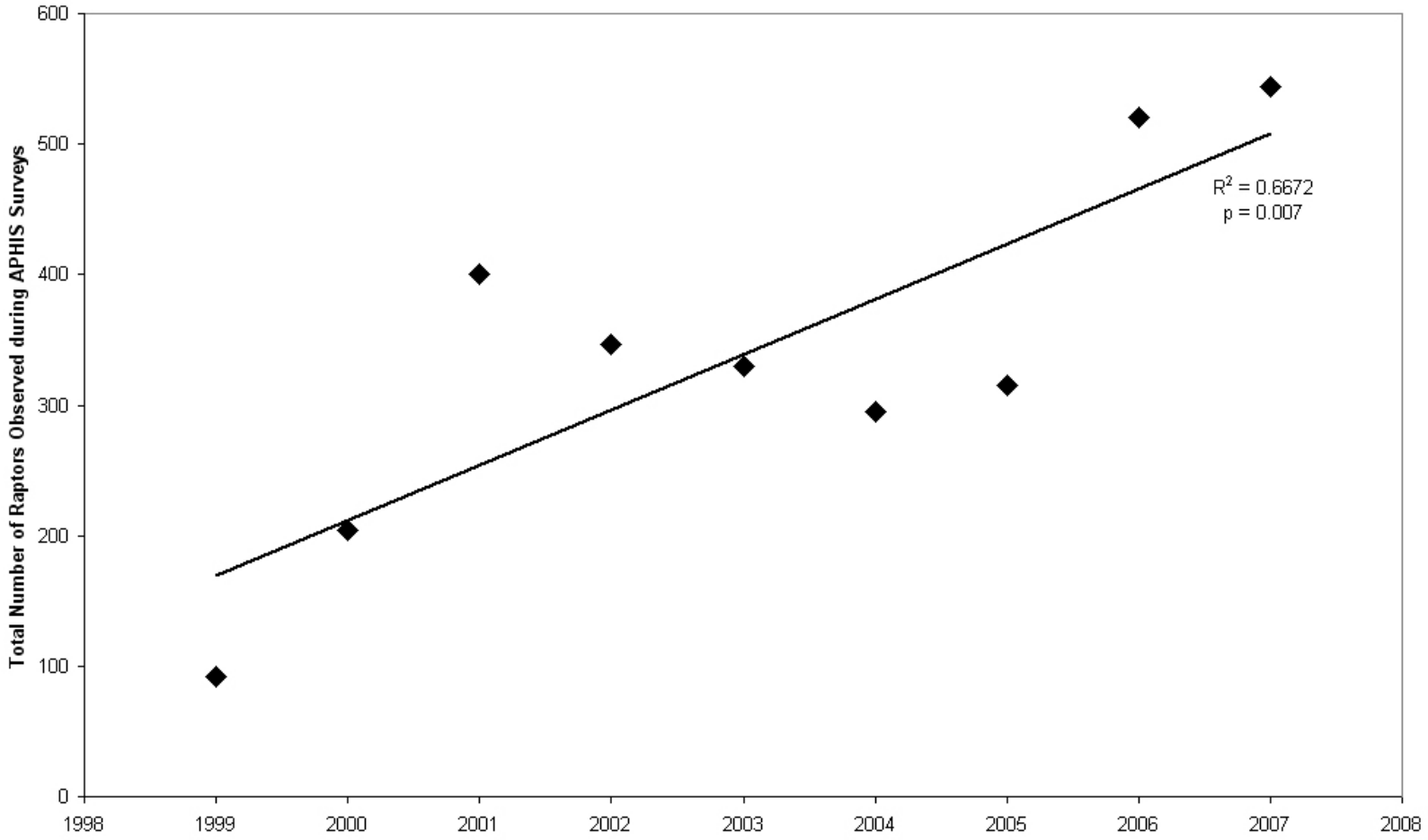

Figure 14. Total Number of Raptors Observed during BASH Operations, 1999-2007, on JBER-Elmendorf, Alaska (Anderson, et al. 2008)

8. CANTONMENT AREA LAND MANAGEMENT AND LANDSCAPING

8-1 Management Objectives

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

For FRA cantonment area management see: http://www.usarak.army.mil/conservation/INRMP_Final/USAGAK_INRMP_07-11_volume_II_annex_B_watershed_and_wetlands.pdf

8-2 Land Management Issues and Planning

8-2a Biological/Physical Constraints

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

8-2b Landscape Planning

Landscape planning on EAFB has centered on the establishment of a Base Beautification Working Group, formed as a sub-group under the Environmental Protection Committee. A base-wide landscape development plan was completed in 1996. This plan contains detailed procedures, planning, and zonation type maps, and is designed to interface with the Base Comprehensive Plan as well as this INRMP and 3WI 91-212 BASH Program (19 May 2008). The landscape development plan contains guidelines and procedures for landscaping projects, as well as a listing of recommended plants for landscaping purposes that are hardy enough to survive the harsh Alaskan climate yet do not create BASH and wildlife attractants near housing. Berry producing trees and shrubs are highly discouraged within the BEZ and WEZ. Trees and

shrubs that attract moose to housing areas, such as mountain ash, are also highly discouraged. . Native plants are the preferred species. In addition, caution will be taken so that no new noxious or invasive species are introduced.

8-2c Airfield/BASH Program

The area of improved and semi-improved lands within the BEZ (Most of LMU 7) is 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, encouraging shrub habitat in large open areas, eliminating bird resting and feeding areas, reducing insects and other prey species, and planting of non-palatable species of vegetation. Further details may be found in 3WI 91-212 BASH Program (19 May 2008), or contact 3d Wing Safety, BASH Section (3 WG/SEF), 552-4798.

8-2d Golf Course

The golf course is maintained by a grounds crew funded through the FSC Office. This crew consists of a full-time supervisor and 10-15 seasonal workers who work from 15 April to 1 October. Management procedures include seeding, mowing, irrigation, fertilization, aeration, and weed and disease control. Details of these procedures can be found in the following sections, or in the Base Landscape Development Plan. Major issues include stream bank stabilization, water quality, and preservation and improvement of fish habitat in this area. A Golf course Environmental Management Plan (GEM) Plan for Eagleglen golf course was drafted in 2008 and is waiting local editing.

8-2e Urban Forestry

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

8-3 Management Strategies for Vegetation Establishment

The following procedures may be found in more detail in the landscape development plan. Species selected will be in compliance with the Base Landscape Plan as well as other directives. See also the requirements for vegetation management in 3WI 91-212 Bird and Wildlife Aircraft Strike Hazard (BASH) Program.

8-3a Grass

The best time for lawn establishment is from 15 May to 15 June. Hydro seeding allows an extension of that period; however, creating young grass during Canada goose dispersal period and migration (Aug12-October 15) creates a high risk attraction when conducted within the BEZ/WEZ. Thus seeding large plots (over 400 square meters) within the BEZ/WEZ should be planned for June but no later thatn 15 July. Fertilizers must have nitrogen-phosphorus-potassium (N-P-K) ratios of at least 8-12-6. Soil preparation is critical to success. Disturbed sites should have the soil tilled to a depth of four inches, and four inches of topsoil should be used to cover the sub-grade. Fertilizer will be thoroughly mixed in, and final grades and elevations will make allowance for the placement of the sod.

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

8-3b Trees and Shrubs

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

A permit to dig wild a limited number of seedlings for planting outside of Auroa housing leased lands is free from CEANC. This permit is good for Air Force fee simple lands only. Roads and Grounds section maintains its own nursery on base, but also digs and transplants some wild trees and saplings, primarily conifers, which are more resistant to transplant shock. Saplings will have a root /burlap ball, and excavations should be at least 50% greater than the root ball and equal in depth.

8-4 Vegetation Maintenance Programs

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

8-4a Mowing

Base lawn areas are mowed from 1 May to about mid September. Mowed areas exceeded 2500 acres in 2005. 773d Civil Engineer Squadron mows common areas, parade grounds, athletic fields, and the airfield area. Airfield procedures are detailed in 3WI 91-212 BASH Program. FSC personnel mow the golf course, ball fields and recreation areas. Areas are mowed weekly or as required. The golf course is mowed twice weekly, except for the greens that are mowed daily. Mowing schedules for areas near the airfield have been modified due to BASH considerations. These areas are mowed once per summer and then left to grow, with the objective of growing grass tall enough to deter use by geese.

8-4b Chemical Control

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

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

8-4c Irrigation and Fertilization

Irrigation is performed primarily at the Eagleglen golf course from 15 April to 1 October, using a permanent, buried system of pop-up sprinklers. Greens and aprons are watered twice daily,

other areas are watered daily. Fertilization is also currently limited to the golf course. Details concerning timing and types of fertilization recommended may be found in the landscape development plan.

8-4d Urban Tree Maintenance

Tree maintenance on improved and semi-improved grounds is performed both by Roads and Grounds section, the privatized housing manager (trees within leased zones) and FSC personnel (in the case of the golf course). 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 the recommended species for planting, to avoid introduction of non-native diseases and pest vectors.

8-5 Environmental Considerations

8-5a Erosion Control

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

8-5b Pollution Prevention

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

8-5c Wetlands/Flood Plain Protection

Wetlands in developed areas receive the same protection that they do elsewhere. As part of the EIS process, all activities that affect wetlands are carefully screened to ensure that impacts are eliminated or kept to a minimum. Appropriate coordination with federal/state agencies is conducted prior to activities occurring, as required by federal and Air Force regulations. When activities take place in these areas, silt curtains must be used to limit the movement of silt generated by construction or repair activities. Compliance with federal regulations is monitored by the Environmental Flight as well federal and state agencies. Further details on wetlands protection procedures may be found in Section 10-1.

8-5d Coordination

Siting of gravel pits, concrete and asphalt debris sites, and clean fill disposal sites must be coordinated with 673d Civil Engineer Squadron, Natural Resources Restoration (673 CES/CEANR). Other land management activities under this plan must be coordinated with Community Planning, Environmental Management, Pest Management, Civil Engineer (CE) Operations, and FSC, as appropriate, depending on the type of activity.

8-5e Environmental Impact Analysis Process (EIAP)

EAFB initiates EIAP with the Request for Environmental Impact Analysis (AF Form 813). 673 CES/CEAO prepares AF Forms 813 on three occasions: following review of Certificates of Compliance for military construction, following review of Work Clearance Requests, and in support of real estate outgrant requests. The AF Form 813 is used to determine if proposed actions qualify for Categorical Exclusion (CATEX) and to initate a biological evaluation for

endangered species. If proposed actions qualify for a CATEX and are determined to have no effect on the endangered species or its critical habitat, no further environmental assessment is necessary. If the AF Form 813 process determines that a proposed action does not qualify for a CATEX, the Air Force prepares an Environmental Assessment (EA) or an Environmental Impact Statement. And if the action is determined to have and adverse affect on the endangered species or its crirtical habitat Typically, EAs and EISs 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, where the Air Force proposes the project, the Air Force is the lead agency. Occasionally, the Air Force may function as a cooperating agency with a neighboring agent, such as in the recent Maritime Administration (MARAD) EAs for POA Expansion and Material Extraction.

9. OUTDOOR RECREATION, ENVIRONMENTAL EDUCATION, AND PUBLIC RELATIONS

9-1 Management Objectives

a. Provide quality outdoor recreation opportunities to support the military mission while maintaining ecosystem health and sustainability

b. Provide a diversity of natural resources based outdoor recreation opportunities for the base residents, and allow public access for recreation where compatible with mission requirements and recreational carrying capacity

c. Maintain and improve existing outdoor recreation facilities and opportunities

d. Educate about the natural world as a way to ensure wise resource use

e. Conduct an active public relations and education program

See also Fort Richardson Outdoor Recereation at:
http://www.usarak.army.mil/conservation/INRMP_Final/USAGAK_INRMP_07-11_volume_II_annex_E_recreation.pdf

9-2 Management Strategies

9-2a Recreation Activities and Facilities

(1) Develop general and special group tent camping areas

(2) Develop day use facility at Sixmile Lake

(3) Develop and maintain handicapped access at all facilities

(4) Construct boat docks at Hillberg and Upper or Lower Sixmile lakes

(5) Repair recreation facilities such as handicap access fishing piers and kiosks

(6) Continue and refine permit and user fee system

(7) Monitor recreational facilities for adequacy

9-2b Trail Management

(1) Continue to develop multi-use trail system

(2) De-emphasize motorized recreation in summer

(3) Establish a trail management committee made up of base Recreation Services, representatives from user groups, and agencies

(4) Develop gated access management system

9-2c Interpretation and Outdoor Education

(1) Develop existing trail into a nature trail suitable for family use

(2) Continue a fishing clinic in cooperation with Recreation Services and AAFES

(3) Improve interpretive program through expansion of displays and development of written tour guides for museum and nature trail

(4) Develop auto tour guide

(5) Develop and expand natural resources volunteer (NRV) programs as part of an overall effort to promote appreciation of nature and natural resources

9-2d History of Outdoor Recreation

The outdoor recreation program on EAFB is extensive, covering at least the northern one-third of the base, and has been a part of the Air Force mission since the early 1950s. EAFB supports a variety of recreational activities including, fishing, hiking, off-road vehicles (ORV), winter sports, wildlife viewing, camping, boating, hunting, swimming, and weekend chalets for retreats, meetings, and parties (Figure 13).

9-2d(1) Historical Fishing

Fishing is the most popular year-round recreational activity taking place on the base. The fishing program started in 1950s. To maintain the fishery, managers in the 1950s restricted fishing to military female dependents and children under 16 years of age. These restrictions were removed in 1958 when ADF&G decided that the fish populations in Green and Sixmile lakes were sufficient to withstand increased fishing pressure. As the demand for fishing areas increased, more lakes have been stocked. Fishing at Sixmile Creek for ocean salmon (pinks and reds) started in 1983. To improve the ice fishery, landlocked salmon were stocked in 1995, 1996 and 1997.

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

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

9-2d(2) Historical Moose Hunting

At the request of the ADF&G, an archery hunt for moose was undertaken on a trial basis in 1990. The normal permit hunts on FRA alone were not effective in reducing moose numbers, due to movement of the moose onto EAFB lands during the hunting periods. A total of 15 permits were issued during the annual drawing for the state permit hunts, eight for bulls and seven for cows, with the hunt taking place from 5 to 30 September. The hunt was extremely successful, with 14 of the 15 moose being taken. Control of the hunters was maintained by the base security officers, who required them to sign on and off the base through the main gate. In addition to providing control, this procedure yielded excellent information on the time required for each hunter to make his kill. Due to the success of the hunt, the state established it as a permanent addition to their drawing hunts, with the annual harvest averaging 12 animals from 1990 to 1997. This hunt is extremely popular with archers and boasts the highest archery success rate (90%) in the state.

9-2d(3) Past/Present Winter Activities

Winter activities include skiing (cross-country, and downhill), snowmobiling, snowshoeing, ice fishing, ice skating, and dog sledding. Skiing facilities are provided by 673 Community Services Flight (FSC), with a downhill ski slope located at Hillberg Lake. Cross-country skiing trails are maintained by FSC at Hillberg Lake as well as at the golf course. Approximately 45 miles of snowmachine trails are available throughout the base. The snowmobile club, made up of volunteers, helps to set up training and inspections that need to occur to get a snowmobile

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

9-2d(4) Past/Present Summer Activities

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

9-3 Public Access

Post 9/11 access to EAFB became more restrictive. Access to base recreational facilities is divided into two groups. Those with DOD identification cards and those without (general public)

General public. There is essentially no uncontrolled access by the general public post-9/11/2001. Permittees to bowhunt 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 identification. DOD employees, military personnel, their dependants and 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).

9-4 Outdoor Recreation Activities, Facilities, and Resources

9-4a Outdoor Recreation Activities and Resources

9-4a(1) Wildlife-Related Activities

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

Hunting is currently limited to an archery-only draw hunt for moose. This hunt is very popular with local archers, as it has the highest success rate in the state for archers.

In addition to Alaska Department of Fish and Game regulations found in Alaska Administrative Code (5AAC) and State statutes (Title 16) hunting and fishing regulations specific to EAFB's are presented in WI 32-7001, *Conservation of Natural Resources*. WI 32-7001 conforms to state laws, but it outlines additional and more restrictive regulations for base usage.

On FRA hunting and trapping opportunites are described at section *SC4.2.1.2 Fort Richardson* of http://www.usarak.army.mil/conservation/INRMP_Final/USAGAK_INRMP_07-11_volume_III_supplements.pdf

Wildlife viewing and photography are popular in the summer. Many base residents drive the back roads in the evening hoping for a glimpse of a moose or bear. A Watchable Wildlife site is

located at the entrance to Lower 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.

Fishing opportunities on EAFB have increased greatly in the past ten years. This is due to annual stocking of lakes and the development of a salmon run on Sixmile Creek. This opportunity has recently decreased due to the hatcheries reduction in productivity. Lower numbers of fish are raised due to loss of hot water from the power plant.

9-4a(2) Water Sports Activities

Water resources on EAFB include seven natural lakes and ponds, three man-made impoundments, three streams, and eight miles of saltwater shoreline (Table 4). Water-related activities include fishing, motorized and non-motorized boating, and swimming. Additionally, most outdoor recreation facilities such as campgrounds, chalets, and picnic areas are found around the lakes and impoundments. Both fishing and boating are very popular during the summer. Canoes, float tubes and other non-motorized watercraft are allowed on all the base lakes. Motorized boating is restricted to electric trolling motors, with exception that gas powered motors, not exceeding 10 HP, are allowed only on Lower Sixmile Lake.

9-4a(3) Winter Sports Activities

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

9-4a(4) Nature and Gathering Activities

Common nature activities include bird watching, nature and wildlife photography, and rock collecting. All are popular with base residents, and no permit is required. Gathering activities include firewood, berry and mushroom picking, sapling digging (for landscaping) and Christmas tree cutting. Permits are required for wood and Christmas tree cutting and sapling digging. Wood and Christmas tree cutting are the most popular activities. In peak years, as many as 800 families participate in the Christmas tree cutting program. Permits are sold beginning the Monday after Thanksgiving for $10, and maps and cutting instructions are given out with the permit. Families are directed to areas with many small spruce trees, which are in need of thinning. Firewood and house logs are sold at $30 per cord. These permit fees go into the EAFB Reimbursable Conservation Account.

9-4a(5) Trail-Related Activities

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

Snowmobiling is a popular winter trail activity on EAFB. The snowmobile club, in conjunction with CEANC, marks and maintains over 40 miles of trails, in addition to the base lakes where

snowmobiling is allowed. Snowmobile trails are much more extensive than the summertime ORV trails, since wetlands are frozen and damage by snowmobiles is minimal.

Snowmobile volunteers to CEANC conduct initial hands-on training for snowmobilers and safety-inspect their machines. CEANC then issues an Outdoor Recreation Permit (Wing Form 35). Trails are maintained jointly by CEANC, 673 CES pavement section (CEORP), and the CEANC snowmobile volunteers.

9-4a(6) Camping/Special Group Activities

Primary concerns for tent camping on EAFB include fire safety and conflicts with bears. Tent camping has been restricted to special groups such as Boy and Girl Scouts and church groups. The Boy Scouts were granted an easement to develop a Boy Scout-only campground near Triangle Lake, but never acted on that grant. The Girl Scouts have historically used a small (five sites) campground near Green Lake, but have not camped there recently. The Green Lake campground already equipped with fire pits or grills 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 EAFB should be thoroughly evaluated and well planned with designs to provide bear-proof food storage and dinning. Rules for food use and storage must be clearly defined and enforced.

9-4b General Recreation Facilities

General recreation facilities on EAFB include one campground, several picnic areas, and several winter and water sports areas, Hillberg Recreation and Ski Area (Figure 16). Table 13 summarizes information about these sites.

Table 15. General Outdoor Recreation Areas for JBER-Elmendorf, Alaska.

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

9-5 Management of Outdoor Recreation and Participants

9-5a Potential Changes or Additions to Current Outdoor Recreation Programs

Refinement and clarification of roles and responsibilities of CEANC and FSC outdoor recreation services is required during this planning period. This should take place in order to reduce repetitive or divergent efforts.

(1) Due to low usage (less than 20 permits issued/year) and limited potential for expansion due to wetlands, CEANC is considering closing the ATV trail and converting it to a multi-use trail for hiking, mountain biking, and possibly development of a portion as a nature trail (Figure 13). This trail could be used to connect other multi-use trails, such as Upper Sixmile and Knik Bluff trails into a coherent trail system. It could still be used as part of the winter snowmobile trail system without serious conflicts with other users. This would also alleviate damage caused by four-wheelers that currently use chains in the winter and operate illegally in the spring, damaging wetlands and rutting trails. The trail could still be used for limited, duty-related four-wheeling by MCAs and trail repair crews.

(2) CEANC will consider a project to connect the portion of the ATV trail on the east side of Talley Avenue to the Upper Sixmile Lake trail. This would require about a ¼ mile section of trail, which could be easily constructed by following the high ground on the east side of Upper Sixmile Lake. This trail extension would create a two-mile trail loop on fairly level ground, which would have great potential to be developed into a nature trail suitable for families with children. The presence of Upper Sixmile Lake, related wildlife resources, old-growth and young forest, and future forest management and browse improvement projects, would all provide outstanding opportunities for interpretation. If this project is not feasible, then CEANC will consider upgrading Knik Bluff Trail into a nature/historic interpretive trail.

(3) Evaluate the demand for tent camping on EAFB and prioritize potential sites for a small tent camping complex. Any plans should consider sites that minimize conflict with wildlife but provide multiple outdoor recreation activities nearby.

(4) Construct docks at Lower and Upper Sixmile lakes at boat launch/portage sites. Consider making handicapped accessible facilities. FSC is providing boats to rent at these areas and is receiving funds that could be used to develop sites.

(5) Establish restrictive access points for the EOD Creek turnoff at Sixmile Munitions, the Oval Lake access road, ATV trailheads, and hiking trailheads. In many cases gates will prevent unauthorized access by four-wheelers, while allowing foot and bicycle traffic, but may also be accomplished with buried posts. Gates should be locked, with key access available for enforcement and work crews who need access for duty purposes. This system is similar to that used on FRA, and should alleviate much of the illegal four-wheeling and damage currently taking place. Gates could be opened during the winter snowmobiling season when damage is unlikely.

(7) Evaluate the establishment of wake control limits for Sixmile Lake and provide clearly defined restrictions for "engine-test permits," issued for Lower Sixmile to avoid abuse and diminish impact on other boaters, floatplanes and waterfowl nesting.

9-5b Allowable Use Guidelines

Allowable use guidelines define maximum recreational usage rates for facilities and management areas. Usage rates vary by activity type. Table 14 describes the allowable use of the recreational facilities maintained by EAFB.

Table 16. Allowable Use Guidelines for JBER, Alaska (From Richmond 1993).

Recreation Opportunity	**Level of Use**
Class I – Outdoor Recreation Areas	
Camping	Medium
Picnicking	High
Water Sports	Low
Winter Sports	Medium
Class II – Natural Environmental Areas	
Fishing	High
Nature Study	Medium
Hiking	Medium
Horseback Riding	Low
Snowmachining/ATV use	Medium
Cross-Country Skiing	Medium
Class III – Special Interest Area	
Botanical-Nature Study	Low
Geological Viewing	Medium
Scenic Viewing	Medium
Zoological Studies	Low
Historical	Medium
Allowable density based on level of use. Low = less than 1 person per acre Medium = 1 to 20 people per acre High = Over 20 people per acre	

9-5c Recreational Facilities Monitoring

See FRA recreational facility survey program at: Section SB5 of http://www.usarak.army.mil/conservation/INRMP_Final/USAGAK_INRMP_07-11_volume_III_supplements.pdf

9-6 Permits, User Fees, and Reimbursable Conservation Funds

9-6a Permits

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

license. Fishing permits are also issued at the FSC Outdoor Recreation Rental Office and the Base Exchange.

9-6b Reimbursable Conservation Program Funds

The only permits currently charged for are moose hunting ($125), woodcutting ($10/cord) and Christmas tree cutting ($5/tree). Proceeds are deposited into Reimbursable Conservation Program accounts and can be withdrawn to be reinvested in base natural resources programs as outlined by AFI32-7064 (17 September 2004). Two separate accounts are maintained with different limitations. Forestry funds go into AF wide account managed by HQ AFCEE. Hunting and fishing fees are entered into an installation level account. Recent activities of the account are presented in Table 15.

Table 17. Reimbursable Conservation Program Funds activities FY01-FY10, JBER-Elmendorf.

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		FW		
		CT		
	2,500	MH	20	
	(4,000)			MCA equipment purchase
FY07	4,220	FW	212	422 cords

FY	Receipts (Expenditures)	Program[1]	Number permits	Notes
FY07 (Cont)	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	?? cords; Fee increased to $30/cord
	1,635	CT	164	Fee increased to $10/tree
	2,875	MH	23	
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

9-6c User Fee Changes

Given the increasing difficulty of funding these programs from other sources, EAFB will continue to evaluate the user fee program to help fund base natural resources management activities. Current fee structures are detailed in Table 16. Having both CEANC and FSC issue permits will be evaluated and instituted if the conflicts do not override convenience to the base users.

Table 18. Current/Proposed Outdoor Recreation User Fee Schedule JBER-Elmendorf 2009

Activity	**Permit Required**	**Annual Fee**	**Proceeds Used For**
Woodcutting	Yes	$30/ cord	Forest Management Costs, Seedlings
General Christmas Tree	Yes	$10	Seedlings
Fishing	Yes	No Charge	[Fish Stocking provided by ADF&G as long as no charge]
Moose Hunting	Yes	$125	Habitat Improvement, Enforcement
Snowmobile	Yes	$5	Trail Maintenance, Enforcement
ATV	Yes	$5	Trail Maintenance, Enforcement
All other activities	No	No Charge	

9-7 Environmental Education and Interpretive Programs

The Wildlife Museum/Natural Resources Office has been the centerpiece of interpretative efforts for many years. Located in one of the base's oldest historic buildings, the museum offers wildlife and natural resources displays that include over 150 life-like mounted specimens, including all of the common species of birds, fish, and mammals found in Alaska. Displays of outdoor recreation opportunities, wildlife safety, and other natural and cultural resources topics are also located here. Tours are conducted by appointment, and prior to base 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 museum visitation dropped to less than 2,000. The museum is a key resource not only for the base community, but also for the Anchorage public schools, whose K-6th grade classes take tours on a regular basis. The museum is open daily, Tuesday through Saturday, for a total of 12.75 hours per week.

Because the museum is co-located with CEANC, some of the personnel from CEANC are on hand to answer questions, issue natural resources permits, and provide informational literature. Additionally, volunteer tour guides are on hand to conduct the scheduled tours.

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

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

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

9-8 Public Relations

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

EAFB's active environmental education program provides much of the positive public relations for natural resources programs. Additionally, groups such as the NRVs and MCAs, through field contacts and visits, provide positive images of the natural resources program at EAFB.

EAFB's Natural Resources Office coordinates closely with the 673d ABW's Public Affairs Office, particularly when dealing with the media or the general public. Special programs or interviews are set up through that office. In the past, this has included coverage on EAFB's on-going Bird Aircraft Strike Hazard program, the bear study, Arbor Day activities, and others.

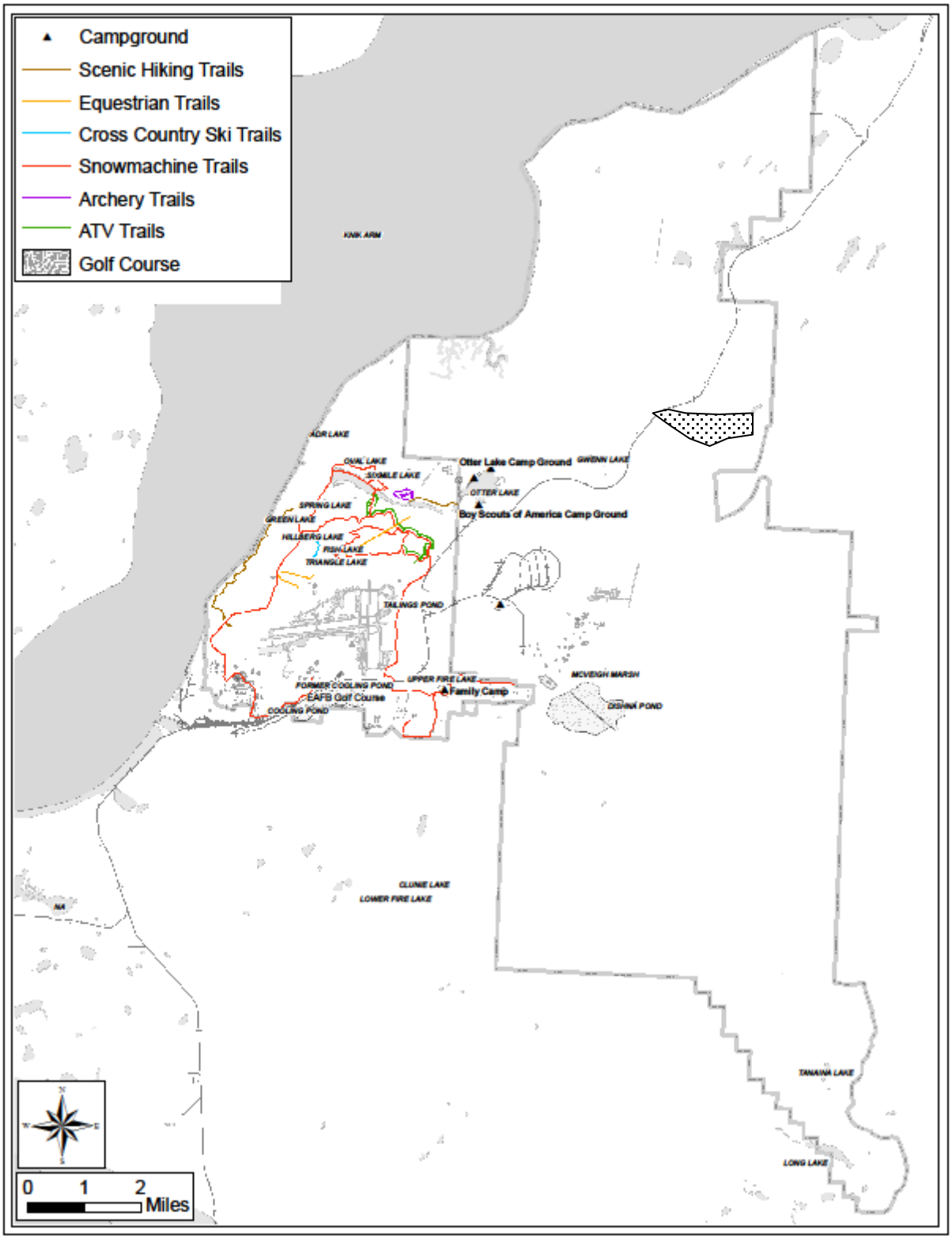

Figure 16. Recreation facilities located on of JBER, Alaska.

10. PROTECTION AND DAMAGE MANAGEMENT

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

10-1 Wetlands

Wetlands/riparian areas are protected at EAFB through compliance with all regulatory requirements. Under AFI 32-7064, the Air Force is instructed to comply with all federal and state regulatory requirements, as well as to inventory and monitor wetlands. Federal regulations include Executive Order 11900, which stipulates that "*federal agencies shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities.*" Additionally, DOD Instruction 4715.3 states that "*DOD operations and activities shall avoid the net loss of size, function, or value of wetlands. Additionally, the DOD will preserve the natural and beneficial values of wetlands in carrying out its activities. The development of mitigation 'banks' is encouraged as sound conservation planning.*" Other regulations regarding protection of wetlands include Section 10 of the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act, and U.S. Army Corps of Engineers (COE) regulations 33 CRF Parts 320-336. State regulations include 18 AAC 70 Alaska Water Quality Standards permits issued by the State of Alaska Department of Environmental Conservation (ADEC). The State of Alaska Department of Natural Resources, Division of Land requires a land use permit when any activity occurs near or on state lands or stream beds under AS 38.05.850.

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

10-2 Special Interest Areas

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

See also FRA Special Interest Areas in section F2.3.2 Special Interest Area Management at: http://www.usarak.army.mil/conservation/INRMP_Final/USAGAK_INRMP_07-11_volume_II_annex_F_te_species.pdf

10-2a EOD Creek Natural Area

The munitions and EOD areas to the south and Eagle River Flats marsh to the east effectively isolate the EOD Creek area composed of approximately 1200 acres. Only one road enters the

area and it is not suitable for large vehicles. Most of the acreage is under the jurisdiction of BLM. Currently, only authorized personnel such as work parties and munitions personnel are allowed in this area, with the exception of a handful of moose hunters during the September season. The 1982 Resource Inventory made the following comments concerning this area: "*This area presently supports a unique, 200-250-year-old, old-growth mixed forest which is probably the least disturbed piece of forest land left in the Anchorage area. It is perhaps the last vestige of this vegetation type which covered much of the Anchorage area prior to arrival and subsequent disturbance by white men*." The only known stand of low-elevation hemlock on the two military installations is found in this unit.

In addition to the unique nature of the forest community, this area has numerous wetlands and two streams, EOD Creek and Sixmile Creek, which constitute the southern boundary. It is critical wildlife habitat. Additionally, the area is an important travel corridor for brown bears and wolves in summertime, and is close to wolf denning and rendezvous areas on FRA. Both black and brown bears and bald eagles heavily use its anadromous stream and saltwater shoreline. It is a population center for spruce grouse, and has an eagle nest near the mouth of EOD Creek that is sporadically active.

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

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

Additional restrictions may occur in the future due the former use of this area as an artillery range safety area, as described in paragraph 4-2a.

10-2b Ship Creek Riparian Zone

Ship Creek riparian areas run through both undeveloped and developed lands on the south side of the installation. Ship Creek is an anadromous stream, and because of its location and importance in maintaining drinking water quality, it is of highest priority. It is also a wildlife travel corridor connecting EAFB with FRA and Arctic Valley, and is heavily used by bears in the summer and wolves in the winter. Recreational facilities include the FSC campground overflow area as well as the Eagleglen golf course. Current management concerns include water quality, soil and bank erosion in the golf course area, and protection of wildlife habitat and salmon spawning areas. A possible future issue revolves around an initiative to facilitate fish passage over/around existing dams. Adding salmon to this system would re-establish the natural diversity of the system. Enhancing fish passage would allow salmon to spawn the length of the creek on EAFB requiring a re-evaluation of recreational activities.

10-2c Other Riparian Areas and Wetlands

Other riparian areas on base include Sixmile Creek, EOD Creek, Upper Otter Creek, Moonshine Creek, which connects Green Lake to Cook Inlet. Wetlands are interspersed throughout the

base. These areas are protected by limited access. No motorized vehicles are allowed, and logging is limited to selective cutting in the wintertime.

10-2d Sixmile Lake System

The Sixmile Lake system is a critical biological and recreational resource on EAFB. It is an anadromous system, with large numbers of salmon migrating to Upper Sixmile Lake each year to spawn. A Watchable Wildlife salmon spawning area is located at the outlet of Lower Sixmile Lake. It appears to be a very productive system biologically, and is managed as a trophy trout fishery, with rainbow trout to 27" present in the system. It is also home to beaver, loons, grebes, and numerous other types of waterfowl. Bald eagles and osprey are regularly seen here. From a recreation standpoint, numerous lodges and chalets dot the shores of Lower Sixmile Lake, and canoeing and boating (10 horsepower limit) are popular in the summer time. Lower Sixmile is also home to the EAFB floatplane base. Ice fishing and snowmobiling on the ice are popular in the winter.

Current management concerns include fuel leakage and spills from floatplanes, impacts on nesting waterbirds by boaters (specifically those testing large outboards), the influences of an abundant beaver population on trees and structures, and an unknown level of salmon poaching during the summer.

Training activities in this system include winter oil spill management near the 611th Chalet.

10-2e Green Lake/Hillberg Lake Recreation Areas

These recreation areas are managed primarily by FSC, with some assistance from CEANC. Green Lake has one active chalet, which is a historical site. Fishing and canoeing are popular in the summer, and ice fishing and snowmobile races in the winter. The north trailhead for Knik Bluff Trail is here, and an incomplete one-mile loop nature trail. A small picnic area is found on the north side. This area is primarily used by Boy and Girl Scout groups. Wildlife resources include an active osprey nest (on nearby communication antenna), loons, and an active beaver colony.

Hillberg Lake Recreation Area is located directly across the road from Green Lake. It is the home of the Hillberg Ski Area, with a large chalet and two ski lifts. It also has a cross-country ski trail (maintained by FSC) and is a major trailhead for the snowmobile trail system. The new (2005) location for recreational horse stables is located north of the parking area. Extraction of water from Hillberg Lake to produce snow for the ski slope has been known to create temporary unsafe ice conditions during early winter

Hillberg and Green Lakes are annually stocked with trout and salmon and are popular summer and winter fishing spots for families. Management efforts for these two areas focus on development of future recreational facilities and maintenance of current facilities.

11. ENFORCEMENT

11-1 Introduction

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

11-2 Objectives

a. Enforce laws and regulations concerning land management and use of natural resources in an effective, impartial, and cost-efficient manner

b. Conduct public education as a key element in preventative law enforcement

c. Complement other natural resources management activities and programs

11-3 Legal Background

11-3a Authority

EAFB operates under a concurrent jurisdiction system. State or federally commissioned officers, including both the Alaska Department of Public Safety and the USFWS Special Agents, can conduct natural resources law enforcement. Additionally, enforcement can be conducted by personnel from CEANC, who have met training requirements outlined in AFI 32-7064 or serve as a MCA, and by law enforcement personnel from the 673 SFS. Authority for military enforcement of these laws stems from paragraph 8 of AFI31-204, as well as 673ABWI 32-7001. MCAs have authority to enforce fish and wildlife laws, off-road vehicles, land and natural resources use regulations, cultural resources, and some types of traffic violations. MCAs have the authority to bear arms, request identification, issue citations, and detain personnel to be turned over to law enforcement or Security Forces personnel. The commander of the Security Forces Squadron, in accordance with 673ABWI 32-7001, delegates this authority to them in writing.

11-3b Jurisdiction

MCAs, once trained and certified as Level 2 Enforcement Agents by the State of Alaska and CEANC, have authority to enforce natural (and cultural) resources laws and regulations on EAFB. Authorized to enforce state fish and game laws, federal environmental laws, and DOD and Air Force regulations on military lands, the MCA's scope of authority within that jurisdiction is similar to that of other federal land management agencies. Federal citations, which are handled through the Federal Magistrate's Office, may be written to both military and civilian personnel for violations of State/Federal fish and game laws in accordance with 10 U.S.C. 2671 and 16 U.S.C 670. In addition, military personnel may be charged under the Uniform Code of Military Justice (UCMJ).

11-4 Enforcement Problem Areas

11-4a BRAC Effects on Public Access

Opening the base to the general public via the BRAC and USARAK user tracking system may increase the enforcement problems due to increased visitor use.

11-4b Trespassing

Trespassing is a common problem on EAFB. The southern border of the base is mostly fenced, but trespassing, frequently for the purposes of poaching salmon, is commonplace. The areas between the state fish hatchery and Eagleglen Golf Course is the most common location for trespass activity. Trespassers encountered by an MCA are usually in the act of salmon poaching and are cited and released. At times individuals are detained and turned over to 673 SFS or Anchorage Police Department (APD).

11-4c Off-Road Vehicle Activity

Illegal off-road vehicle (ORV) activity is a persistent problem on EAFB. This activity includes illegal off-roading by trucks and jeeps, four-wheelers, dirt bikes, and snowmobiles. ORV activity is particularly critical during the summer, due to the potential for damage to wetlands, and oil and fuel contamination of base streams and lakes; anadromous streams (supporting salmon) in particular. Although permits from CEANC are required, the typical offender does not have a permit. Illegal off-roading, depending on the area, can result in loss of driving privileges on base, fines, or action under the UCMJ.

11-4d Wildlife Violations

Two major problems are poaching and feeding of wildlife. It is believed that considerable poaching occurs during the salmon season (approximately 1 July through 15 September). This is based on anonymous tips and actual field contacts and citations issued. Most poaching occurs at night or at low tide at the mouth of 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. MCAs have no enforcement authority on the tidelands, creating a serious resource issue. 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 MCAs are stepped up during this period.

Poaching of moose and other large wildlife is not believed to be a serious problem. In the past, several moose carcasses have been found under suspicious circumstances, but poachers have not been apprehended. The closure of the roads at Talley and 46th has made unobserved access on EAFB more difficult for the purpose of illegal take of wildlife.

Feeding of wildlife, intentionally or negligently, is a major problem, especially in the housing areas. Feeding contributes to wildlife conflict problems by habituating animals to humans. Feeding includes unsecured garbage, unsecured pet food, wild bird food available during summer months, dirty barbecue grills, et. This is a difficult area to enforce, but state regulations now require a $325.00 fine for those in violation of feeding bears (5 AAC 92.230).

11-4e Cultural Resources Enforcement

Cultural resources enforcement is not a major problem at EAFB. However, several incidents have occurred at remote sites, and it is possible that EAFB MCAs will be called on in the future to investigate such incidents. Chief Conservation Law Enforcement Officer (CLEO) has been trained in Archeological Resources Protection (ARPA) crimes as well as Native American Graves Protection and Repatriation Act (NAGPRA) incidents.

11-4f Other Enforcement Areas

MCAs also enforce various natural resources and outdoor recreation activities, including wood and Christmas tree cutting (permit required), water sports, ATV, snowmobiling, and safety issues. Problem areas include cutting firewood without a permit and selling firewood, and extensive problems with illegal and unsafe snowmobile operations.

11-5 Military Conservation Agent Program

11-5a Agencies Involved

Agencies involved in natural and cultural resources enforcement on EAFB include:

(1) U.S. Fish and Wildlife Service

(2) Alaska Department of Public Safety/Alaska Bureau of Wildlife Enforcement

(3) Alaska Department of Fish and Game

(4) 673d Air Base Wing Judge Advocates Office

(5) 673d Security Forces Squadron

(6) 673d Civil Engineer Squadron/Natural Resources Office

(7) National Marine Fisheries Service

(8) Bureau of Land Management

11-5b Military Conservation Agent (MCA) Program

11-5b(1) Conservation Law Enforcement Investigator Duties

CEANC currently has a full-time YN-02 Conservation Law Enforcement Investigator assigned to natural/cultural resources enforcement. Enforcement duties include conducting short term and long term investigations, public education, issue of citations, and wildlife incident response. This individual also serves as the Chief of the MCA program. In addition to enforcement and wildlife response duties, the Conservation Law Enforcement Investigator conducts newcomers briefings, wildlife safety briefings, and assists the natural resources technician with permit issue and the biologists with resource monitoring.

11-5b(2) MCA Volunteer Program

MCAs are selected from applicants from active duty 673d ABW and tenant units. They volunteer their own time to serve as a part-time MCA. The MCA program was initiated in 1992 as a means of providing CEANC with additional manpower to enforce laws and regulations, respond to wildlife problems and incidents, educate the public, and patrol the base. Prior to 1992, 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 was trained and certified by Alaska's Bureau of Wildlife Enforcement in May of 1992, and annual training classes have been conducted since.

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

a full-time investigator, who acts as the non-commissioned officer-in-charge (NCOIC) of the program.

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

Since 1995, MCAs, who volunteer their own time, much like reserve police officers, have volunteered over 20,000 man-hours, averaging 2.5 man-years annually.

11-5c Training

11-5c(1) Conservation Law Enforcement Investigator

The Conservation Law Enforcement Investigators have met basic training requirements and are in compliance with AFI 32-7064.

11-5c(2) Military Conservation Agents (MCAs)

Level 1 MCAs receive eight hours of orientation and training, and are then assigned to a Level 2 or 3 trainer for field training. After a six-month probationary period, most Level 1 MCAs are scheduled to attend Level 2 MCA enforcement training. As mentioned previously, Level 2 MCAs are trained and certified by the state of Alaska's Fish and Wildlife Protection Division. Initial training for Level 2 agents totals 110 hours, and required annual refresher training. At this point, agents are state commissioned Fish and Wildlife Protection Officers with jurisdiction on military lands only. Training is conducted by Alaska Wildlife Troopers, Fish and Game enforcement, Security Forces. National Marine Fisheries Enforcement, USFWS Special Agents, 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. Level 3 agents receive additional training in wildlife investigations and bear response procedures.

11-5c(3) Security Forces Conservation Detail

Security Forces Conservation Enforcement Detail will operate under the umbrella of the GS-1801 Conservation Law Enforcement Officers and be trained in accordance with the Memorandum of Understanding signed by the respective Squadron Commanders.

11-5d Manpower, Funding and Equipment

Manpower is an ever challenging issue. The conservation enforcement program currently has two full time paid positions. All other manning is provided by MCAs and Security Forces detailed personnel. Recently, with the increase in deployments and other national and base events, the ability to retain qualified MCAs has diminished. We must continue to provide adequate conservation enforcement to be within Sikes Act compliance. In order to accomplish this, additional full time manning needs to be implemented.

The MCA program is important in day-to-day operations at CEANC. Assuming that the MCA program continues to function as it does now, averaging 2.5 man-years annually, and assuming comparable pay to entry-level state Bureau of Wildlife Enforcement officers, the MCA program is estimated to provide over $200,000 per year of free labor to the JBER Natural Resources Office.

In spite of the success of the MCA program, it has been hampered by limited funds and equipment throughout its existence. No dedicated funding source currently exists for this

program. Two four-wheel-drive vehicles, along with several four-wheelers and snowmobiles, are shared with CEANC. Safety equipment, such as firearms, ammunition, shared duty belts, bulletproof vests and pepper spray, is also provided. MCA hats and badges are provided by CEANC, but the duty uniform is the military BDU. MCAs almost always purchase their own duty belt and attachments and badge (as a level 3). Given the increasing prominence of this program, and the degree to which CEANC and the Security Forces Squadron have come to rely upon this unit, reliable options for funding will need to be explored.

12. MISCELLANEOUS PROGRAMS

12-1 Coastal Zone Management

12-1a Coastal America program involvement:

The Air Force has an MOU with Coastal America (Coastal America 1992) to perform the following:

(1) Protect, preserve, and restore the nation's coastal ecosystems through existing federal capabilities and authorities.

(2) Collaborate and cooperate in the stewardship of coastal living resources by working together and in partnership with other federal programs.

(3) 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.

EAFB protects, preserves, and restores the coastal ecosystems through the Environmental Planning section with the National Environmental Policy Act/Environmental Impact Analysis Process (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. EAFB works closely with neighboring agencies as exemplified by the recent cooperative effort with the POA in the Port Expansion projects.

12-1b Coastal Zone Protection Issues:

As stated in AFI 32-7064, par. 5.2.1, all AF activities, operations, projects, and programs that affect any lands, water use or natural resources of a state's Coastal Zone must be consistent to the maximum extent practicable with the state Coastal Zone Management Plan. EAFB 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 Code of Federal Regulations (CFR) 923.3), activities on these lands are subject to the consistency provisions of Section 307 of the Coastal Zone Management Act of 1972, as amended. During the NEPA/EIAP process, if EAFB determines that an activity, operation, project, or program may affect the Coastal Zone, EAFB prepares and submits for review an Alaska Coastal Management Program Consistency Determination for Federal Activities questionnaire and submits it to State of Alaska Department of Natural Resources Office of Project Management and Permitting. Coastal Zone Management Act (CZMA) section 307(c)(1)(C) requires the consistency determination to be provided at least 90 days before final approval of the activity unless the federal agency and the state agree to an alternative schedule. The state response becomes part of the NEPA/EIAP documentation.

12-1c Consistency with State Coastal Zone Management Program:

The coastal zone boundary of the Municipality of Anchorage is described as follows: The inland coastal zone boundary of the Municipality of Anchorage along the coast between the Matanuska-Susitna Borough and Potter Creek includes all lands and waters within: (1) a zone extending 1,320 feet inland, measured horizontally, from the extent of the 100-year coastal flood; (2) the 100-year floodplain or 200 feet from the center (whichever is greater) of each river and stream intersected by the 1,320-foot zone up to the 1000-foot elevation contour; and (3) other areas as delineated by the map. The inland coastal zone boundary in watersheds of the upper Knik River includes all lands and waters within the 400-foot elevation contour. The inland coastal zone boundary south of Potter Creek includes all lands and waters within the 1000-foot elevation contour (Figure 17).

See also FRA in section SD Institutional Controls in:
http://www.usarak.army.mil/conservation/INRMP_Final/USAGAK_INRMP_07-11_volume_II_annex_F_te_species.pdf

In the past, EAFB typically has not had projects that affected the coastal area as described in (1) above; however, several projects had the potential to affect Ship Creek as described in (2). EAFB prepared and submitted Coastal Zone Consistency Determination questionnaires for the following projects: Bank Stabilization – Ship Creek (Jul 1992); Repair of Ship Creek Dike (Jun 1993); Construction of the Golf Course Clubhouse Replacement Facility (Aug 1996); Six Mile Lake Culvert Replacement (Jun 1997); and Ship Creek – Eagleglen Golf Course Bridge Replacement (Jul 1998). During the NEPA/EIAP process, EAFB will determine on a case-by-case basis, when to prepare and submit consistency determinations to the State for future activities.

12-2 Cultural and Natural Resources Management

The Integrated Cultural Resource Management Plan (ICRMP) outlines EAFB's management of cultural resources. Activities such as tree removal and development of recreation areas are potentially damaging to cultural resources. Projects that require ground-disturbing activities will be processed through the base's cultural resources manager.

Determination of effect and consultation guidelines provided in implementing regulations for the National Historic Preservation Act (36 CFR 800) will be followed during review of projects. Any project assessed as having a significant affect on cultural resources or historic property will be coordinated with the Alaska State Historic Preservation Officer (SHPO). Coordination with the Native Village of Eklutna and other local tribes has aided EAFB in working to identify sensitive cultural sites.

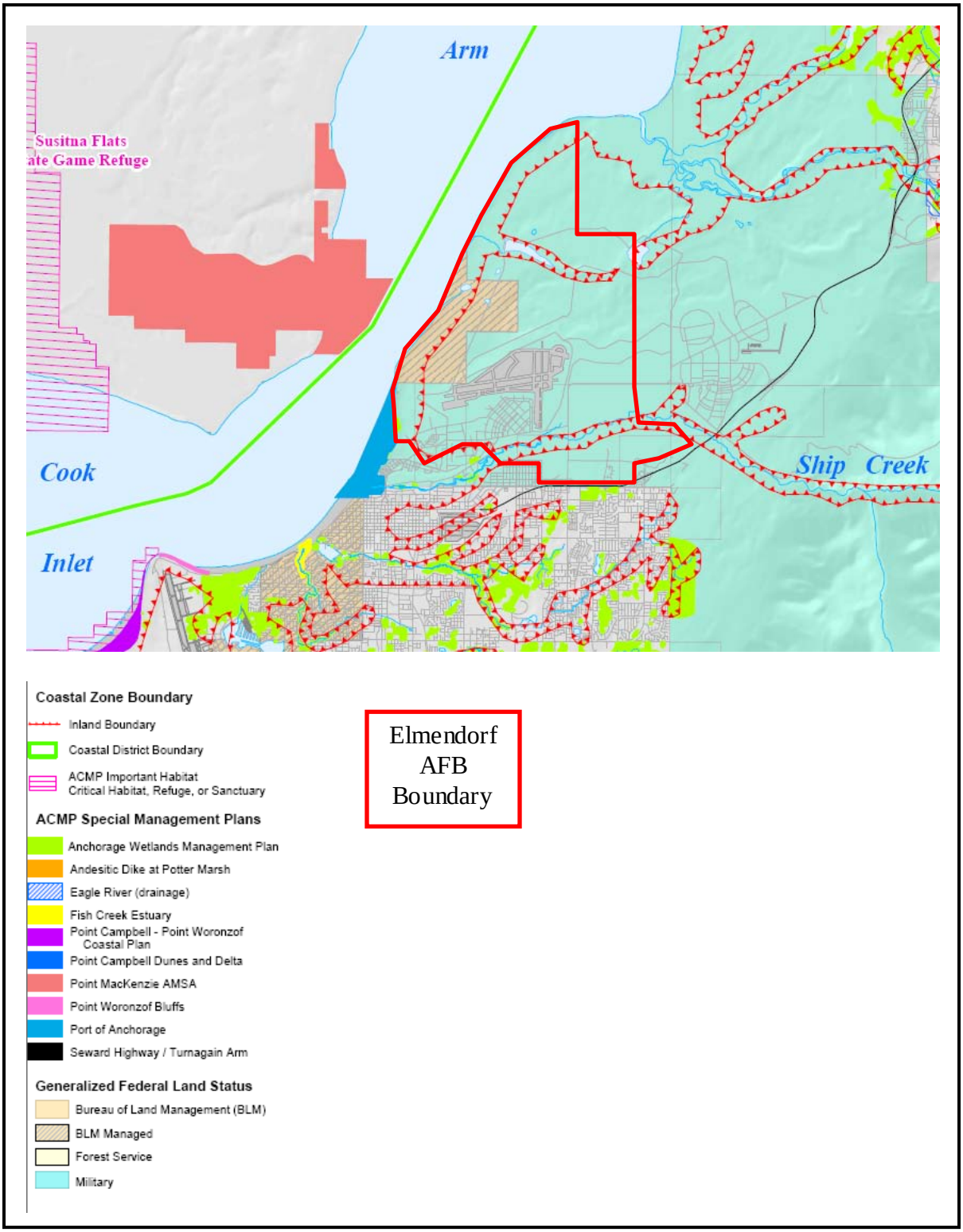

Figure 17. Anchorage Coastal Management Zone Jurisdictions overlaid on EAFB, July 2005.

13. GOALS AND OBJECTIVES

13-1 General

13-1a Biodiversity

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

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

13-1b Ecosystem Management

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

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

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

(1) A shift from single species to multiple species management

(2) Consider the formation of partnerships necessary to assess and manage ecosystems that cross political boundaries

(3) Use the best available scientific information in decision making and adaptive management techniques in natural resources management

(4) Include associated cultural values

(5) Use principles and guidelines defined by DOD instructions and enclosures

13-2 Ecosystem Management Goals

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

a. Restoring and maintaining ecological associations of local and regional importance
b. Restoring and maintaining biodiversity
c. Restoring and maintaining ecological processes, structures, and functions
d. Adapting to changing conditions
e. Managing for viable populations
f. Maintaining ecologically appropriate perspectives

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

13-3 JBER Elmendorf AFB Goals and Objectives

The following general goals and objectives are intended to implement management of natural resources in accordance with Department of Defense, Air Force, and 673d ABW policies and directives. Individual program management objectives, as well as the strategies to implement them, will be found in the various management chapters.

13-3a GOAL 1: Support the Air Force mission

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

Goal 1 will be accomplished through the following objectives:

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

13-3b GOAL 2: Maintain functional ecosystems and natural diversity

Maintain functional ecosystems and natural diversity including viable populations, native species, and communities.

Goal 2 will be accomplished through the following objectives:

(1) Analyze current status of ecosystem integrity and function

(2) Emphasize, monitor and maintain viable populations of native species and maintain diversity of species and communities that occur on base

(3) Maintain or improve native vegetation patterns, successional stages, and biodiversity

(4) Restore disturbed areas dominated by invasive species to natural vegetation where practical and consistent with mission requirements

(5) Maintain or improve forest health

(6) Reintroduce fire to the ecosystem within the constraints of mission, safety, and air quality standards

(7) Use land management techniques which mimic natural disturbance

(8) Identify and protect sensitive areas such as wetlands, riparian areas, critical and seasonal habitats, wildlife travel corridors, and linkage zones

(9) Incorporate environmental and natural resources concerns and constraints in the base comprehensive planning process

13-3c GOAL 3: Manage under principles of Ecosystem Management

Manage under the guidelines and principles of ecosystem management

Goal 3 will be accomplished through the following objectives:

(1) Integrate the various natural resources management programs with each other

(2) Conduct long-term monitoring of changes in ecosystem status and health based on biodiversity indicators and Management Indicator Species

(3) Monitor quantity/quality of habitats and track losses of habitat

(4) Utilizing the principles of adaptive management, monitor results of management activities and adjust management practices based on results

(5) Manage at the landscape level by coordinating and managing across jurisdictional boundaries

(6) Using risk factors, identify species and habitats at risk at the base level and at the regional level

(7) Identify and maintain functional wildlife corridors and habitat linkages

(8) Emphasize species and habitats that are of limited distribution in a regional context

(9) Manage urban areas as part of the ecosystem

(10) Manage developed lands so as to minimize adverse ecological effects while maximizing cost efficiency

(11) Utilize and integrate ecosystem information into existing Air Force Management Information Systems and Decision Tools, to facilitate incorporation of ecological factors into routine management decision-making

13-3d GOAL 4: Manage Human Use of Resources

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

Goal 4 will be accomplished through the following objectives:

(1) Manage for long-term sustainability

(2) Identify land or ecosystem management areas to assist in integrating resource management

(3) Establish biological, physical, and management databases to assist in management and planning

(4) Place equal emphasis on consumptive and non-consumptive resource uses

(5) Emphasize wild stocks and native ecosystems

(6) Provide diversity of natural resource-based recreation opportunities for the base residents

(7) Educate about the natural world to ensure wise resource use

(8) Provide effective enforcement of all federal, state, and local natural resources laws and regulations

13-3e GOAL 5: Soil, water, and air quality

Protect, maintain, and improve soil, water, and air quality.

Goal 5 will be accomplished through the following objectives:

(1) Integrate natural resources management programs with environmental programs such as pollution control, hazardous waste, and restoration programs

(2) Minimize pollution

(3) Maintain or improve water quality

(4) Maintain or improve air quality

(5) Prevent vegetation stripping where possible and re-vegetate stripped areas

(6) Prevent or control erosion

(7) Mitigation of habitat losses

13-3f GOAL 6: Cultural resources

Protect cultural resources

Goal 6 will be accomplished through the following objectives:

(1) Integrate natural and cultural resources management plans and activities

(2) Ensure natural resources management activities do not degrade known cultural resources sites

13-3g GOAL 7: Scientific knowledge

Contribute to scientific knowledge

Goal 7 will be accomplished through the following objectives:

(1) Conduct long-term monitoring program and provide results to other interested local agencies

(2) Conduct studies with wide-ranging applications and impacts, analyze data and publish results

(3) Attend professional meetings and workshops

(4) Share results of work with other agencies and the public by presenting papers at national and regional conferences and workshop

(5) Maintain list of possible or needed future studies and projects and encourage and cooperate with university research programs and graduate students

13-4 Elmendorf AFB Project List

The projects listed in Table 16 were generated from needs identified within each respective section of the INRMP.

Table 19. Natural resources projects and monitoring programs identified for JBER-Elmendorf, Alaska, 2007-2017.

Fiscal Year	Project Name / Description	Yr Complete
2007 – 2013	Vegetative Plot Monitoring	2008
2007 - 2017	Biodiversity Habitat Monitoring	2007-2009
2008 - 2017	Invasive Species Mapping and Control	2008, 2009
2007-2017	Annual INRMP Review/Revision	2008, 2010
2007	Terrestrial Invasive Species Survey	2007
2008	Aquatic Invasive Species Survey	2008
2009	Wildlife Corridor Identification	
2009-2017	Beluga Whale Prey Monitoring – Sixmile Creek	2009
2010-2014	Moose Habitat Enhancement	2010
2010	EIAP for Sixmile Watershed Enhancement Activities	
2010	Design Sixmile Watershed Fisheries Enhancement Activities	
2010	Upper Sixmile Lake Spawning Habitat Enhancement	
2010	Wildlife Education Facility Repair and Upgrade	
2011	Replace Sixmile Creek Fish Ladder	
2011	JBER Integrated Natural Resource Management Plan Revision	
2011	Macro-invertebrate Indicator Species Survey	
2011	Timber Inventory and Wildfire Plan Update	
2011, 2013	Moose Habitat Survey	
2011	Wildlife Education Facility Repair and Upgrade	
2011	JBER Programmatic Biological Assessment	
2012	Sixmile Creek Over-wintering Habitat Enhancement	
2012	Repair Salmon viewing platform and kiosk	
2012	Wildlife Enforcement Facility Upgrade	
2012	Investigation of Wood Frog Populations	
2012	Sixmile Lake Campsite Feasibility Study	
2012	Wetland Delineation for 50-Year Plan	

2013	Ship Creek Bank Restoration	
2013	Update Vegetation mapping for JBER	
2014	Black bear population estimate	
2014	Bat population inventory	
2014	American Dipper Habitat Survey and Enhancemt	
2015	Generate WEZ Goose Use Index	

13-5 JBER-Richardson Ecosystem Managment Goals and Objectives

The overall goal of the ecosystem management program is to maintain an environment in which Soldiers can train to a high-level of military readiness and to maintain natural landscape features and ecosystem integrity at a broad landscape scale. The set of specific program objectives to be accomplished in pursuit of this goal are:

(1) Work with the Integrated Training Area Management program to integrate landscape-scale land management efforts with the needs of military training.

(2) Promote recreational use in ways that do not compromise the military mission or the maintenance of ecosystem integrity.

(3) Engender support for the protection of natural landscapes and ecosystem processes required for the training and testing necessary to maintain military readiness.

(4) Incorporate the concept of conservation of ecosystem integrity in the Integrated Natural Resources Management Plan process, the Integrated Training Area Management program, and other planning protocols.

(5) Promote the general use of proactive planning methods to avoid prolonged controversy over land use proposals and environmental compliance processes.

(6) Continue to upgrade the process used to target priority species to be managed.

(7) Outline inventory and monitoring needs to determine current levels of species diversity and to monitor population sizes of selected management priority species.

(8) Outline habitat-use studies needed to increase the accuracy of habitat preference data used in impact assessment and conflict-resolution procedures.

(9) Outline habitat management projects that may be needed to maintain the desired landscape scale habitat mosaic (so as to promote species diversity and desired population sizes for a suite of management priority species).

(10) Continue to fine-tune the landscape-scale impact assessment and conflict-resolution procedures so that multiple species can be more easily assessed.

(11) Incorporate measures of habitat fragmentation and habitat connectivity into impact assessment and conflict-resolution procedures.

(12) Coordinate natural resources program with other management agencies and conservation organizations with similar interests.

(13) Encourage internal and external stakeholders to become involved in the ecosystem management process as it develops.

(14) Promote management relationships with adjacent landholders so that larger, regional-scale efforts at land management can become a reality.

13-6 Ecosystem Management Program Procedures

There are 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

Descriptions of each of these components of the ecosystem management program, their objectives, methods, and critical tasks for implementation are presented below.

13-7 Priority Management Species, Methods

To be included for management in the ecosystem management program, a species must occur in at least one of four categories:

(1) The species is of conservation concern, as determined largely by population declines noted broadly throughout the species range (not necessarily in Alaska) or from conservation priority species lists produced by the U.S. Fish and Wildlife Service, Alaska Department of Fish and Game, and especially specialist working groups (for birds, the national Partners-in-Flight Watch List, the Alaska Audubon Watch List, Boreal Partners-in-Flight Working Group, Alaska Shorebird Working Group, and Alaska Loon Working Group, and for vascular plants, the Alaska Natural Heritage Program,).
(2) The species has socioeconomic importance as a locally hunted game animal.
(3) The species is ecologically important in ecosystems as a predator.
(4) The species is ecologically important in ecosystems as prey.

Each species was prioritized to determine its relative priority for management. This prioritization process involved using a set of ten ranking criteria that address each species' biology and ecology relative to its response to human-induced disturbances and alterations of habitats (high ranking species are likely to be less common and/or more susceptible to impacts). Each species was given a score of 1–5 for each ranking criteria and the (unweighted) values were summed for all ten criteria, which resulted in high values for high priority management

species. A short list of high priority management species for JBER-Richarson will be used in most cases for impact assessment and conflict resolution in land use issues.

13-8 JBER-Richardson Project List

Table 20. Natural resource projects and monitoring programs identified for JBER-Richardson, Alaska, 2007-2011

Fiscal Year	Project Name / Description	Yr Complete
2007-2011	Aerial Moose Survey	2008
2007-2011	Moose Browse Survey	2007
2007-2011	Moose Harvest Data Collection	2007-2010
2007-2011	Wildlife Movement Corridor Study	2009-2010
2007-2011	Moose Habitat Enhancement	2007-2010
2007-2011	Winter Track Surveys	2007-2009
2007-2011	Beluga Whale Surveys (Eagle River Flats)	2007-2010
2007-2011	Pike Removal and Monitoring on FRA	2007-2009
2007-2011	Rusty Blackbird Nesting Survey	2007-2010
2007-2011	Wolverine Population Estimate	2008-2010
2007-2011	Wood Frog Survey	2008-2010
2007-2011	Spawning Salmon Surveys on Campbell Creek	2007-2009
2007-2011	Spawning Salmon Surveys on Chester Creek	2007-2009
2007-2011	Nuisance/Injured Wildlife Response	2007-2010
2007-2011	Tracking of Nuisance Wildlife Calls	2007-2010
2007	Brown Bear Telemetry Survey	2007
2007	Brown Bear Population Estimation using Non-invasive Genetic Methods	2007
2008	Alaska Landbird Monitoring Survey (Arctic Valley)	2008, 2010

14. IMPLEMENTATION

Implementation of the natural resources program consists primarily of full implementation of this INRMP. The Sikes Act requires each military installation to prepare, update, and fully implement an INRMP. The INRMP is considered to be fully implemented if all high priority projects are funded and executed, there are sufficient numbers of trained natural resources personnel, those personnel have sufficient supplies and equipment to carry out these projects. The following natural resources program management section details the staffing funding sources and priorities, and other requirements necessary to fully implement this INRMP.

14-1 Organization and Manpower

14-1a Staffing

CEANC currently has the following positions authorized:

Title	Type	Series/Grade
Chief Natural / Cultural Resources	DOD Civilian	Series 0401 YF-02
Wildlife Biologist	DOD Civilian	Series 0486 YF-02
Wildlife Biologist	DOD Civilian	Series 0486 YD-02
Wildlife Biologist	DOD Civilian	Series 0486 GS-11
Wildlife Biologist	DOD Civilian	Series 0486 YD-02
Cultural Resources Officer	DOD Civilian	Series 0028 GS-12
Conservation Enforcement Specialist	DOD Civilian	Series 1801 YN-02
Conservation Enforcement Specialist	DOD Civilian	Series 1801 YN-02
General Biologist	Contractor	
Fisheries Biologist	Contractor	
Forester	Contractor	
Forestry Technician	Contractor	
GIS Support	Contractor	

In FY10 no DOD seasonal personnel or summer hires are anticipated, nor is there a position for museum attendant. This duty is currently split up between the forestry technician, the biologist staff and volunteers. Some duties (museum work, some types of field work) could be accomplished by volunteers. Seasonal or volunteer support will be pursued in the future via the student or standard over hire program; other supplemental staffing support is being considered using reimbursable streams.

Bird dispersal within the BEZ/WEZ is contracted to the local office of the USDA-APHIS Wildlife Services. Dispersing other wildlife within the airfield security fence is also now the responsibility of USDA-APHIS Wildlife Services.

14-1b Training

Training allocation is authorized for all personnel in accordance with Air Force funding matrix requirements. Typically a training course or professional development event each year is authorized annually. Minimum training requirements are specified in AFI 32-7064. In addition, appropriate training is sought via the Air Force Institute of Technology, US Navy Civil Engineer Corps, Corp of Engineers, or The Fish and Wildlife Service. CEANC usually sends at least one representative to the North American Wildlife Conference and joint meetings

of the National Military Fish and Wildlife Association. Individuals also occasionally attend the Society of American Foresters Convention, the annual Wildlife Society meeting, the Alaska Environmental Forum, the Joint Service Environmental Management conference, and various specialized training sessions related to ecosystem management and biodiversity. An EAFB representative attends the national BASH conference annually. Maximum use is made of locally available training. All professional managers are also required to attend the initial training course for Natural and Cultural Resource Management sponsored by the DOD.

MCAs initially receive 100 hours of training (see Chapter 11) and usually attend refresher training on an annual basis.

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

14-1c Volunteer Program

Volunteer programs provide significant manpower for CEANC. Individuals and groups typically donate labor, and occasionally materials, for specific projects.

CEANC has an active natural resources volunteer program. Volunteers receive training, are issued equipment, and are covered for liability and workman's compensation. In return, they volunteer a minimum of 48 hours per year to assist in various natural resources projects and programs. In addition to the NRV program, where volunteers sign up individually, 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 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
- Museum tour guide

14-1d Military Conservation Agent Program

The MCA volunteer program has provided about 2.5 man-years of volunteered time annually over the last ten years. Since only one full-time enforcement position exists, this program effectively quadruples available coverage for enforcement, patrol, public contact, and wildlife response activities. Unfortunately the program also requires substantial effort to coordinate, supervise and train MCAs, reducing time for the full-time enforcement specialist to conduct field enforcement.

14-2 Technical Support and Outside Assistance

CEANC receives outside assistance from a variety of sources. Major projects such as natural and cultural plans and inventories are often contracted out to various public and private agencies such as the Fish and Wildlife Service, ADF&G, the 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. CEANC intends to pursue management of some aspects of forestry management through an agreement with the US Forest Service.

Technical support is sometimes available from agencies such as the ADF&G and FRA's Natural Resources Branch. The latter has been particularly helpful in terms of GIS support and funding for joint projects such as the bear study. The ADF&G has provided technical advice and training on a host of issues.

14-3 Program Priorities and Funding

14-3a Program Priorities

14-3a(1)Operations and Services

Natural resources programs are funded through a variety of means. CEANC normally has an annual operations and maintenance budget allocated through the Civil Engineering Squadron and covers day-to-day operational costs such as vehicles, gas, office supplies, field supplies, and basic operating requirements. In addition to this general funding source, funding is also received for special projects, and some natural resources programs generate funds which are, by regulation, used to support the programs that generated them. These requirements are submitted through the Automated Civil Engineer System (ACES) as "Level 0" priority (Ops and Services), as they are required for daily operation.

14-3a(2)Project Funding

Conservation projects are usually funded through the Environmental Planning, Programming and Budgeting System process using Automated Civil Engineer System (ACES). Projects are identified, prioritized, and costs are estimated. They are then submitted through the ACES environmental budget process to the parent command and, ultimately, HQ Air Force. Projects have three categories of priority. Level 1 projects are required to comply with federal laws or regulations in the fiscal year (FY) they are programmed. An example might be funding for an endangered species related project. Category 2 funding includes requirements that are not presently out of compliance, but will be at a future date. Category 3 projects support enhancement projects which are not driven by compliance with laws. In recent years, most funded projects were Category 1. Air Force natural resource funding is programmed out to 2020 and reviewed annually. An Air Force budgetary integrated priority list (IPL) is created at the MAJCOM level from installation project submittals for two subsequent fiscal years beyond the operating year. The IPL not only priorities the MAJCOM project it restricts project and financial modifications.

14-3a(3) Projects or Programs to be Conducted In-House

(a) Optimize Boundaries for Land Management Units

(b) Maintain permanent plot system for long-term monitoring

(c) Analyze BASH data

(d) Identify habitat improvement areas for lynx, moose, and snowshoe hare

(e) Maintain firebreak system

(f) Evaluate campground location at Sixmile Lake

(g) Re-evaluate permit user fee schedule

(h) Establish priorities for collecting and entering GIS data into the 673 CES Geobase and conduct data development

(i) Establish funding programs for museum and MCA program

(j) Attain "bear-resistant status" for base before spring 2008

(k) Monitor Management Indicator Species and Adapt to new information

(l) Conduct breeding bird surveys

(m) Expand wildlife safety education program

(n) Conduct minor repair boat docks and kiosks

(o) Design improvements to parking area and beach access at Sixmile Creek Recreation Area

(p) Coordinate installation of controlled access points to trails and roads in sensitive areas

(q) Design nature trail suitable for families

14-3a(4) Possible Future Projects

(a) Conduct berry production survey

(b) Develop written tour guide for museum

(c) Develop written tour guide for nature trail and/or auto tour

(d) Design Watchable Wildlife site at Upper- Sixmile Lake

14-3b Other Funding

14-3b(1) Natural Resources Program Funding Sources.

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

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

In 2005 these receipts were used to purchase a forestry truck for activities related to forest management and inventory.

14-3b(2) Legacy Program.

In the past, some special projects have also been funded through the DOD's Legacy program, the most recent being the study of Rusty Blackbird habitat use on JBER (Matsuoka, et al. 2009). The status of this program varies from year to year.

14-3b(3)BASH Funding.

Since the fatal air crash in 1995, numerous projects have been funded under this program. Past and future projects to change vegetation around the flightline, as well as the cost of bird

dispersal operations, are funded from this source. In many cases the funds are Wing-level funds that are diverted from other programs. In 2000 the estimated cost for this program over the next 10 years was 1.1 million dollars.

14-3b(4)Wetlands Mitigation Funds.

The gravel extraction project by which the Maritime Administration and POA are extracting 12M CY of gravel from Elmendorf AFB will result in the destruction of some wetlands. MARAD expects to provide wetlands mitigation funds in to an account managed by the COE. CEANC has obtained preliminary approval from the Corps of Engineers to utilize up to $800K of these funds for enhancement of salmon habitat along Sixmile Creek and Sixmile Lake.

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16. APPENDICIES

APPENDIX A: SUPPORTING REFERENCES

32 CFR. Part 190, *Appendix--Integrated Natural Resources Management*
32 CFR. Part 989, *Environmental Impact Analysis Process (EIAP)*
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 32-9003, *Granting Temporary Use of Air Force Real Property*
AFI 36-2817, *Civil Engineer Awards Program*
AFI 65-601, *Budget Guidance and Procedures*, Volume 1
AFI 91-202, *The US Air Force Mishap Prevention Program*
AFI 91-204, *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*
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Executive Order 13514—*Federal Leadership in Environmental, Energy, and Economic Performance*, October 8, 2009
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Migratory Bird Treaty Act, as amended (16 U.S.C. 703 *et. seq.*)
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National Trails Systems Act of 1986 (16 U.S.C. 1241-1249)
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*
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Outleasing for Grazing and Agriculture on Military Lands (10 U.S.C. 2667(d)(4))
Protection of Fossils on Federal Lands (43 U.S.C. 1701 et. seq., 18 U.S.C. 641, and 18 U.S.C. 1361).
Rivers and Harbors Act of 1899 (33 U.S.C. 401 *et. seq.*)
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Taylor Grazing Act (43 U.S.C. 315 *et. seq.*)

Timber Sales on Military Lands [An update of the Military Construction Authorization Act] (10 U.S.C. 2665)
Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design*
Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1271-1287)

APPENDIX B: ACRONYMS

3 OG/OGV	3d Operations Group, BASH Section
673 MSG/CC	673d Mission Support Group, Commander
673 SFS	673d Security Forces Squadron
673 CES	673d Civil Engineer Squadron
673 CES/CEC	673d Civil Engineer Squadron, Engineering
673 CES/CEAN	673d Civil Engineer Squadron/Asset Management Flight, Natrual Resources Element
673 CES/CEANQ	673d Civil Engineer Squadron, Environmental Compliance
673 CES/CEANR	673d Civil Engineer Squadron, Environmental Restoration
773 CES/CEO	773rd Civil Engineer Squadron, Operations and Maintenance
AAC	Alaska Administrative Code
ABWI	Air Base Wing Instruction
ACES-PM	Automated Civil Engineering System, Project Management
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AF	Air Force
AFCEE	Air Force Center for Environmental Excellence
AFB	Air Force Base
AFI	Air Force Instruction
AFMAN	Air Force Manuals
AFS	Alaska Fire Service
AGS	Air Guard Station
AK	Alaska
ALMS	Alaska Landbird Monitoring System
ANG	Air National Guard
ANILCA	Alaska National Interest Lands Conservation Act
AOG	Air Operations Group
APHIS-WS	Animal Plant Health Inspection Service, Wildlife Services
APD	Anchorage Police Department
ARPA	Archaeological Resources Protection Act
ASG	Air Support Group
ATV	All Terrain Vehicles
AWACS	Airborne Warning And Control System
BASH	Bird Aircraft Strike Hazard
BBS	Breeding Bird Survey
BEZ	Bird Exclusion Zone
BHWG	Bird Hazard Working Group
BIRDRAD	Bird Radar
BLM	Bureau of Land Management
BRAC	Base Realignment and Closure Commission
CATEX	Categorical Exclusion
CE	Civil Engineer
CEANC	673d Civil Engineer Squadron, Cultural and Natural Resources Conservation
CEMML	Center for Ecological Management of Military Lands

CFL	Commercial Forest Land
COE	Corps of Engineers
CONUS	Continental United States
CFR	Code of Federal Regulations
CRREL	Cold Regions Research and Engineering Laboratory
CZMA	Coastal Zone Management Act
DBH	Diameter Base Height
DEEV	Engineering Design Section
DOD	Department of Defense
DODD	Department of Defense Directive
DODI	Department of Defense Instruction
DOF	Division of Forestry
EA	Environmental Assessment
EAFB	Elmendorf Air Force Base
ECAMP	Environmental Compliance and Management Program
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EO	Executive Order
EOD	Explosive Ordinance Disposal
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESOH	Environmental, Safety, and Occupational Health
FAMCAMP	Family Camp
FFMC	Fine Fuel Moisture Content
FLETC	Federal Law Enforcement Training Center
FRA	Fort Richardson, Alaska
FSC	673d Forces Support Squadron, Community Services Flight
FWS/OBS	Fish and Wildlife Service Observation
FY	Fiscal Year
GIS	Geographic Information System
GPS	Global Positioning System
HQ	Headquarters
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
IS	Invasive Species
LMU	Land Management Unit
LRAM	Land Rehabilitation and Maintenance
LTVMP	Long Term Vegetation Monitoring Plots
MARAD	Maritime Administration
MBTA	Migratory Bird Treaty Act
MCA	Military Conservation Agent
MILCON	Military Construction
MIS	Management Indicator Species
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MWR	Morale, Welfare, and Recreation
NAGPRA	Native American Graves Protection and Repatriation Act
NAMH	North Anchorage Moose Herd

NCOIC	Non-commissioned officer-in-charge
NEPA	National Environmental Protection Act
NFES	National Fire Equipment System
NFPA	National Fire Protection Association
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
N-P-K	Nitrogen-Phosphorous-Potassium
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRV	Natural Resources Volunteer
NWI	National Wetlands Inventory
OHMP	Office of Habitat Management and Permitting
OPLAN	Operations Plan
ORV	Off-Road Vehicle
PACAF	Pacific Air Command Air Force
PL	Public Law
PLO	Public Land Orders
POA	Port of Anchorage
POL	Petroleum, Oil, and Lubricants
RV	Recreational Vehicle
SOD	Secretary of Defense
SOA	State of Alaska
SHPO	State Historic Preservation Officer
TES	Threatened and Endangered Species
UCMJ	Uniform Code of Military Justice
UFC	Unified Facilities Criteria
USARAK	United States Army, Alaska
USAF	United States Air Force
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WES	Waterways Experiment Station
WEZ	Waterfowl Exclusion Zone

Appendix C: Jurisdictional History

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

For Fort Richardson see : Appendix 2-4: Fort Richardson Jurisdictional History *in* Integrated Nartural Resources Management Plan 1998-2003 U.S. Army Alaska Vol. II. Fort Richardson. Pages A-19 – 25.

APPENDIX D: COOPERATIVE AGREEMENTS AND MEMORANDUMS OF AGREEMENT/UNDERSTANDING JBER-Elmendorf

Type	Parties	Subject	AF level	Who With	Date	CEANCEANC POC
MOA	Memorandum of Agreement between the Maritime Administration and USAF, PACAF, Elmendorf AFB	Gravel Extraction	3 WG/CC	MARAD	8-Aug-05	EP
CA	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 Elmendorf AFB and Alaska Dept of F&G	Hatchery Water and Sport Fish Stocking	3rd Log Group CC	ADF&G	(expired) 5-Apr-01	NR
MOU	Memorandum of Understanding regarding Watchable Wildlife in Alaska	Wildlife viewing	11 AF/CC	ADF&G	14-Feb-98	NR
MOU	Memorandum of Understanding regarding Comprehensive Wildlife Management Plan	Human/wildlife conflicts	3 WG/CC	ADF&G et al	28-Mar-00	NR
MOA	Memorandum of Agreement between the US Army Garrison AK, US Air Force, Elmendorf AFB, AK Dept of Fish and Game, and US Dept of Agriculture, Animal and Plant Health Inspection Service, Wildlife Service	Bear/human conflict response	3 WG/CC	ADF&G et al	pending	NR

Type	Parties	Subject	AF level	Who With	Date	673 CES/CEANC POC
MOA	AK-MOA-213 Memorandum of Agreement Between U.S. Army Garrison, Fort Richardson and Elmendorf Air Force Base	Geographical Information System (GIS) data sharing	3 WG/CC	USARG, FRA	3 June 06	
MOA	MOA-28-H-730 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 673rd ABWIng Elmendorf Air Force Base	Fire prevention, hazardous material response, and protection from wildland fires	3 WG/CC	Municipality of Anchorage, et al	8 Aug 02	
MOA	WS0587-02288-001 Memorandum of Agreement between Us Department of Agriculture- Animal Plant Health Inspection, Wildlife Services and 673rd ABWIng, Elmendorf Air Force base	BASH program support	3rd Log Group CC	USDA/APHIS/WS	21 Aug 02	

APPENDIX E: PLANT SPECIES: JBER-ELMENDORF

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

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

C. ostrata	Beaked sedge
C. rotundata	Rotund sedge
C. sitchensis	Sitka sedge
C. tenuiflora	Sparse-flowered sedge
Chamaedaphne calyculata	Leatherleaf
Chenopodium albun	Lamb's quarter
Circuta douglasii	Water hemlock
C. mackenzieana	Mackenzie water hemlock
Corallorrhiza trifida	Early coral-root
Cornus canadensis	Bunchberry
Corydalis sempervirens	Pale corydalis
Cypripedium guttatum, subsp. *guttatum*	Spotted lady's slipper
Dracocephalum parriflorum	Dragonhead
Droser rotundfolia	Round-leaf sundew
Dryopteris dilatata	Spinulose shield fern
D. dilatat, subsp. *americana*	Spinulose shield fern
Echinopanax horridum	Devil's club
Eleocharis palustre	Creeping spikerush
Empetrum nigrum, subsp. *hermaphroditum*	Crowberry
Epilobium adenocaulon	Northern willow herb
E. angustifolium, subsp. *angustifolium*	Fireweed
E. hornemannii	Alpine willow herb
E. lactiflorum	Alpine willow herb
E. latifolium	Dwarf fireweed
E. palustre	Swamp willow herb
Equisetum arvense	Meadow horsetail
E. fluviatile	Swamp horsetail
E. pratense	Meadow horsetail
E. silvaticum	Woodland horsetail
Eriophorum angustifolium, subsp. *scabriusculum*	Tall cottongrass
E. angustifolium	
E. gracile	Slender cottongrass
E. russeolum-albidum	Chamiss cottongrass
E russeolum, subsp. *rufescens*	
E. scheuchzeri-scheuchzeri	White cottongrass
E. scheuchzeri-tenuifoluim	White cottongrass
E. Viridi-carinatum	Thinleaved cottongrass
Festuca rubra	Red fescue
Galium boreale	Northern bedstraw
G. triflorum	Sweet-scented bedstraw
Geocaulon lividum	Bastard toadflax
Geranium erianthum	Cranesbill
Germ macrophyllum	Large-leaf avens
Goodyera repens-ophioides	Lesser rattlesnake
Gymnocarpium dryopteris	Oak fern
Hammarbya paludosa	Bog adder's tongue
Heracleum lanatum	Cow parsnip
Hippuris peploides	
Honckenya peploidis	Sea-bench sandwort

H. jubatum	Squirrel grass plantain
Iris setosa, subsp. *setosa*	Blueflag
Juncus alpinus	Alpine rush
J. bufonius	Toad rush
J. castaneus, subsp. *castaneus*	Chestnut rush
J. oreganus	Oregon rush
Juniperus horizontalis	Creeping juniper
Lathyrus palustris	Wild pea
Ledum palustre, subsp. *decumbens*	Northern labrador tea
L. palustre, subsp. *groenlandicum*	Labrador tea
Lemna minor	Pondweed
Linaria vulgaris	Butter-and-eggs
Linnaea boreali	Twinflower
Listera cordata	Heart-leafed twayblade
Luminus nootkatensis	Nootka lupine
L. polyphyllus	Large-leafed lupine
Lycopodium annotinum, subsp. *annotinum*	Stiff clubmoss
Matricaria matricaroides	Pineapple weed
Menyanthes trifoliata	Buckbean
Menziesia ferruginea	Rusty menziesia
Mertinsia paniculata	Tall bluebell
Mimulus guttatus	Yellow monkey-flower
Moehringia lateriflora	Blunt-leafed sandwort
Moneses uniflora	One-flowered wintergreen
Myrica gale-tomentosa	Sweet gale
Nuphar polysepalum	Yellow pond lily
Nymphaea tegragona	White pond lily
Osmorhiza depauperata	Chile sweet cicely
Oxycoccus microcarpus	Bog cranberry
Papaver nudicaule	Iceland poppy
Parnassia palustris, subsp. *neogaea*	Northern grass-of-parnassus
Pedicularis capitata	Capitate lousewort
P. labradorica	Labrador lousewort
Picea glauca	White spruce
P.mariana	Black spruce
Plantago major-major	Common plantain
Plantanthera dilathta	White bog orchid
P. Hyperborea	Northern bog orchid
Poa glauca	Glaucous bluegrass
P. plaustris	Wood bluegrass
P. pratensis	Kentucky bluegrass
Polemonium acutiflorum	Jacob's ladder
Polygonum viviparum	Alpine bistort
Populus balsamifera	Balsam poplar
P. tremuloides	Trembling aspen
P. trichocarpa	Black cottonwood
Potamogenton alpinus, subsp. *tenuifolius*	Northern pondweed
P. epihydrus-ramosus	Nuttal pondweed
P. filiformis-borealis	Filiform pondweed

P. gramineus	Fries pondweed
P. natans	Floating pondweed
P. pectinatus	Fennel-leaf pondweed
P. perfoliatus-richardsonii	Clasping-leaf pondweed
Potentilla fruticosa	Shrubby cinquefoil
Pyrola asarifolia-purpurea	Liverleaf wintergreen
P. chlorantha	
P. grandiflora	Large-flower wintergreen
P. minor	Lesser wintergreen
P. secunda, subsp. *obtusata*	One-sided wintergreen
Ranaunculus gmelini, subsp. *gmelini*	Yellow water crowfoot
R. lapponicus	Lapland buttercup
Rhinanthus minor, subsp. *borealis*	Rattlebox
Ribes glandulosum	Skunk currant
R. laxiflorum	Trailing black currant
R. triste	American red currant
Rorippa hispida	
Rosa acicularis	Prickly rose
R. arcticus	Nagoonberry
R. chamaemorus	Cloudberry
R. idaeus, subsp. *melanolasius*	Raspberry
R. pedatus	Five-leaf bramble
Salix alexensis, subsp. *alexensis*	Alaskan willow
S. alexansis, subsp. *longistyulis*	
S. barclayi	Barclay willow
S. bebbiana	Bebb willow
S. brachycarpa, subsp. *niphoclada*	Barren-ground willow
S. fuscescens	Alaska bog willow
S. glauca	Grayleaf willow
S. lasiandra	Pacific willow
S. myrtillifolia	Low blurberry willow
S. planiforia, subsp. *pulchre*	Diamond-leaf willow
S. pulchra	Richardson willow
S. scouleriana	Scouler willow
S. sitchensis	Sitka willow
Sambacus racemosa	Red elderberry
Sanguisorba menziesii	Menzies burnet
S. stipulata	Sitka burnet
Scirpus validus	Great bullrush
Shepherdia canadensis	Soapberry
Sorbus scopulina	Western mountain ash
Sparganium angustifolium	Narrow-leaved burreed
S. hyperboreum	Northern burreed
S. minimum	Small burreed
Speianthes beauverdiana	Ladies tresses
Stellaria media	Common chickweed
Striptopus amplexifolius	Twisted stalk
Swertia perennis	
Taraxacum officinale	Common dandelion

Thalictrum alpinum	Arctic meadowrue
Thelypteris phegopteris	Northern beach-fern
Tolfieldia coccinea	Northern asphodel
T. glutinosa	
T. pusilla	False asphodel
Trichophorum alpinum	
T. caespitosum	Tufted clubrush
Trientalis europaea, subsp. *arcticus*	Arctic starflower
Trifolium hybridum	Alsike clover
T. repens	White clover
Triglochin maritimum	Maritime arrowgrass
T. palustris	Marsh arrowgrass
Tsuga mertensiana	Mountain hemlock
Typha latifolia	Common cattail
Utricularia intermedia	Flat-leaf bladderwort
U. vulgaris, subsp. *macrorhiza*	Common bladderwort
Vaccinium ovalifolium	
V. uliginosum	Bog blueberry
V. vitis-idaea, subsp. *minus*	Lowbush cranberry
Valeriana captiata	Capitate valerian
Viburnum edule	Highbush cranberry
Viola episila, subsp. *repens*	Marsh violet
V. renifolia-Brainerdii	White violet

Aulucomium spp.	Brown fen moss
Dicranum spp.	Cranesbill moss
Hylocomium spledens	Feathermoss
Mnium spp.	Big-leaf moss
Pleurozeum schreberi	Schrebers feathermoss
Polytricum spp.	Haircapped moss
Rhytidiadelphus triquetrus	Feathermoss
Scorpidium spp.	Brown fen moss
Sphagnum fuscum	Brown sphagnum peat moss
S. green spp.	Green spagnum peat moss
S. squarrosum	Squarrose sphagnum peat moss
S. warnstorfianum	Red sphagnum peat moss
Thomenthypnum spp.	Brown fen moss

Caldina spp.
Cladonia spp.

APPENDIX F: VERTEBRATE SPECIES: JBER-ELMENDORF

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

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*
Lynx	*Lynx canadensis*
Marten	*Martes americana*
Mink	*Mustela vison*
Moose	*Alces alces*
Muskrat	*Ondatra zibethica*
Otter, River	*Lutra canadensis*
Porcupine	*Erethizon dorsatum*
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, Meadow	*Microtus pennsylvanicus*
Vole, Northern Redback	*Clethrionomys rutilus*
Weasel, Least	*Mustela nivalis*
Weasel, Shorttail	*Mustela erminea*
Wolf, Gray	*Canis lupus*
Wolverine,	*Gulo gulo*

? no verified observation, but habitat present.

BIRDS

COMMON NAME	SCIENTIFIC NAME
Blackbird, Rusty *	*Euphagus carolinus*
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 + @	*Limnodromus griseus*
Duck, Harlequin +	*Histrionicus histrionicus*
Duck, Mallard *	*Anas platyrhynchos*
Duck, Ring-necked*	*Aythya collaris*
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*
Goldeneye, Barrow @	*Bucephala islandica*
Goldeneye, Common @	B*ucephala clanqula*
Golden-plover, Lesser #	*Pluvialis domini*
Goose, Canada *	*Branta canadensis*
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, Sharp-shinned	*Accipiter striatus*
Jay, Gray*	*Perisoreus canadensis*
Jay, Stellar *	*Cyanocitta stelleri*
Junco, Dark-eyed*	*Junco hyemalis*
Kestrel, American	*Falco sparverius*
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*
Merlin *	*Falco columbarius*
Nuthatch, Red-breasted @	*Sitta canadensis*
Owl, Boreal?	*Aegolius funereus*
Owl, Northern Sawwhet*	*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*
Pintail, Northern *	*Anas acuta*
Plover, Semipalmated *	*Charadrius semipalmatus*
Ptarmigan, Willow #	*Lagopus laogpus*
Raven, Northern *	*Corvus corax*
Redpoll, Common *	*Carduelis flammea*
Redpoll, Hoary *	*Carduelis hornemanni*
Robin, American*	*Turdus migratorius*
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, Common*	*Gallinago gallinago*
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*
Swallow, Bank *	*Riparia riparia*
Swallow, Cliff *	*Hirundo pyrrhonota*
Swallow, Tree *	*Tachycineta bicolor*
Swallow, Violet-green *	*Tachycineta thalassina*
Swan, Trumpeter *	*Cygnus buccinator*
Swan, Tundra @	*Cygnus columbianus*
Teal, Blue-winged @ *	*Anas discors*
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*
Warbler, Arctic ?	*Phylloscopus borealis*
Warbler, Blackpoll + *	*Dendroica striata*
Warbler, Orange-crowned *	*Vermivora celata*
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*
Wigeon, American*	*Anas americana*
Woodpecker, Black-backed +	*Picoides arcticus*
Woodpecker, Downy *	*Picoides pubescens*
Woodpecker, Hairy *	*Picoides villosus*
Woodpecker, Three-toed *	*Picoides tridactylus*
Yellowlegs, Greater	*Tringa melanoleuca*
Yellowlegs, Lesser	*Tringa flavipes*

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

FISH

Salmon, Chum (dog)	*Oncorhynchus keta*
Salmon, King (chinook)	*Oncorhynchus tshawytsha*
Salmon, Pink (humpback)	*Oncorhynchus gorbuscha*
Salmon, Red (sockeye)	*Oncorhynchus nerka*
Salmon, Silver (coho)	*Oncorhynchus kisutch*
Pacific tomcod	*Microgadus proximus*
Sculpin, Slimy	*Cottus cognatus*
Stickleback, Threespine	*Gasterosteus aculeatus*
Stickleback, Ninespine	*Pungitius pungitius*
Trout, Dolly Varden	*Salvelinus malma*
Trout, Rainbow	*Oncorhynchus mykiss gairdneri*

Appendix G. JBER-ELMENDORF Fish and Wildlife Monitoring Programs Protocols and Results.

1. Moose

Annual Elmendorf/Fort Richardson Aerial Moose Survey

Protocol. In the process of gathering an overall estimate for moose in the Elmendorf/Fort Richardson moose subpopulation, survey units are flown in accordance with procedures outlined by Gassaway (1986). During the process of surveying sample units 8, 9, 10 and 11, moose number, sex and age, and locations (whether in or out of the Elmendorf boundary) are noted. The results provided in the table below do not consider sightability correction.

Fall Moose Survey Results for Elmendorf AFB, 1991-2009[1].

Year	Date	Bulls	Cows	Calves	Total	Calves:100 cows	Bulls:100 cows
1991		13	52	24	89	46	25
1992		11	36	20	67	56	31
1993		10	38	17	65	45	26
1994[2]		3	37	9	49	24	8
1996		3	12	9	24	75	25
1998[2]		1	24	14	39	58	4
1999		8	34	19	61	56	24
2001		4	20	5	29	25	20
2003		7	22	9	41	41	32
2004	No count						
2005		7	21	8	36	38	33
2006	5-11 Dec	1	22	12	33	53	5
2007	No count						
2008	No count						
2009	No count						

[1]Data provided by FRA (1991-2003 represents subset of moose observed from fixed-wing aircraft in survey units 8, 9, 10 and 11 and within the EAFB boundary, all after represent total count of same sample units..
[2]Winter counts are prone to under-represent bulls due to antler-drop thus minimizing bull and calf to cow ratios.

Moose Hunter Effort/Success Summary, 2001-2009

Elmendorf Moose Bowhunter Summary

Year	Permits	Apps	Hunted (paid) [a]	Days hunted	Total shots reported	Success	%	Male	Female	Unk
2001	15	608			Unk	8		5	5	0
2002	15	518	13(13)		Unk	9	69.2	5	4	0
2003	20	857	20(20)	140	+33	10	50.0	6	4	0
2004	20	610	19(19)	120	27	9	47.4	6	3	0
2005[b]	25	586	19(20)	108	34	16	84.2	10	6	0
2006[c]	25	653	21(21)	213	41	11	52.4	6	5	0
2007	25	767	22(22)	160	30	10	45.3	4	6	0
2008	25	758	22(23)	215+	31	12	54.5	7	5	0
2009	18	753	16(17)	128	16	8	50.0	8	0	0

[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 (Bull Moose – Day after Labor Day – Sept 30)

Year	Permits	Apps	Hunted	Days hunted	Total shots reported	Success	%	Male	Female	Unk
2001	10	492								
2002	10	394								
2003	10	330								
2004	10	286	8	73	15	5	62.5	5	0	0
2005[b]	13	263	9	76	16	6	66.7	6	0	0
2006[c]	13	310	10	103	15	5	50.0	5	0	0
2007	13	396	13	104	10	4	30.8	4	0	0

2008	13	363	11	134	13	4	36.4	4	0	0
2009	13	414	13	109	15	7	53.8	7	0	0

[b] Includes nuisance bull calf shot 2 Nov. by unsuccessful DM-428 hunter – new allowance by ADFG.

[c] Includes nuisance bull shot 6 Oct.

Hunt DM-429 (Antlerless moose – Day after Labor Day – Sept 30)

Year	Permits	Apps	Hunted	Days hunted	Total shots reported	Success	%	Male	Female	Unk
2001	5	116								
2002	5	124								
2003	5	77								
2004	5	64	5	21	8	3	60.0	0	3	0
2005	7	82	6	20	10	6	100.0	0	6	0
2006	7	88	6	64	14	4	66.7	0	4	0
2007	7	102	7	42	13	5	71.4	0	5	0
2008	7	114	7	66	9	4	57.1	1	3	0
2009	0	1	--	--	--	--	--	--	--	--

Hunt DM-430 (Any moose – October 15 – November 15)

Year	Permits	Apps	Hunted	Days hunted	Total shots reported	Success	%	Male	Female	Unk
2001	0	0								
2002	0	0								
2003	5	440	5	23	6	3	60.0	2	1	0
2004	5	260	5	26	4	1	20.0	1	0	0
2005	5	241	4	12	8	4	100.0	4	0	0
2006	5	255	5	46	12	2	40.0	1	1	0
2007	5	269	2	16	7	1	50.0	0	1	0
2008	5	281	4	15+	9	4	100.0	2	2	0
2009	5	338	3	19	1	1	33.0	1	0	0

EAFB Bowhunter Qualifying Proficiency Shoot Results

Year	Number Shooters	Number passing[1]	Number Failing	Score 5/5 (%)	Score 4/5 (%)	Score 3/5 (%)	Score 2/5 (%)	Score 1/5 (%)
2005	21	20	1	11 (52)	9 (43)	1 (5)	0 (0)	0 (0)
2006	22	20	2	10 (45)	10(45)	2(9)	0(0)	0(0)
2009	17	17	0	11(65)	6(35)	0(0)	0(0)	0(0)

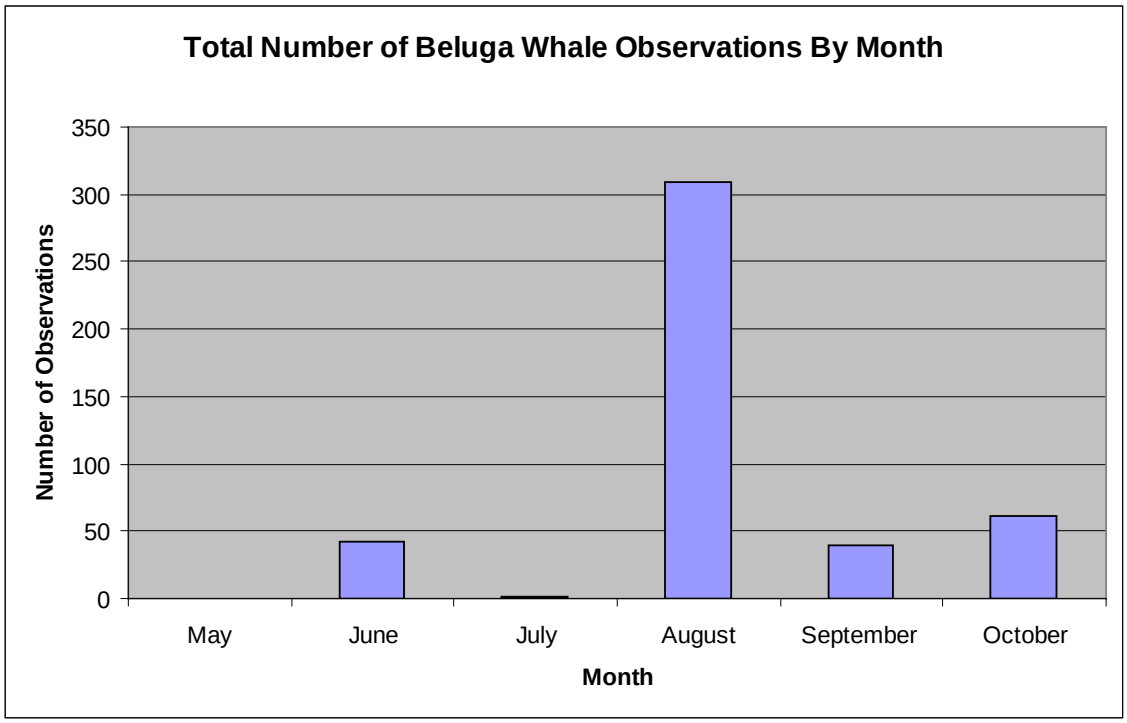
[1]Passing score is 4 or 5 shots in the heart-lung-liver kill zone with 5 shots at life size moose targets.

2. Beluga Whale

COOK INLET BELUGA WHALE OBSERVATIONAL STUDY PROTOCOL- EAGLE RIVER and EAGLE BAY

Protocol. (See Appendix H)

Results Summary. See figures below.



Monthly distribution of beluga whale sightings in Eagle Bay and Eagle River during the 2007 field season.

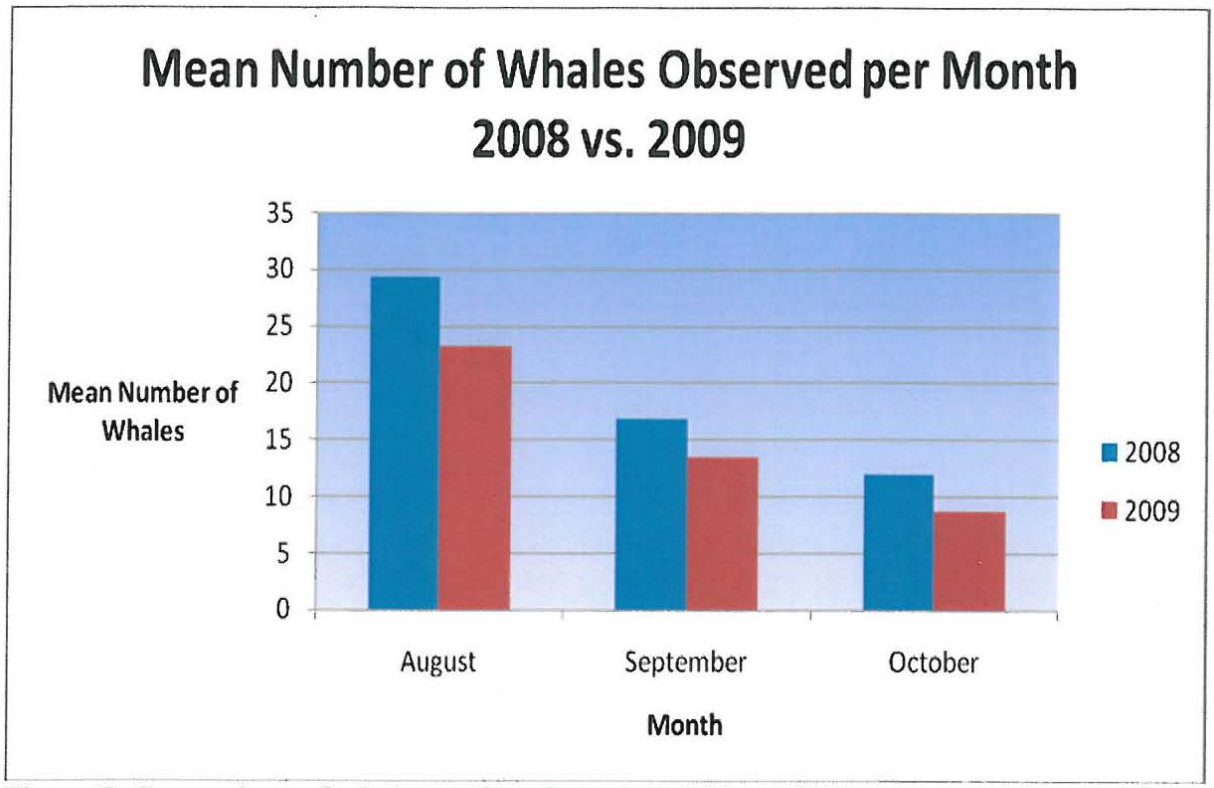


Figure 7. Comparison of whale numbers between 2008 and 2009.

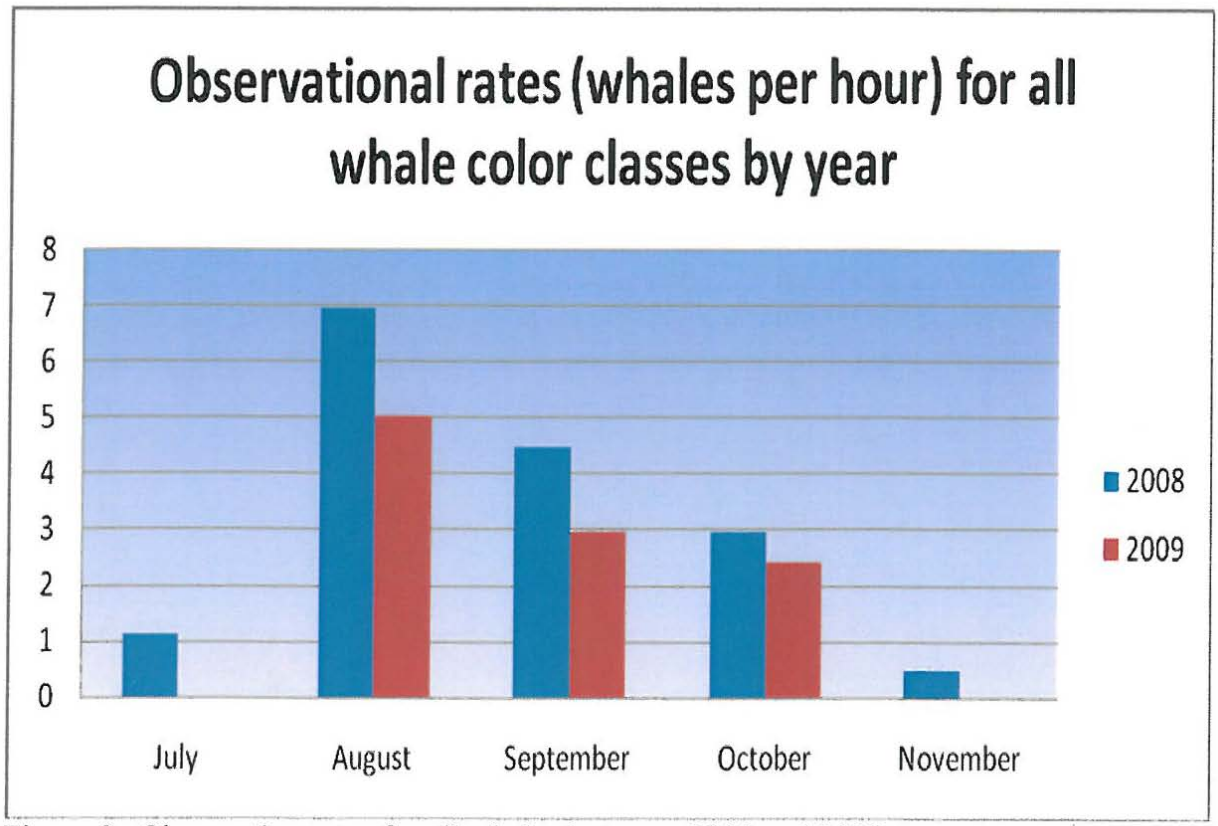


Figure 8. Observation rates for all whales between 2008 and 2009.

3. Beaver

Elmendorf Beaver Population and Harvest Monitoring

Protocol
During late September to mid October, just before local lake surfaces freeze, base water bodies are visited to search 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 (WEZ), 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 GMU 14C trapping season (1 Dec – 15 April) are recorded by size of the hide (width + length) if available. Size data is 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	0	?
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

3. Snowshoe Hare/Lynx

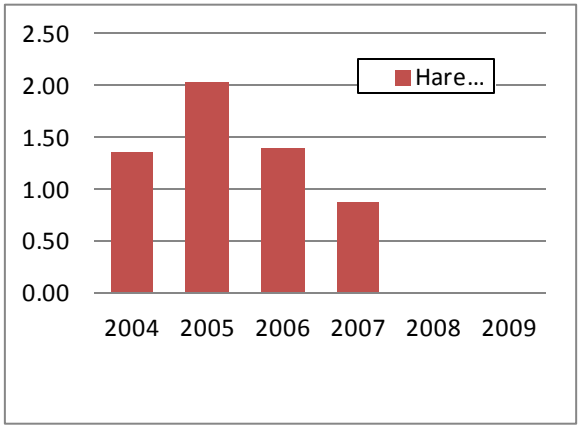
Elmendorf Wildlife Winter Track Surveys

Protocol. Observer(s) travel one of 13 set routes (Figure G-3) 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 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 are noted. Routes range from 1.0-2.0 km in length and 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 (SNHA) 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/100ft. Hare index is generated from the earliest counts in Nov-Dec.

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 G-1-2. EAFB Snowshoe Hare Track Index (tracks/night/100 ft) (No counts 2008-2009)



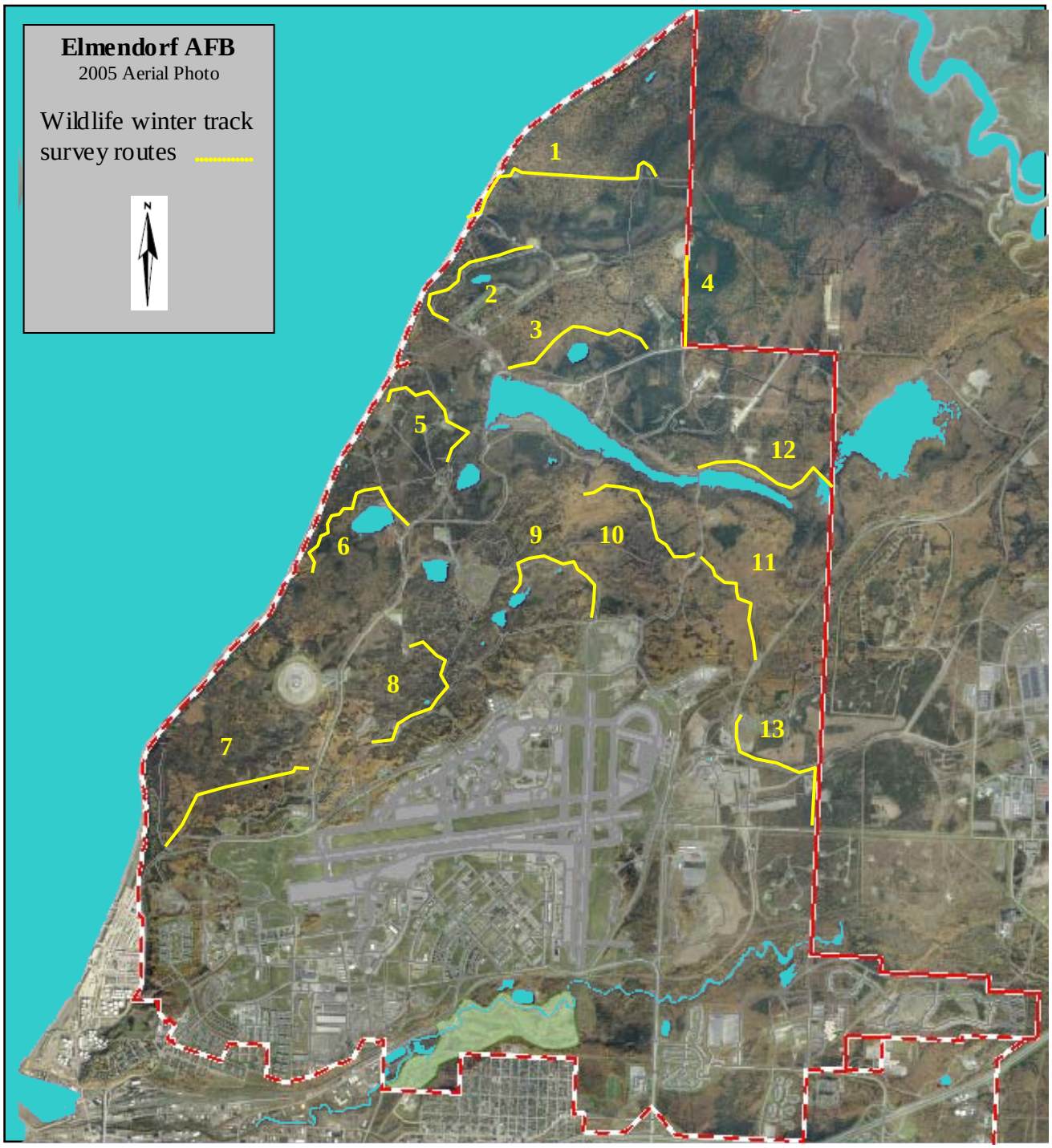


Figure G-3. Furbearer winter survey routes, Elmendorf AFB, AK, 2004-2009.

4. Loons

Elmendorf Breeding Loon Surveys

Protocol. Volunteer observer(s) visit base 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.

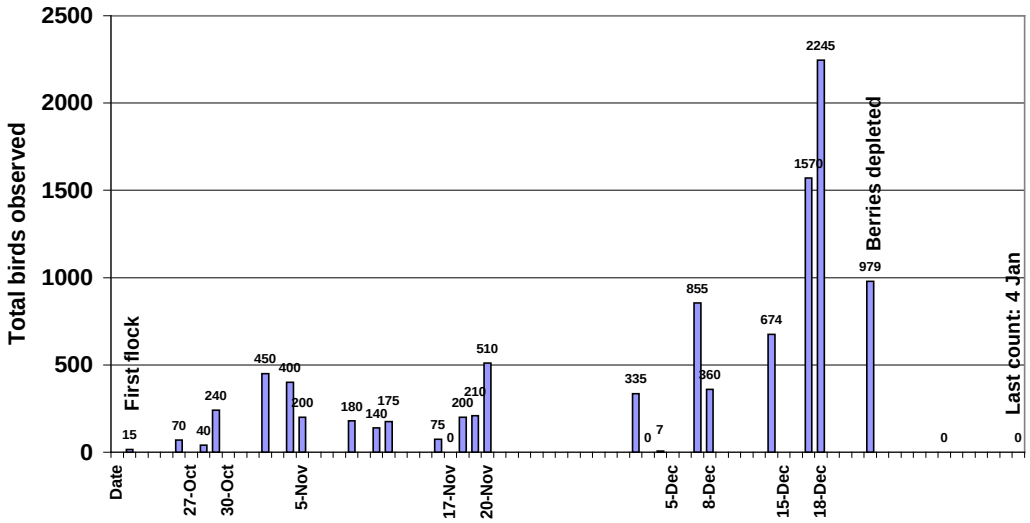
Summary of EAFB loon breeding and production as observed by USFWS Loon Watch Volunteers, 1985-2010.

	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

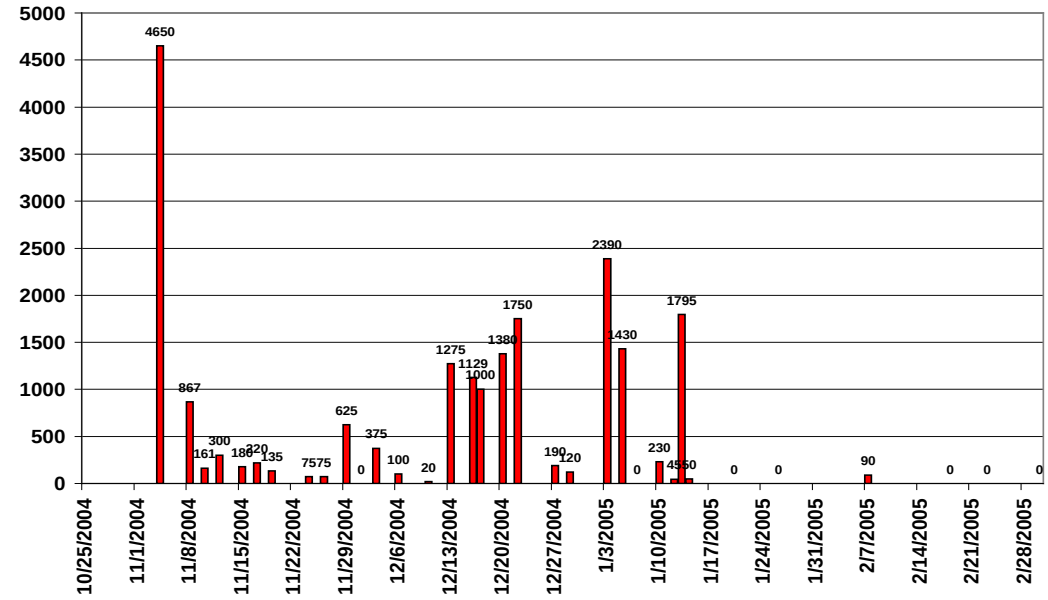
Elmendorf Bohemian Waxwing Winter Surveys

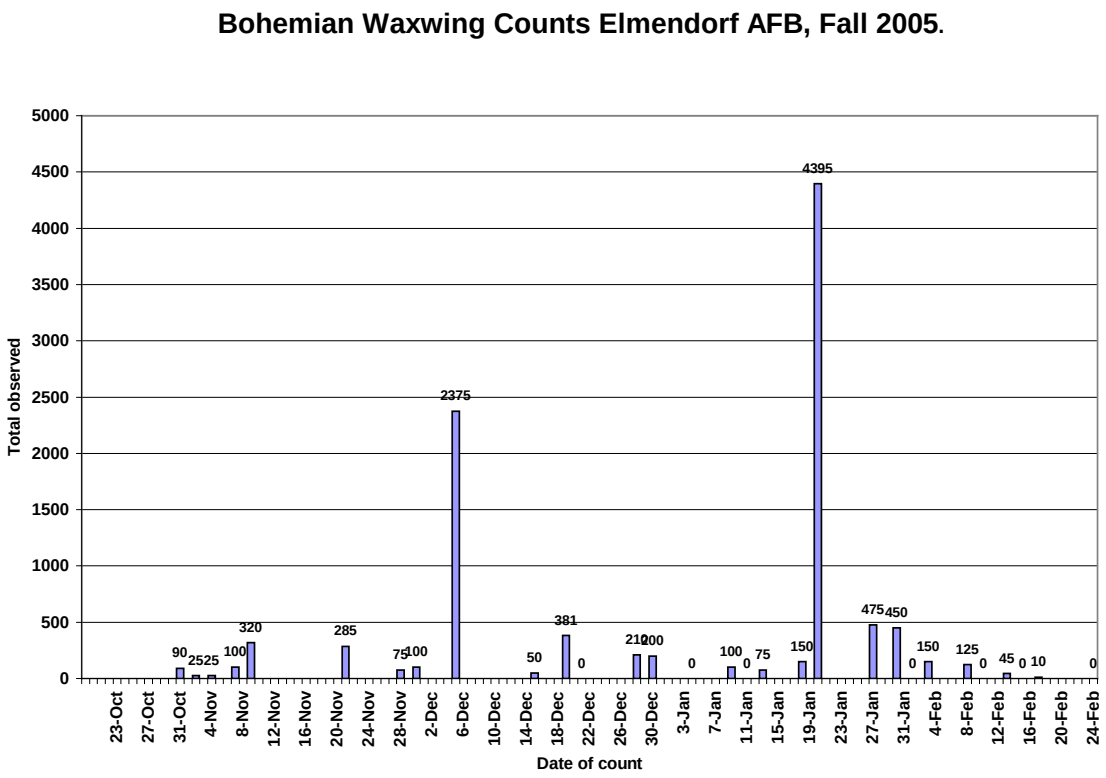
Protocol. A relatively consistent route that covers the cantonment area of the base is surveyed 2-3 times each week during late October to mid-February. The observer travels by vehicle and records location, number, behavior (feeding, resting, gritting or flying) and species of berry being eaten for each group of waxwings. (No counts during falls 2007-2009)

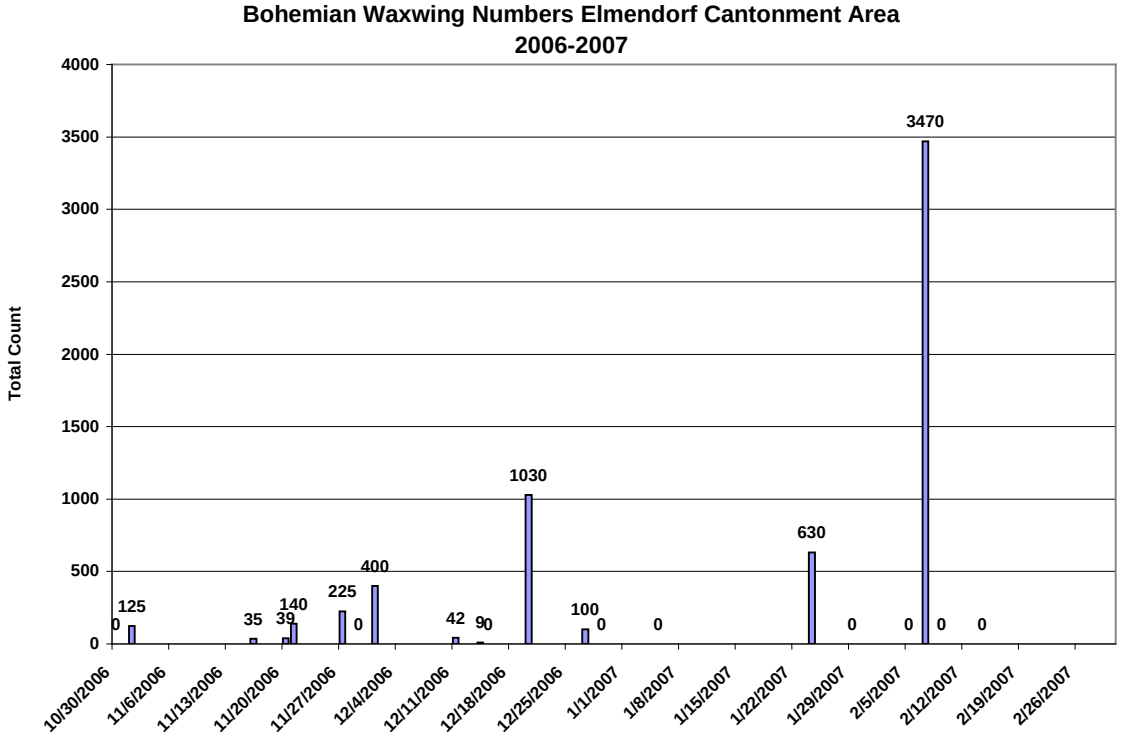
Bohemian Waxwing Counts Elmendorf AFB, Fall 2003.



Bohemian Waxwing Counts Elmendorf AFB, Fall 2004.







Figures G-4-7. Daily fall/winter counts of Bohemian waxwings on EAFB, 2003-2007.

Elmendorf Breeding Bird Surveys

Point Counts

Protocol. Observer(s) conducts point counts of every bird heard or seen using the Alaska Landbird Monitoring System (ALMS) as described by Handel (2003). Observer(s) counts at 30 points established in 2001 as Long-term Vegetation Monitoring Plots (LTVMP) (Tande et al 2001). Points represent non-developed habitats on the north end of EAFB. 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			

Roadside Surveys

Protocol. Initiated in 2006 as an alternate survey-year method, observer(s) conducts standard roadside breeding bird count at 50 points established along base roads and streets that are ½ mile distance from previous stops. Observer or assistant records every bird heard or seen during 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 base. Bird detections are mapped on ALMS 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.

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)

Fort Richardson ALMS and BBS Survey Synopsis for 2008

ALMS

ALMS grid established in Arctic Valley area of Fort Richardson. 21 out of 25 points 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.

BBS

FRA BBS 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.

Fort Richardson ALMS Survey Synopsis for 2010

The summer of 2010 was the second year in which an Alaska Landbird Monitoring Survey (ALMS) was conducted on Fort Richardson. The ALMS grid was established in the summer of 2008 and is run every two years. The results of this year's efforts are summarized in this report.

Methods

The purpose of ALMS 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 ALMS grid is determined by the type of habitat being surveyed. In closed habitats, spacing is 250m, while in open habitats, spacing is set at 500m. The ALMS grid on Fort Richardson 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). Because of this, all points on the Fort Richardson ALMS grid were spaced 500m apart.

A minimum of 15 points is needed to establish an ALMS grid. Points that are located in unsafe terrain are excluded. Detailed habitat data is collected at each point and all points are photo referenced as well. Habitat data on all points is 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 (Figure

2). 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 ALMS 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 at 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 (Figure 3). Species diversity was highest in the grass meadow type in 2008 and the dwarf shrub meadow type in 2010 (Figure 4).

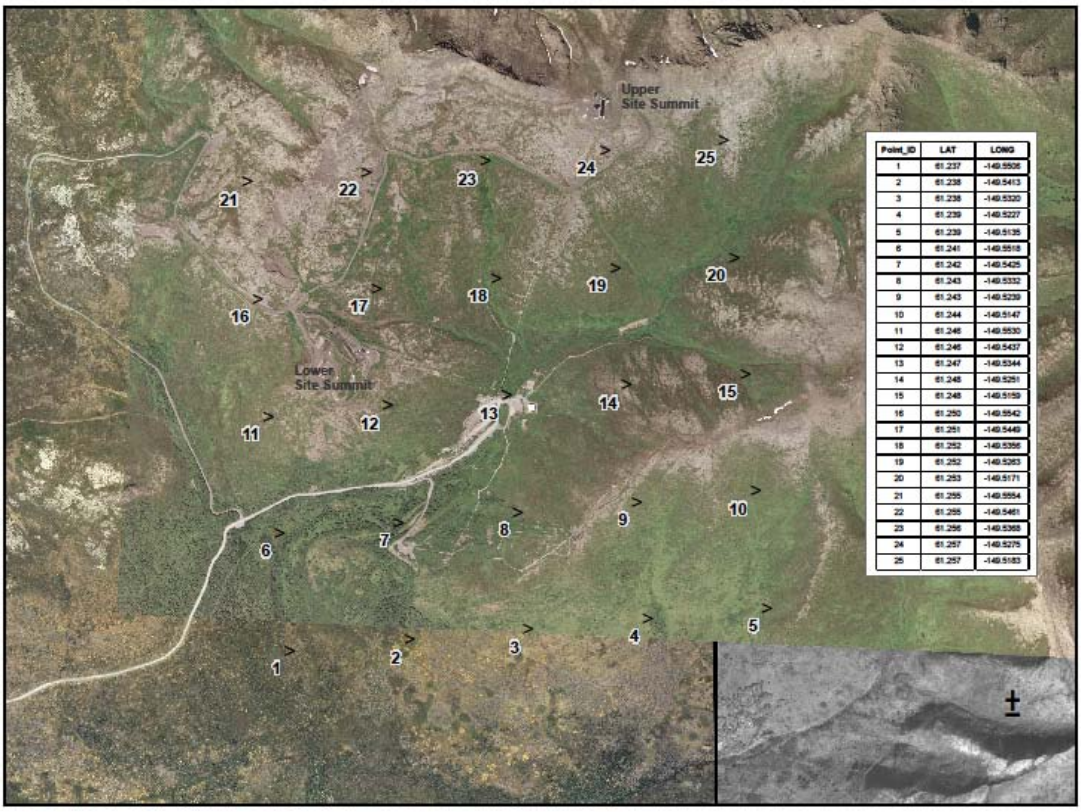


Figure 1. ALMS grid in Arctic Valley area of Fort Richardson, Alaska.

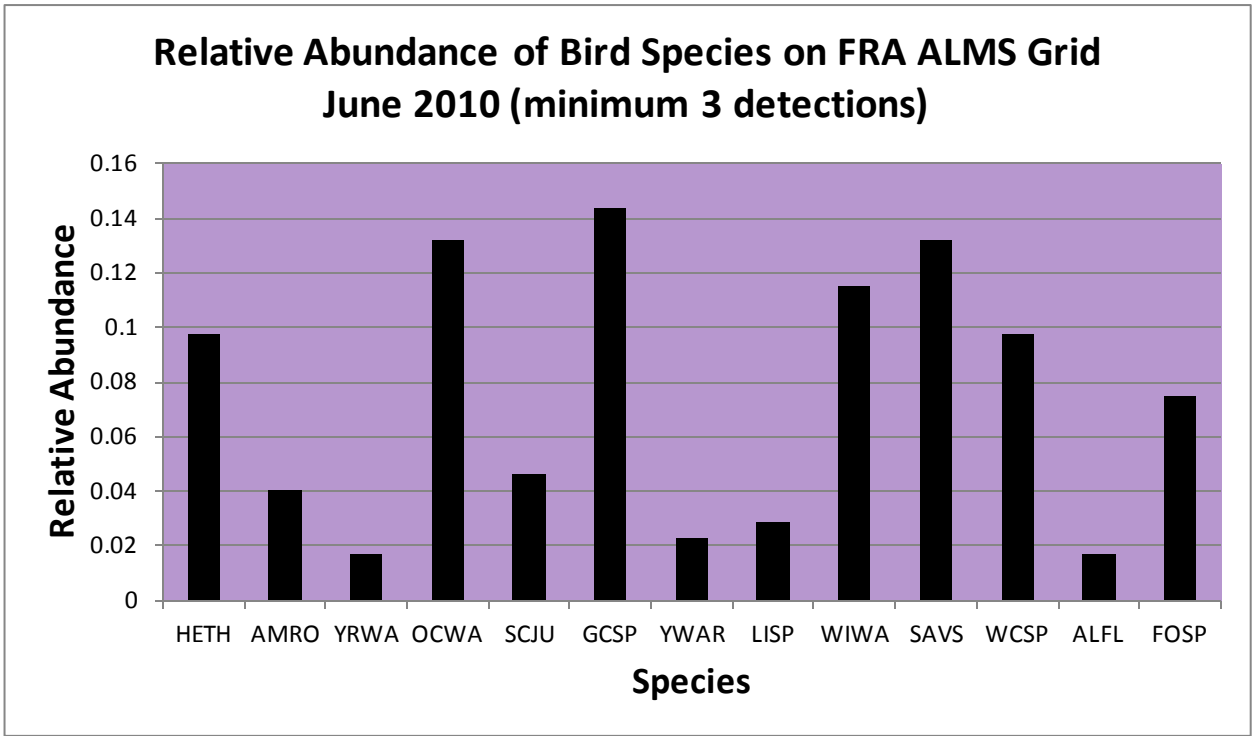


Figure 2. Bird species abundance on FRA BBS route, Summer, 2010.

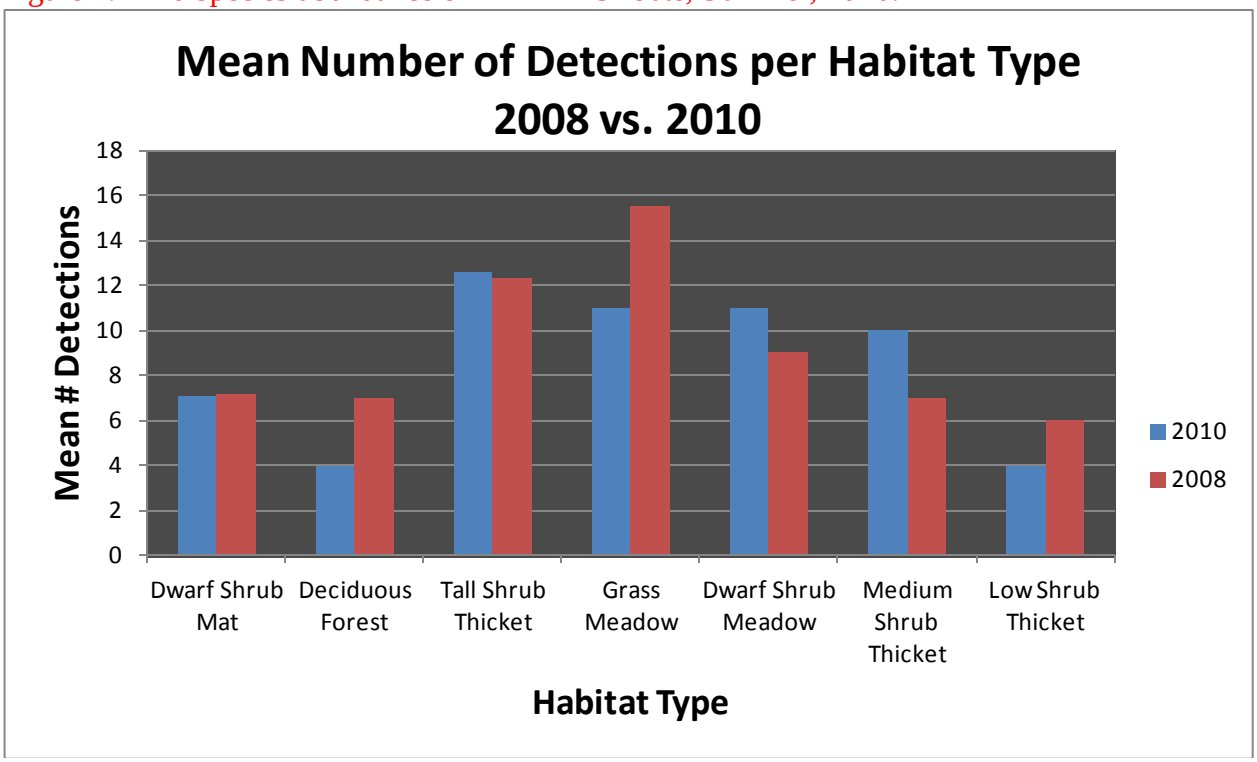


Figure 3. Mean number of bird dectections by habitat type, 2008 vs. 2010.

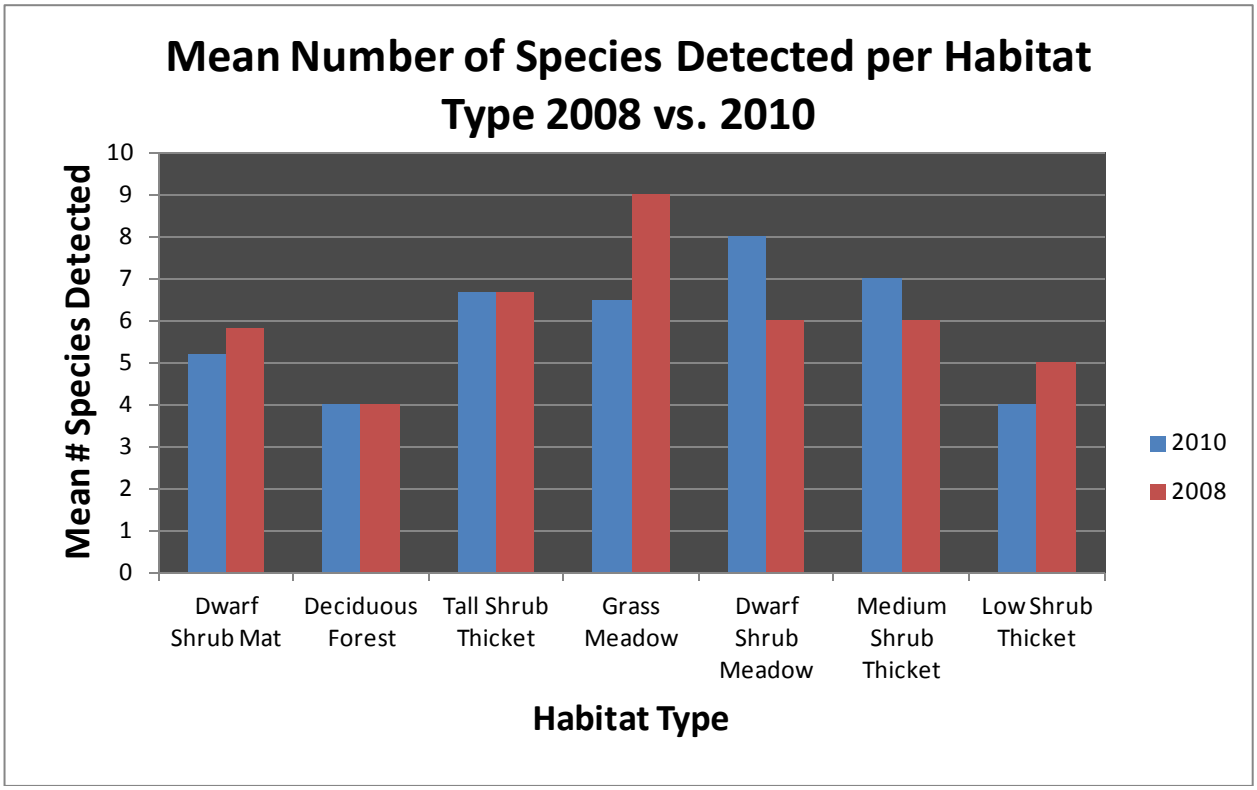


Figure 4. Mean number of bird species by habitat type, 2008 vs. 2010.

6. Raptors and owls

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 the period 15 February – 15 April. The goal was to survey each route (Figure G-6) each month. Surveys began at 2 hours after sunset until completion. All owls heard during an 8-minute listening bout at each stop were recorded; duplicate registrations from the same owl were not included into results. 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

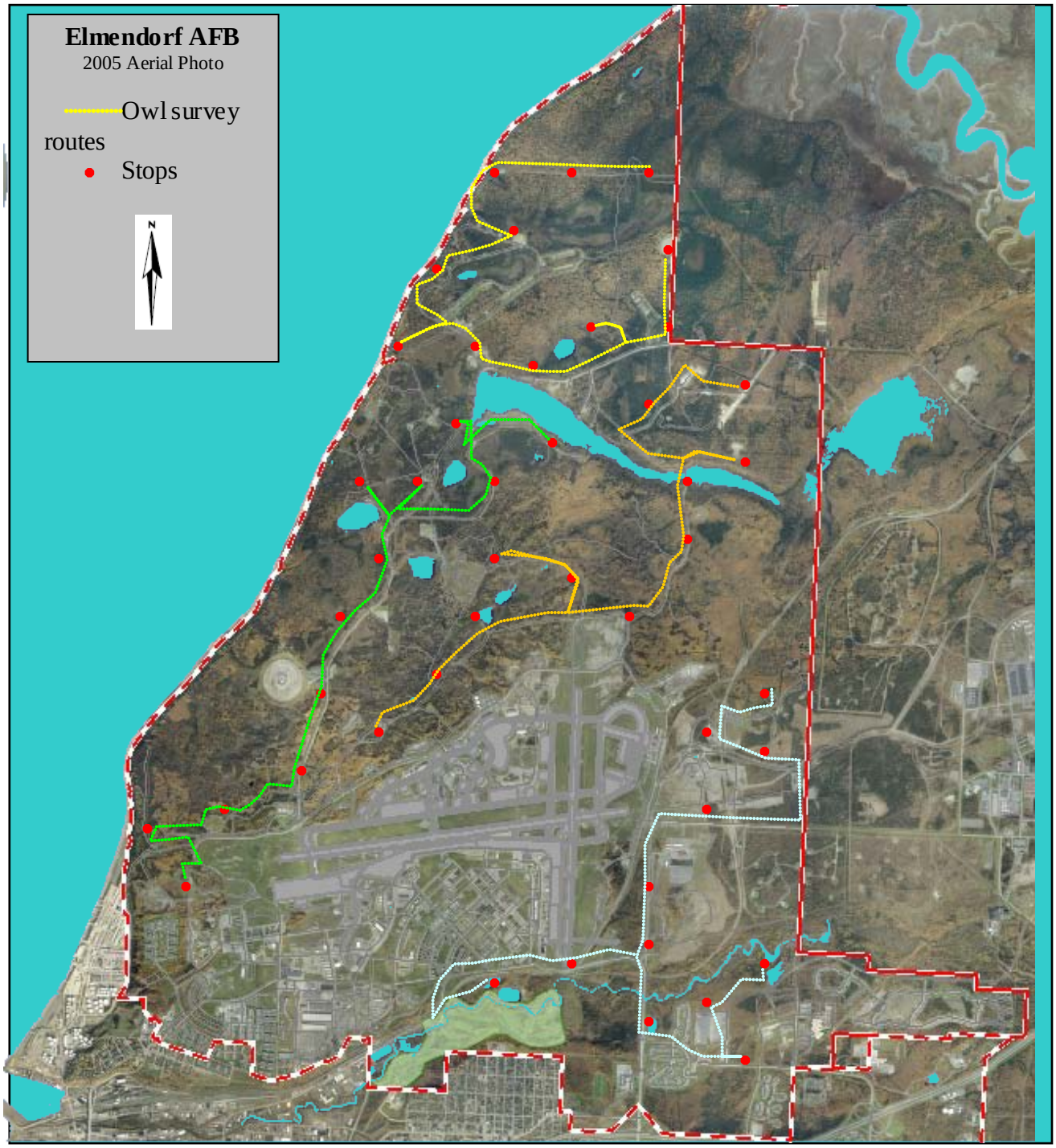


Figure G-8. Owl call survey routes, Elmendorf AFB, AK, 2003-2009.

7. Wood Frogs

Protocol. Roadside calling surveys were conducted at ten sites on EAFB using the USGS 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 is 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.

2003 - Roadside calling surveys were conducted on May 6th & 7th.

2004 - Roadside calling surveys were conducted on May 1st, 3rd, 5th, & 7th.

2005 -2009 (No counts)

2010 – See attached Report (Gravier 2010)

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 Elmendorf AFB to document the number of Wood Frogs present and their abundance. Surveys are conducted using a calling scale to estimate the number of Wood Frogs at each site. Calling scale and other required information are provided on survey forms. A copy of the form along with Site maps and Site descriptions are at the end of this document.

Methods: Between 28 Apr 2010 and 24 May 2010, I visited each of the eleven sites on fourteen different days. At each site I 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 given to me by Elmendorf AFB, Wildlife personnel.
Special Note: The best route to follow is to go to site 2 first, then 1, 3, 4, 5, 6, 7, 8, 9, 11, and 10 last.

Results: Wood Frogs were hard at all sites except site 2 - Golf Course Site. Base personnel report that this site has some contamination and this may be the reason there are not frogs present.
Sites 1 and 2 were the first sites to lose their ice cover.
Site 3 is being finned 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 headed toward the lake.
Site 11 could not be accessed during the first part of the counts due to road conditions.
Although there is not enough data to do a statistical correlation, the calling appears to be highly correlated with the air temperature (Chart 1). 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 (Chart 2).

Conclusions and Recommendations: Calls appear to be correlated with air temperature.
Recommendations:
1)Data recorders be installed in the 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 the 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.
2) Add ice cover observations to the survey worksheets to study the relation of frog calling to ice cover.
3) In the future, on multiple observations on the same day to determine the best time to hear/observe frogs.

Michael E. Gravier
Citizen Scientist Program Volunteer.
Completed 18 June 2010

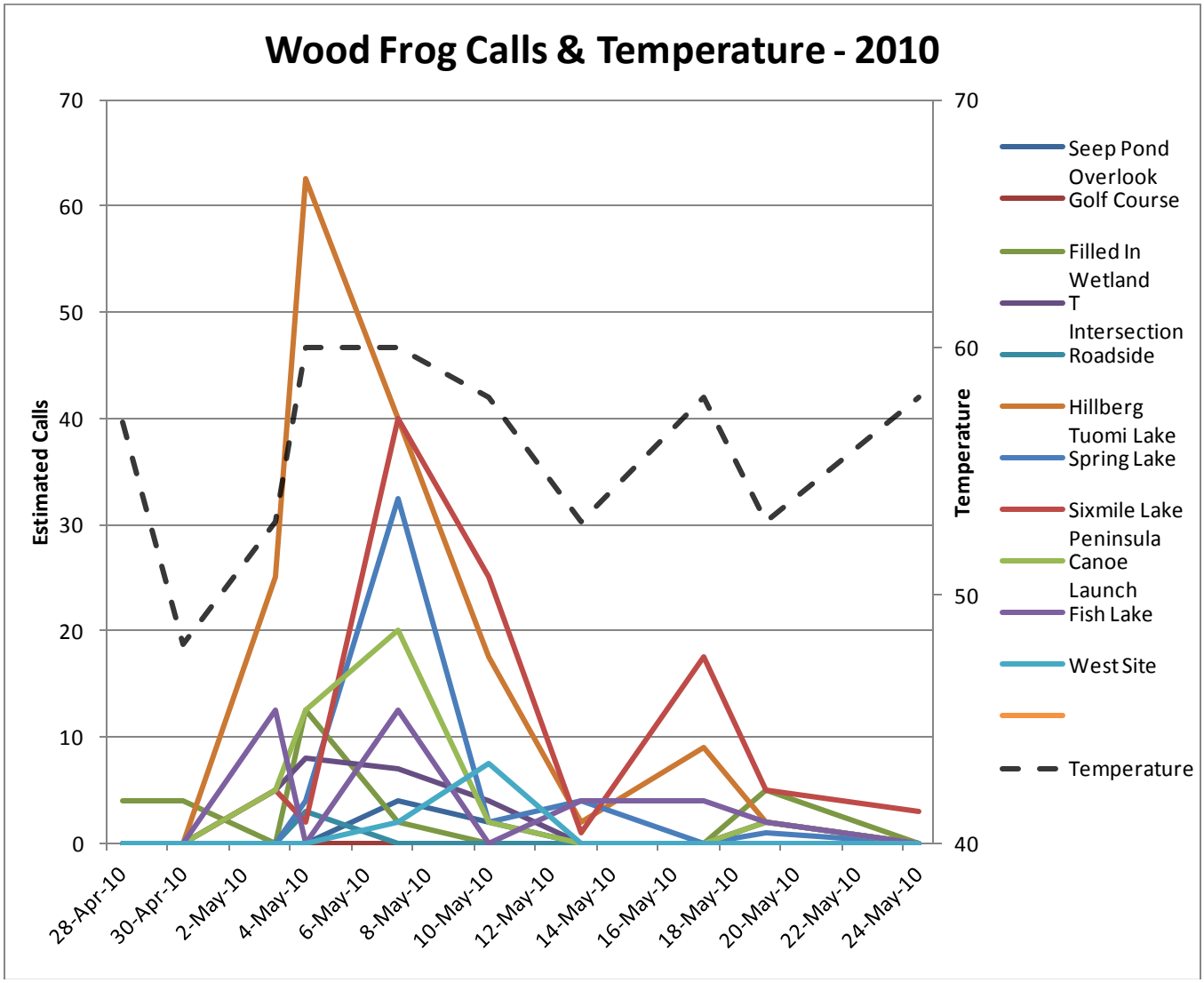
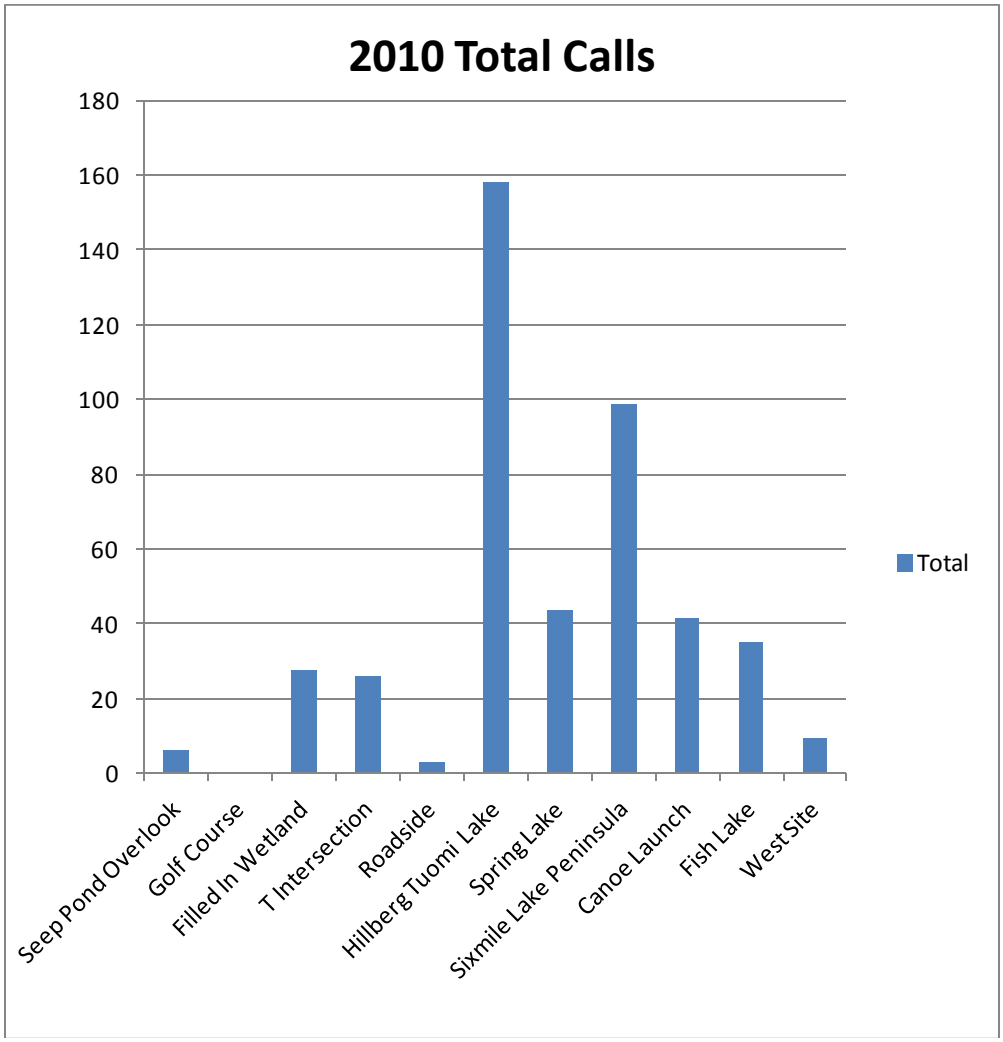

Wood Frog Calls & Temperature - 2010
Estimated Calls
Temperature
70
60
50
40
30
20
10
0
70
60
50
40
28-Apr-10
30-Apr-10
2-May-10
4-May-10
6-May-10
8-May-10
10-May-10
12-May-10
14-May-10
16-May-10
18-May-10
20-May-10
22-May-10
24-May-10
Seep Pond
Overlook Golf Course
Filled In Wetland T
Intersection Roadside
Hillberg
Tuomi Lake Spring Lake
Sixmile Lake
Peninsula Canoe Launch Fish Lake
West Site
Temperature

Chart 1


2010 Total Calls
180
160
140
120
100
80
60
40
20
0
Seep Pond Overlook
Golf Course
Filled In Wetland
T Intersection
Roadside
Hillberg Tuomi Lake
Spring Lake
Sixmile Lake Peninsula
Canoe Launch
Fish Lake
West Site
Total

Summary of Fisheries Monitoring Efforts on EAFB

SALMON SMOLT MONITORING METHODS

A weir is installed under the Sixmile Creek/Fairchild Avenue Bridge in early May, and consists of rigid aluminum net panels placed in a V-shape to funnel smolt into a collection box.

Smolts are scooped out of the box with a hand net, identified, counted, and released into the creek 2-4 times per day, depending on volume.

A log is annotated with the date, time, name of counter, water temperature, daily count of smolt species, and cumulative count of smolt species.

The weir is closed and removed at the end of June.

Summary of Sockeye and Coho smolt out-migration counts at Sixmile Creek weir, Elmendorf AFB

Year	Sockeye	Coho
2003	20,113	49
2004	6,004	23
2005	9,575	393
2006	17,221	204
2009	8,614	52
2010	4,037	42

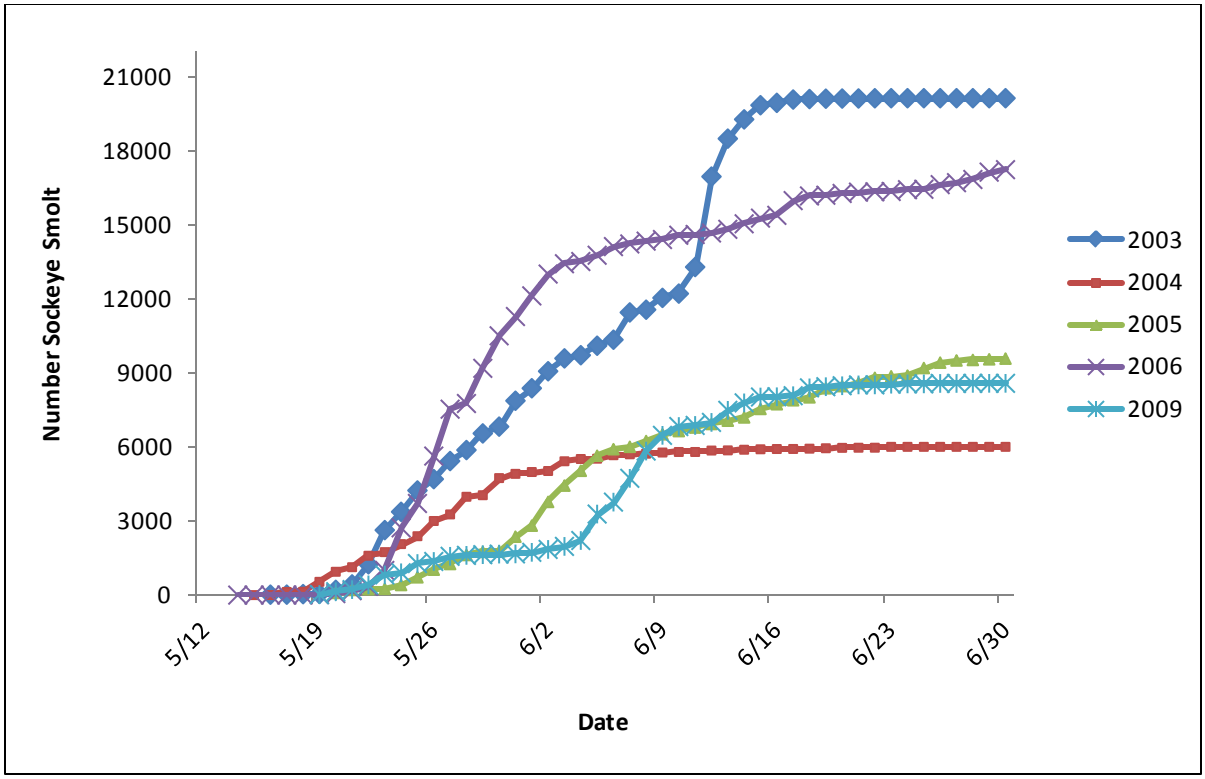


Figure G-9. 2003-2009 comparison of Sockeye smolt out-migration at Sixmile Creek

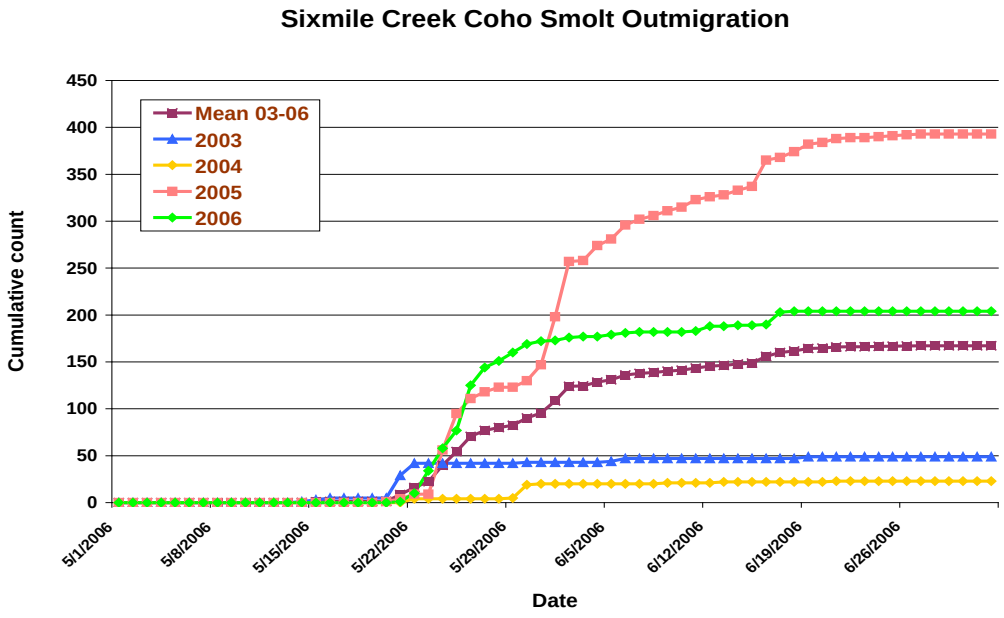


Figure G-10. 2003-2006 comparison of Coho smolt out-migration at Sixmile Creek

ADULT SALMON MONITORING PROCEDURES

The fence gates of the weir under the Sixmile Creek road bridge are closed to prevent adult salmon from getting into Lower Sixmile Lake in early-mid July when salmon are first observed at the mouth of Sixmile Creek.

With the weir gates closed, the salmon are held under the bridge where they are identified by species.

Salmon are counted by slowly releasing them into Lower Sixmile Lake by slightly opening the upstream weir gate, and herding the fish with a seine net toward the lake. As the fish pass through the upstream gate, they are counted.

A log is annotated with the date, time, names of counters, water temperature, daily count of adult salmon species, and cumulative count of adult salmon species.

One or two stream walks are conducted in August to annotate the number of pink salmon that spawn in Sixmile Creek, and don't pass through the weir into Lower Sixmile Lake.
The weir is opened at the conclusion of the last stream walk at the end of the run, usually occurring by the first week in September.

Summary of adult Sockeye escapement counts at Sixmile Creek weir, EAFB, 1988-2010

Year	Total Count	Year	Total Count
1988	2107	2000	1571
1989	1115	2001	4034
1990	1450	2002	2580
1991	1974	2003	2778
1992	768	2004	1611
1993	3442	2005	1341
1995	4282	2006	1192
1996	1593	2007	903
1997	2240	2008	1463
1998	1662	2009	3342
1999	663	2010	2533

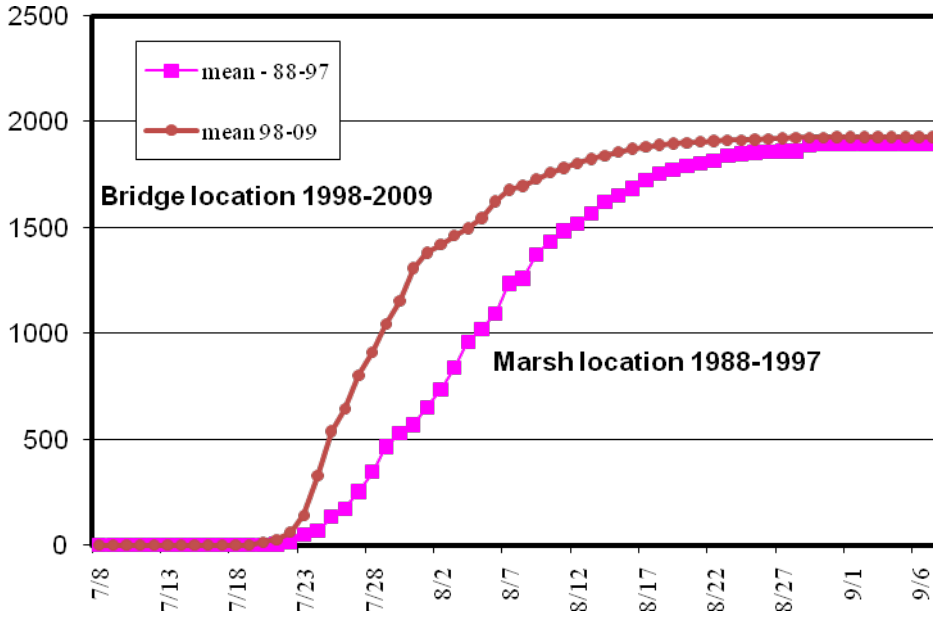


Figure G-11. Comparisons of adult sockeye salmon run timing at two weir site locations on Sixmile Creek, 1988-2009.

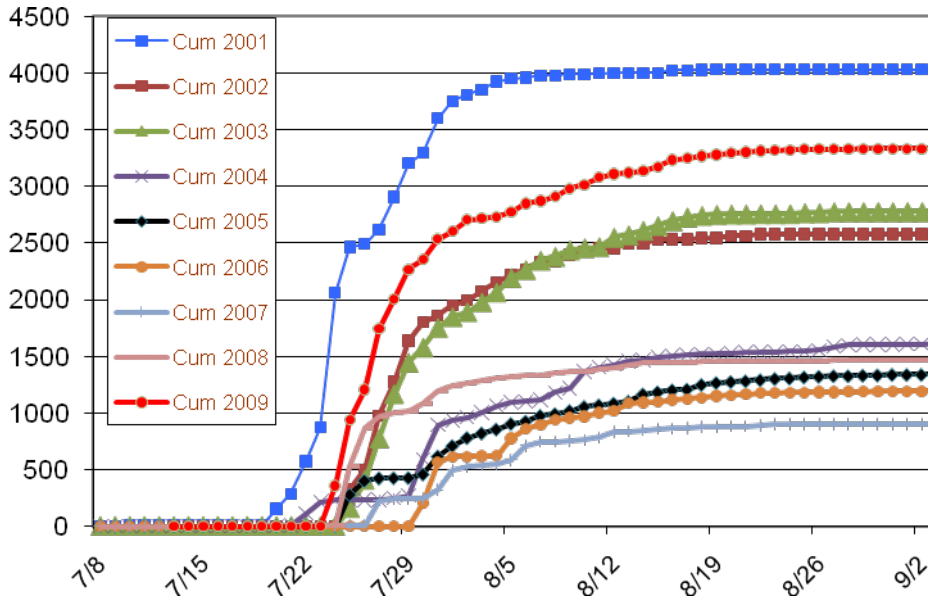


Figure G-12. Comparison of 2001-2009 sockeye salmon daily cumulative escapement at Sixmile Creek, EAFB.

2001-2010 Sixmile Creek Stream Walk Results

DATE	PINKS	REDS	SILVERS	CHUMS	MORTS
6 Sept 01 *	951	18	23	0	Included in counts
26 Aug 02	1729	131	102	0	Included in counts
26 Aug 03	1340	186	26	3	100
8 Sept 04 *	290	30	86	3	28
18 & 31 Aug 05	818	12	15	3	27
17 Aug & 8 Sept 06	1654	2	26	1	425
24 Aug 07	1595	12	8	1	180
18 Aug & 6 Sep 2008	2811	1	4	0	59 counted 18 Aug
21 Aug & 1 Sept 2009	3075	8	19	0	402
16 Aug & 15 Sept 2010	477	7	4	5	Not counted

- Note: 2001and 2004 stream walks were conducted later than other years, and the pink salmon runs were likely substantially underrepresented.

SUMMARY OF PIKE REPORTS

This summary of pike reports/observations represents water bodies other than Otter Lake and its tributaries. The Otter Lake system is currently infested with pike, and is under pike population reduction management by FRA DPW staff.

2002 - Report of Pike caught at Green Lake, and apparently placed on a picnic table on shore; when investigated for confirmation, no pike was found. REPORT UNCONFIRMED Green Lake was beach seined and test netted during following spring.

2005 - Report of Pike caught at Fish Lake, and apparently placed on shore; when investigated for confirmation, no pike found. REPORT UNCONFIRMED

2005 - Reported observation of a Pike feeding in Ship Creek below dam (off EAFB) by conservation agent. REPORT CONFIRMED

2006-2010– No Reports on Elmendorf

APPENDIX H. COOK INLET BELUGA WHALE OBSERVATIONAL STUDY PROTOCOL

EAGLE RIVER and EAGLE BAY (minus Figures 6-22)

Introduction

Pursuant to the Eagle River Flats Settlement Agreement, the U.S. Army Alaska (USARAK) agreed to conduct field monitoring to observe the apparent health, behavior and movements of belugas in and around Eagle River Flats (ERF) during periods of frequent whale use.

During the months of July – October, USARAK also agreed to monitor for beluga presence before, during and after firing events (artillery) in ERF. The intention of this surveillance is to ensure that beluga whales are not harmed during such a firing event. Currently, USARAK does not fire artillery into the ERF during the ice-free months, but if such firing occurs in the future, this requirement will be fulfilled.

Objectives

In order to best fulfill the terms of the Eagle River Flats Settlement Agreement, the following objectives were developed:

Objective 1: *Determine temporal and seasonal*[1] *usage of Eagle River and Bay (henceforth called "the area") by belugas.*

Objective 2: *Estimate the number of belugas using the area.*

Objective 3: *Determine relative age class of belugas using the area.*

Objective 4: *Determine spatial distribution of belugas using the area.*

Objective 5: *Determine beluga activities while in the area.*

Objective 6: *Determine the effect of firing activities occurring in ERF on belugas. Note that this objective is not addressed in this protocol except to acknowledge that should artillery firing into ERF occur during the ice-free months (currently not allowed), that USARAK will indeed proceed with the required monitoring.*

Methods

Study Area and Observation Points:

[1] Note that the field portion of this protocol starts in April or May and runs through November, so this is not a true look at seasonal usage throughout the year but rather a look at usage in the spring, summer and fall months.

ERF is a 2,140 acre estuarine salt marsh located at the mouth of Eagle River on Fort Richardson Army Post (see figures 1 and 2). Glacially fed Eagle River flows through the flats before discharging into Eagle Bay of Knik Arm in Upper Cook Inlet, southcentral Alaska.

ERF has been characterized into seven major physiographic zones and 15 vegetation classes based on physiography and vegetation (representing 67 species of vascular plants). The 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 embankment 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 the flats 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 the flats including those exerted by a high tidal range, glaciofluvial influences from Eagle River, sedimentation from the turbid waters of Knik Arm and Eagle River and the subarctic coastal climate of southcentral Alaska (Lawson et al.1996). Anthropogenic influences on the flats include military training, both historic (Army artillery impact area since 1949) and current (winter firing of artillery into flats), activities associated with the remediation of white phosphorus residues and activities involved with study of Cook Inlet beluga whales in and around ERF. The combination of these forces 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 macroinvertebrates (approximately 30 species of benthic macroinvertebrates) (Racine et al. in press) and is an important staging area for spring and fall waterfowl migrations.

Beluga whales gather in Eagle Bay between the months of May and November (Hobbs *et al*, 2005) and have been observed in Eagle River from June to October as far inland as 1.25 miles upstream of Eagle Bay (CH2M Hill 1997). The whales have been observed chasing fish (thought to be salmon) onto the river bank in Eagle River.

The best area for observations of belugas entering Eagle River and moving in Eagle Bay is from the mouth of Eagle River. A less desirable observation point for belugas entering the river, but a great place for observations of belugas entering Eagle Bay from the West, is Observation Post (OP) Vital. Most observations will be from the mouth unless observers are precluded from entering the flats, at which time they will observe from OP Vital, if possible (see figure 2).

Schedule for Observations:

Observations will be conducted on as many days as possible during the months of May-November. Technicians assigned to the beluga project will be prepared to conduct observations every work day and some weekends. Before the observation season at the mouth of Eagle River can begin, a trail must be cleared by Explosives Ordnance Demolition (EOD) personnel. Alternate trails will also be established leading from the main trail around the ends of tidal channels, to allow for egress during average high tide events (28-30 feet). Anyone accessing the mouth across the flats must have the appropriate training (see below), coordinate with Range Control, retain positive radio communication with Range throughout the entirety of the stay on the ERF and must walk only on the trail cleared and marked by EOD.

Observation start times will be as close to 0800 as possible with end times around 1600. These are loose guidelines however, as ambient light (especially in the fall) and tidal state conditions (high tides often cover the routes cleared by EOD and thus preclude entrance into the impact area) will often dictate the true start time. Also, there may be times when tidal conditions will preclude leaving the flats until well after 1600.

Observations will be coordinated as far in advance as possible with Range Control, noting, however, that the Range schedule usually does not extend beyond a couple of days to a week at the maximum. The number of days in which sampling can occur in ERF is directly related to military training activities. Any military training involving "live fire" exercises may block use of access roads used to enter ERF if they are within the firing fan of the training at hand. The firing fan is that area in which there is a one in a million chance of a live round of ammunition landing outside of the surface danger zone. The amount of data that can be collected over the course of the field season is therefore directly related to these activities. Currently, no firing is taking place during the field season.

Viewshed Analysis:

A viewshed analysis has been conducted for this project. This analysis determined which areas of ERF will be visible from a variety of observation points. The analysis used high resolution elevation data derived from LIDAR (Light Detection and Ranging) to calculate line-of-sight visibility from a given location. Running this analysis for multiple observation points allows us to determine a combination of points that provides the maximum visibility of targets during live fire exercises to aid us in determining whether or not belugas are present in the area.

Training:

All field observers will attend the following safety courses: First aid/CPR (unless possessing current certification), Unexploded Ordnance training, Eagle River Flats safety briefing and bear safety. All field observers will read, at a minimum, section I of the National Marine Fisheries Service document, "Conservation Plan for the Cook Inlet Beluga Whale *(Delphinapterus leucas*), 2008" http://www.fakr.noaa.gov/protectedresources/whales/beluga/mmpa/final/cp2008.pdf .

Field observers will also undergo supervised training by experienced (minimum of two years of directed beluga observations) permanent staff regarding data collection procedures and identifying defined whale behaviors. Observers will be exposed to the full variety of typical behaviors exhibited by beluga whales in Eagle River and Eagle Bay. A minimum of 40 hours of supervised training will take place before observers will be allowed to collect data on their own. Most of the time, at least one experienced member of the permanent staff will be present throughout the field season. A minimum of two observers will always be present during whale observations.

Observations and Data Collection:

Follow protocol: Group follow
Sampling Method: Focal group sampling.
Length of Sampling Round: 20 minutes
Parameter of Interest: Beluga abundance (# of individuals or # of whale groups).
Estimator: mean number of belugas, mean number of whale groups

Once at the observation point, one observer will scan for belugas in Eagle Bay using high quality binoculars (Zeiss and Swarovski 12x45) and spotting scope (Swarovski 20-60X)[2] while the other observer scans the river using the naked eye. Scans will be broken down into 20 minute sampling rounds. Once whales are spotted, observers will follow a single group of whales for 20 minutes or until the group can no longer be seen due to distance or environmental conditions.

All observations will be noted on a standardized data sheet (figures 3 and 4). The observer will define group activity based on their assessment of what most (>50%) of the whale group is engaged in during the course of the sampling round. Up to two behaviors can be recorded during the sampling round, with one being designated as the primary (1^o) activity and the other designated as the secondary (2^o) activity. Any unusual behaviors during sampling rounds will be noted in the comments section on the back of the datasheet (see figure 4).

Behavioral budgets of belugas (a proportion, calculated as time spent in a behavioral state/total time focal group follow) will be calculated. Budgets can also be determined on a daily scale, at 1-hour intervals over the course of the day (average proportion of time spent per behavioral state per 1-hour interval). Beluga behavioral budgets will allow us to examine the range of activities whales engage in over the course of the day in a systematic fashion and whether or not these behaviors change over the course of the field season (Objective 5). Focal group sampling is subject to several biases such as attention being drawn to more obvious behaviors and differential visibility of group members due to their activity (Mann 2000), but there are a few reasons why this sampling methodology is being used in ERF. First, focal animal sampling for belugas is not possible as individuals are very hard to identify and following them at any distance in the turbid conditions of Eagle Bay and Eagle River is not practical. Second, two years of whale observation from ERF has shown that belugas tend to move as one cohesive group into and out of the observation area over the course of the day, with relatively small inter-individual distances, which lends itself very well to group sampling. In addition, because of this cohesive behavior, rare behavioral events can be recorded without losing track of the primary behavior of the group itself.

Over the course of each sampling round, instantaneous counts of whales will be made, distinguishing between white, gray, and calves. *Only whales actually seen will be counted. There will be no attempt to account for whales that might be under water***.** These estimates will be averaged to come up with an estimate of the total number of whales observed over the course of the day. Since most observations over the course of a day are of the same group of whales, the number of animals observed will usually increase as the whales move closer to the observation point, allowing for more accurate counts.

Summary statistics will be calculated for the mean number of whales observed for each day, week and month (Objective 2). Single factor analysis of variance will be used to determine if there are significant differences in the mean number of belugas observed in and around ERF from month to month (May-October) and over the course of the day (Objective 1). Sample size requirements needed to obtain a 95% confidence interval for multisample means analysis will follow Zar (1984). In addition, t-tests will be run to compare abundance estimates between

[2] Inclusion of specific company names or products in this document does not indicate endorsement by the U.S. Army or any other entity named herein.

years and to compare whale color class composition percentages between years as well as abundance estimates for color classes between years.

Environmental conditions can mask the true color of an individual. Under some lighting conditions for instance, some gray animals appear much lighter than they actually are. For this reason, observers should, to the greatest extent possible, compare the size of gray animals to that of associated white animals. Additionally, while beluga calves are primarily dark in color, calves ranging from pinkish-brown to almost pure white have been observed in Knik Arm. Since observed whale groups tend to move closer to the observation point throughout the day as they move up Eagle Bay, more accurate enumeration of age class composition will be possible (Objective 3), helping to minimize observation biases associated with distance. Furthermore, based on past observations, the ability to count and classify whales decreases dramatically on the west (far) side of Eagle Bay sandbar. Because of this, enumeration and classification of whales will only be recorded for animals sighted on the east (near) side of the sand bar, which should further help to minimize distance bias. Environmental conditions will be recorded at the start of every sampling round. Any sampling round in which conditions are rated as poor will be truncated from the data set and excluded from analysis.

An alpha-numeric grid superimposed over a map of the area (figures 5) will be used to record the location of a whale group at the start and end of the sampling round. A compass bearing to the whale(s) position relative to the observation site should also be noted to help refine the location (Objective 4). Depending upon funding, a theodolite may be purchased in order to more accurately denote whale locations.

The time covered by each sampling round will be noted (in 24 hr. mode). This will allow for further analysis of whale numbers over the course of the day. Unusual behaviors or other species of wildlife observed will be recorded in the notes section. Any signs of a beluga in distress (signs of entanglement, strandings, etc) will be reported immediately to the NMFS [(907)360-3481)]. Any harassment of belugas by boats must be reported to NMFS enforcement division [(907) 250-5188]. Pictures (especially video) of such incidents and recording of boat numbers and detailed descriptions will be taken to aid in carcass recovery, rescue, or law enforcement efforts. Responses (if any) of belugas to boats or aircraft flying over the study area should also be noted. The presence of other marine mammals (such as harbor seals) should always be recorded in the notes section as well.

Observers will only follow one group at a time per sampling round. If a group can no longer be observed, then it is permissible for the observer to move on to another group, making sure to note the sampling round and whale count in the next row on the data sheet. Each whale group will be given its own unique sampling round number to distinguish between separate samples. Separate data sheets will be used for each distinct whale group. If more than one group is present at the same time, more than one observer will be needed. If groups converge, they will be treated as one group for the duration of the sampling round. Observers should make a note of converging groups in the comments section on the back of the datasheets. If a target whale group goes out of sight during any point of a sampling round and whales are seen again before the end of the same round, then this observed group will be considered the same group if seen in same general grid area of the previous sighting. If a whale group goes out of sight and stays out of sight for more than 20 minutes, it will be treated as a separate sample group if spotted after that time period and given its own unique sampling round number.

Statistical Note: In this study, the sample is each distinct group of belugas. If one group of whales is followed for one or several sampling rounds, then our sample size is still only N = 1. This is an important distinction for purposes of analysis and to avoid pseudoreplicaton.

Remote Camera Operation:

In addition to direct observations of whales, remote color motion-sensitive cameras with infrared illumination at low light (Reconyx PC 85)[3] are used to collect presence/absence data on belugas during times when observers cannot be present. A minimum of two cameras will be deployed on the north bank of Eagle River- one at the mouth facing SSW (perpendicular to water flow) and one approximately 200 M upstream from the mouth facing W). Cameras will be set on time-lapse mode with a one minute time increment between shots and with the motion-detection feature enabled. Camera times will be synched with each other and all other devices used to record time during the observational period (watches, video cameras, etc). Each camera will be serviced (change card and batteries) every two weeks and checked for obvious external problems (alignment change, lens fouling, etc) every day when feasible.

Camera cards will be stored in a waterproof container while in the field. The data from cards will be downloaded onto an external hard drive dedicated solely to this project and backed up on a redundant drive. Analysis of the images from each card will be completed as soon as possible after removal from the field with a general time limit of two weeks from removal to analysis. Data will be entered into a Microsoft Access database.

Analysis will be performed by one experienced team member (having analyzed at least one full seasons worth of camera data (or at least 30,000 images) or two team members that have analyzed less than 30,000 images each. Analysis of the images will include searching photos[4] for presence of beluga whales and harbor seals in the river. Analysts will indicate camera number, folder name,[5] 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. When an entry is made about the presence of a beluga, the analyst must note the following information: date, time, image number, number of whales, color of whales, and tidal state[6].

At the end of the folder, the analyst will then subtract the number of unusable images (night images, images taken while servicing camera, etc) from the gross number of images and record the resulting figure as the total number of usable images. The analyst will also note if observers

[3] Inclusion of specific company names or products in this document does not indicate endorsement by the U.S. Army or any other entity named herein.

[4] Images are named using an alpha-numeric scheme, are numbered sequentially, and ordered sequentially in the folder created by the camera. Images taken under the motion-detection mode are named with a number proceeded by an "M" (e.g. M000101.jpg). These images are placed at the beginning of the sequence of images in a particular folder, even if they were the last images taken. Images taken under the time-lapse mode are named with a number proceeded by a "T" (e.g. T000101.jpg) and are placed after the images taken by the motion-detection images.

[5] Folders will be named using the following convention: ERFCamera#_start date-end date. Thus a group of images taken with Camera number 3 during from 1 July to 1 August, 2009 would be archived in a folder called "ERFCam3_1July-1Aug09"

[6] i.e. low tide, ¼ flood/ebb, ½ flood/ebb, ¾ flood/ebb, full tide—these are based on comparison to a series of photos indicating physical landmarks associated with each tidal stage.

were present on the flats during the dates covered in a folder and if so during which times. The presence/absence data from both the camera and the observational studies will then be compared. This comparison will allow a measure of how effective the cameras are at recording the actual presence/absence of whales.

Definitions

Diving: surfacing whale bends its dorsal surface at an acute downward angle, slipping beneath the surface of the water with the tail flukes usually emerging completely out of the water and being the last part of the whale to be seen prior to complete submergence. This action can be slow, almost casual, or it can be rapid and accompanied by significant surface disturbance from the beating tail flukes.

Feeding: whale usually observed engaging in "prey pursuit" just prior to feeding. The distinction between the two is that in a pursuit situation, the prey is not observed, while during a feeding event the whale is observed with the prey item in its mouth. *The turbid waters of Knik Arm coupled with the tendency for belugas to ingest whole prey makes such direct visual observation of prey in a whale's mouth extremely rare. In an effort to capture events where there is deemed to be a greater than average chance that feeding is occurring we have also added the following language to define a feeding event:* whale prey-pursuit that drives a prey item onto land AND a whale or pursuit wake is observed at the point of prey re-entry into the water AND the observer has more than 50% confidence that the prey item was captured. Note that all three conditions must be met for this secondary definition to apply.

Milling: whales surfacing in a more or less constantly varying direction, especially in relation to each other. They may remain in the same area or drift/move with the tide or current.

Prey Pursuit: whale exhibits sudden or explosive movements, often forward but may include rapid changes in direction and depth. Observation of prey pursuit in the turbid waters of Knik Arm are always associated with a fast appearing linear wake, violent disturbance of water or a combination of the two.

Side-scanning[7]**:** whale swims (often very slowly) or floats (moving with the current) at the surface with the lateral aspect of its body visible. The pectoral flipper, lateral surface of the body, tail fluke, or a combination of these parts, are visible, often for 30 seconds – several minutes. This behavior is often followed by explosive movements of the tail as the animal moves rapidly forward in pursuit of prey. **This behavior excluded from datasheet and included as a note when observed.**[8]

Spy Hopping: whale emerges from the water such that its head is held vertically above the water, at least to above the eye level, but never so that the pectoral flippers are observed AND remains in this position for several seconds at a minimum before submerging such that the head is the last body part to slip beneath the surface. The eyes are usually noted in a spy-hopping beluga. **This behavior excluded from datasheet and included as a note when observed.**

[7] Note this is a novel term used to describe a behavior often noted during the months of July and Aug (when salmon are running) in the Eagle River. It is not used elsewhere that we are aware of.
[8] This scenario would be noted as "side-scanning" transitioning into "prey pursuit".

Snorkeling: a surfacing whale lifts head gently to the surface in such a manner that only the melon, blowhole and a small portion of the dorsal surface just posterior to the blowhole are visible. After gas exchange has occurred, the whale then gently lowers its head below the surface. The dorsal ridge is never seen during a snorkeling event. Note that this behavior often makes detection of whales difficult from a distance as it reveals only a small portion of the whale and leaves a rapidly dissipated, relatively small (several feet diameter), concavity at the surface of the water . **This behavior excluded from datasheet and included as a note when observed.**

Travelling: whale or whales moving in a consistent, unidirectional fashion relative to other individuals in a group. Often travelling whales appear to move in a purposeful, coordinated manner. A single traveling whale moves forward with few to no lateral deviations in course.

Whale group: group of whales engaged in more or less coordinated behavior(s). Inter-individual distances may increase while travelling, especially among large groups.

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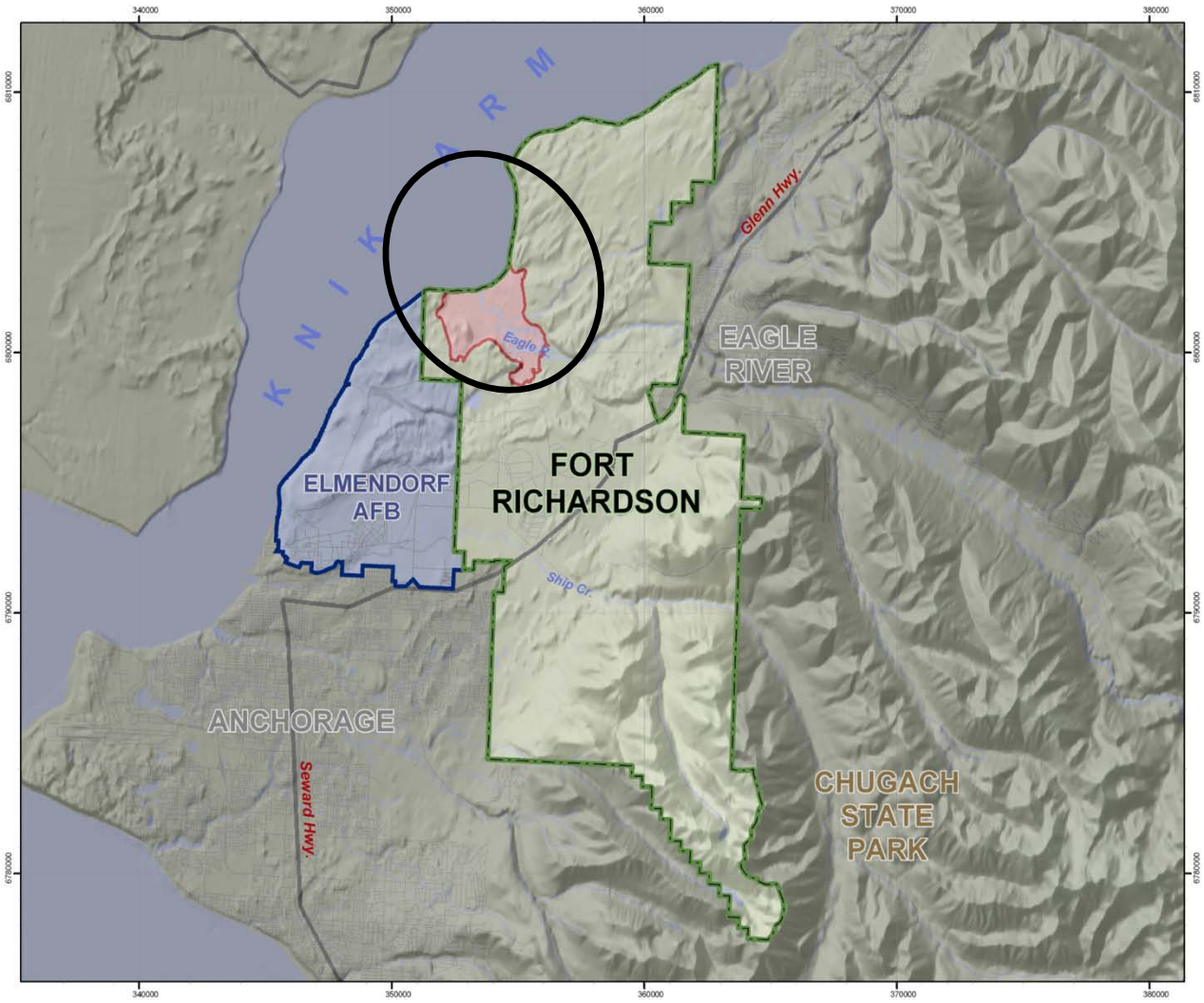

Figure 1. Study Area – Eagle River as it runs through Fort Richardson and Eagle River Flats, discharging into Eagle Bay of Knik Arm, Upper Cook Inlet, southcentral Alaska.

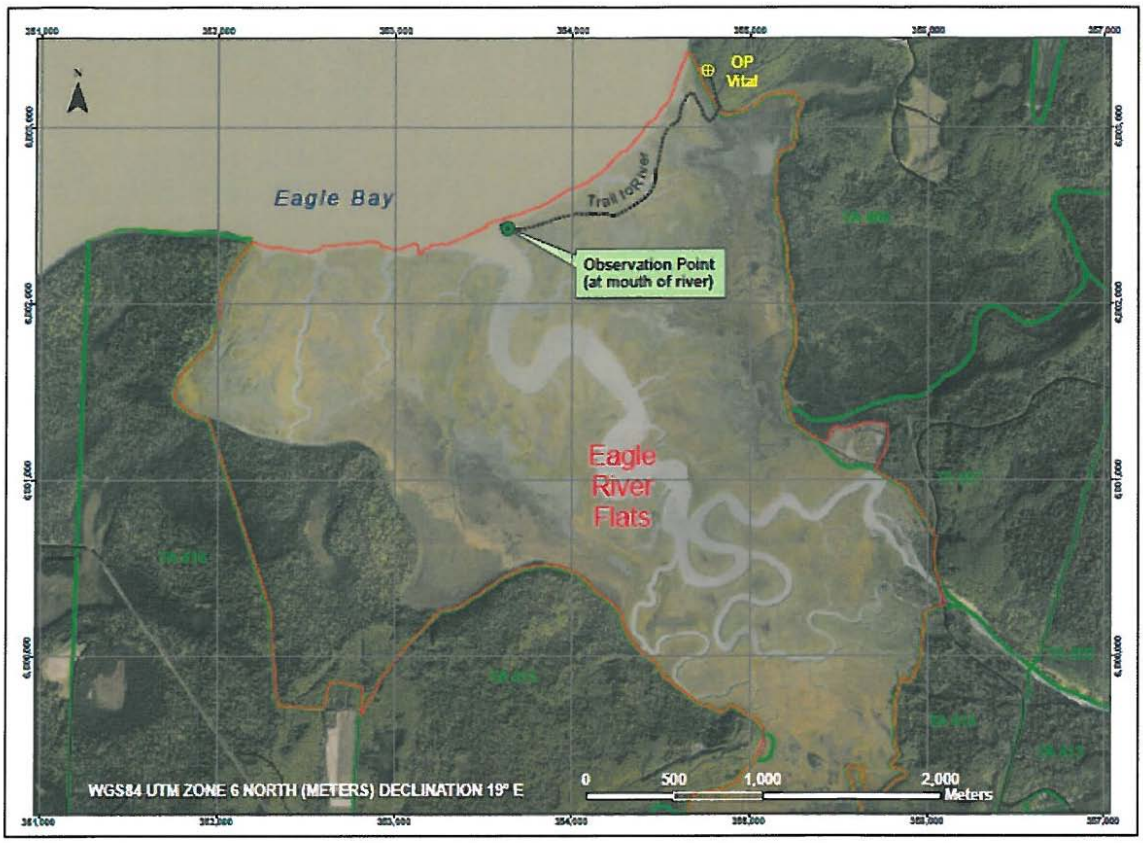

Figure 2. Overall map of Eagle River Flats with primary observation points and the trail used to access the mouth observation point.

Cook Inlet Beluga Observations – Eagle Bay and Eagle River, Alaska

Observer: Garner / Battle / McKee / Dushane / Mustin / Padilla Location: OP Vital /OP FAGAN /ER Mouth / Coast of EB Date

Grid #/Compass Bearing Start/Finish	Sampling Round/Time Interval	White/Gray/Calf	Survey Conditions (Poor, Fair, Good, Excellent)	Behavior 1°	Behavior 2°
		W G C			
		W G C			
		W G C			
		W G C			
		W G C			
		W G C			
		W G C			
		W G C			
		W G C			
Estimated Total Number of Whales:			Page_____ of _____		

Time Start	Time End
Total Time	

Behavior Legend

Traveling (**T**)

Milling (**M**)

Prey Pursuit (**PP**)

Diving (**D**)

Feeding (**F**)

Other (see notes)

Figure 3. Front page Beluga observation data sheet for Eagle Bay.

Additional Comments:

Sampling Round	Comments

Survey Conditions					
Time	Beaufort Scale	Visibility	Tidal Stage	Precip	Overall
	0 1 2 3 4 5 6		Flood/Ebb	0 1 2 3	P F G E
	0 1 2 3 4 5 6		Flood/Ebb	0 1 2 3	P F G E

Figure 4. Back page Beluga observation data sheet for Eagle Bay.

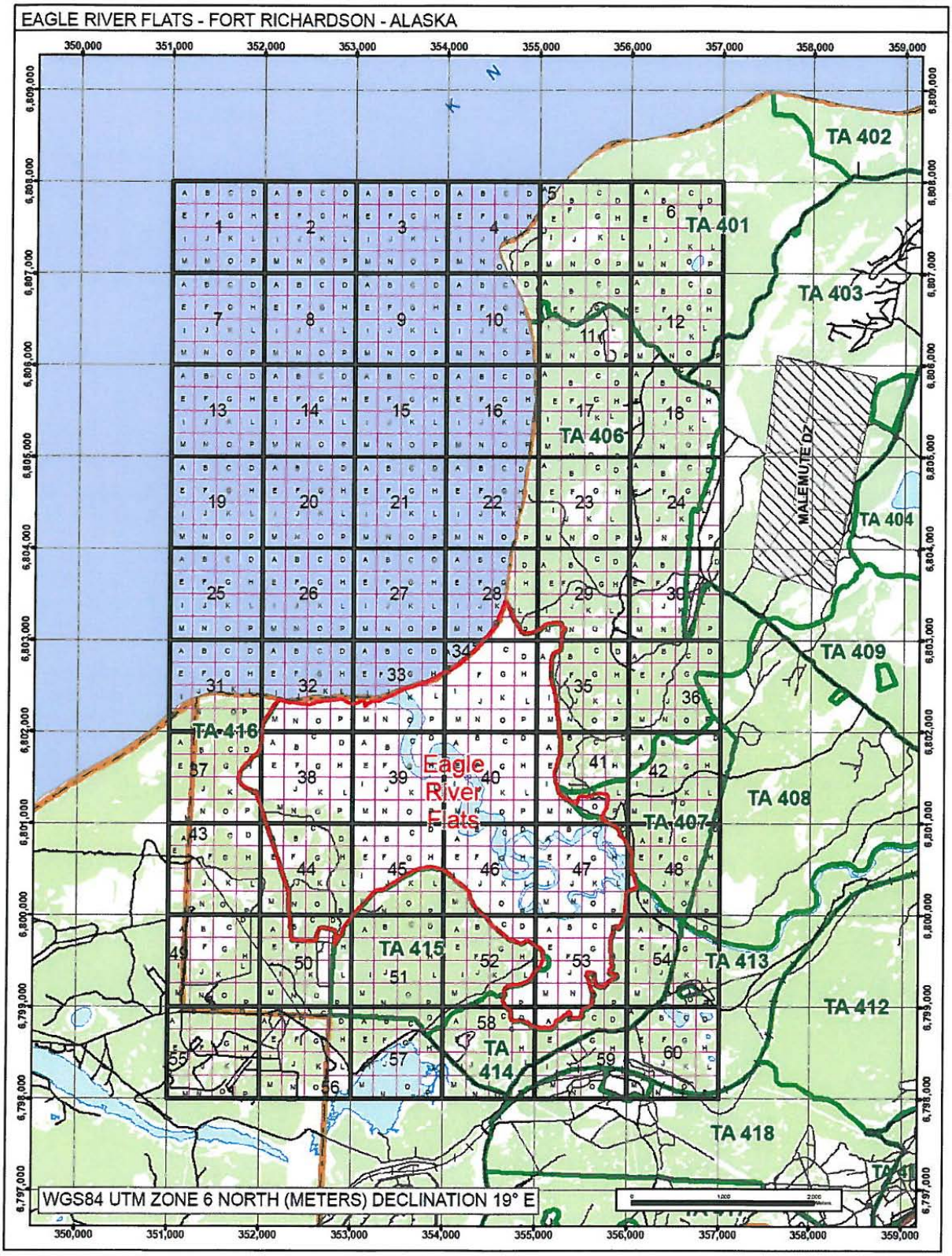

Figure 5. Grid for determination of beluga position

APPENDIX I. 2009 Exotic/Invasive Species Joint Base Elmendorf-Richardson

2009

Exotic/Invasive Species Joint Base Elmendorf-Richardson

Herman Griese

3 CES/CEANC

P. Chris McKee

USAG-AK DPW Environmental Branch

Effective 08/05/2009

Table 1. Current Exotic/Invasive Mammals, Birds and Fish Species on Joint Base Elmendorf-Richardson

Scientific Name	Common Name	Family	Confirmed for Elmendorf (H. Griese 2009)	Confirmed for Fort 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. T. Rothe et al. 1983. Natural Resource Inventory of Elmendorf Air Force base, Alaska. U.S. Fish and Wildlife Service, Anchorage, AK 99503
2. USAF 2001. Integrated Natural Resources Management Plan for Elmendorf AFB 2001-2005. Center for Ecological Management of Military Lands
3. K. Peirce. 2003. A small mammal inventory on Fort Richardson, Alaska, Final Report.
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.

Table 2. Current and Potential Plant Invasives on Joint Base Elmendorf-Richardson

USDA CODE	ITIS scientific name with authors	Common name	Family	Record of Occurrence in Anchorage (AKEPIC database Downloaded May 24, 2007 and December 6, 2007)	Found on EAFB Species List Prior to 2007	Reported for Fort Richardson lands (DPW-Environmental) 2009 [18]	Found during 2007 EAFB Invasive Plant Survey [17]	Other Source Documenting Occurrence in AK
ALPR3	Alopecurus pratensis L.	meadow foxtail	Poaceae	X			X	1, 2, 3, 4
BEIN2	Berteroa incana (L.) DC.	hoary alyssum	Brassicaceae	X			X	3, 4
BRNA	Brassica napus L.	field mustard	Brassicaceae	X			X	1, 2, 4
BRRA	Brassica rapa L.	bird's rape	Brassicaceae	X	X	X	X	1, 2, 3, 4
BRINI	Bromus inermis ssp. inermis Leyss.	smooth brome	Poaceae	X			X	1, 2, 4, 6
BRTE	Bromus tectorum L.	cheatgrass, downy brome	Poaceae	X		X	X	1, 2, 4
CABU2	Capsella bursa-pastoris (L.) Medik.	shepherd's purse	Brassicaceae	X	X	X	X	1, 2, 4
CAAR18	Caragana arborescens Lam.	Siberian pea-tree, common caragana	Fabaceae	X			X	3, 4, 7
CEBI2	Centaurea biebersteinii DC.	Spotted Knapweed	Asteraceae	X				4
CEGL2	Cerastium glomeratum Thuill.	mouse-ear chickweed	Caryophyllaceae	X				1, 2, 4
CHMI	Chaenorhinum minus (L.) Lange	dwarf snapdragon	Scrophulariaceae	X			X	16
CHALA	Chenopodium album L.	lamb's quarters	Chenopodiaceae	X	X		X	1, 2, 4
CIAR4	Cirsium arvense (L.) Scop	Canada thistle	Asteraceae	X			X	1, 2, 4
CIVU	Cirsium vulgare (Savi) Ten.	bull thistle	Asteraceae	X				1, 2, 4
CRTE3	Crepis tectorum L.	annual hawksbeard	Asteraceae	X	X	X	X	2, 4
ELRE4	Elymus repens (L.) Gould	quackgrass	Poaceae	X		X	X	1, 2, 4
ELSI	Elymus sibiricus L.	Siberian wildrye	Poaceae	X		X		2, 4
ERGA	Erucastrum gallicum (Willd.) O.E. Schulz	common dogmustard	Brassicaceae	X			X	4, 11
GABI3	Galeopsis bifida Boenn.	splitlip hempnettle	Lamiaceae	X	X		X	1, 2, 4

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GATE2	Galeopsis tetrahit L.	brittlestem hempnettle	Lamiaceae	X			X	1, 2, 4, 7
HIAU	Hieracium aurantiacum L.	orange hawkweed	Asteraceae	X	X	X	X	2, 4
HIUM	Hieracium umbellatum L.	narrow-leaf hawkweed	Asteraceae	X	X		X	2, 4, 6
HYPE	Hypericum perforatum L.	St. Johnswort	Clusiaceae	X				4, 6
HYRA3	Hypochaeris radicata L.	cat's-ears	Asteraceae	X				1, 2, 4
IMGL	Impatiens glandulifera Royle	Himalayan balsam, policemans helmet	Balsaminaceae	X				4, 12
LEAU2	Leontodon autumnalis L.	fall dandelion	Asteraceae	X			X	2, 4,
LEDE	Lepidium densiflorum Schrad.	pepperweed	Brassicaceae	X	X		X	1, 2, 4, 6
LEVU	Leucanthemum vulgare Lam.	ox-eye daisy	Asteraceae	X		X	X	1, 2, 4
LIPI3	Linaria pinifolia (Poir.) Thellung	pineneedle toadflax	Scrophulariaceae	X			X	4, 11
LIVU2	Linaria vulgaris P. Mill.	butter and eggs	Scrophulariaceae	X	X	X	X	1, 2, 4
LOPEM2	Lolium perenne L. ssp. multiflorum (Lam.) Husnot	Italian ryegrass	Poaceae	X	X	X	X	1, 2, 4, 6
LUPOP4	Lupinus polyphyllus Lindl.	bigleaf lupine	Fabaceae	X			X	1, 2, 4, 6
LYCH3	Lychnis chalcedonica L.	maltese cross	Caryophyllaceae	X			X	4
LYSA2	Lythrum salicaria L.	Purple Loosestrife	Lythraceae	X				4
MADI6	Matricaria discoidea DC.	pineappleweed	Asteraceae	X	X	X	X	1, 2, 4
MELU	Medicago lupulina L.	black medic, hop clover	Fabaceae	X				1, 2, 4
MESAS	Medicago sativa L. ssp. sativa	alfalfa	Fabaceae	X	X			1, 2, 4
MEAL12	Melilotus alba [officinalis (L.) Lam.]	white sweet clover	Fabaceae	X	X	X	X	1, 2, 4
MEOF	Melilotus officinalis (L.) Lam.	yellow sweet clover	Fabaceae	X		X		1, 2, 4
PANU3	Papaver nudicaule L.	Iceland poppy	Papaveraceae	X			X	1, 2, 4

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PHAR3	Phalaris arundinacea L.	Reed canarygrass	Poaceae	X			X	1, 2, 4, 6
PHPR3	Phleum pratense L.	timothy	Poaceae	X	X	X	X	1, 2, 4
PLMA2	Plantago major L.	common plantain	Plantaginaceae	X	X		X	1, 2, 4, 6
POAN	Poa annua L.	annual bluegrass	Poaceae	X	X	X	X	1, 2, 4
POPRI2	Poa pratensis L. ssp. irrigata (Lindm.) Lindb. f.	bluegrass	Poaceae	X	X	X	X	1, 2, 4
POPRP2	Poa pratensis ssp. pratensis L.	Kentucky bluegrass	Poaceae	X	X		X	2
POBO10	Polygonum ×bohemicum (J. Chrtek & Chrtkovß) Zika & Jacobson [cuspidatum x sachalinense	Bohemian knotweed	Polygonaceae	X				4
POAV	Polygonum aviculare L.	knotweed	Polygonaceae	X	X	X	X	2, 4
POLA4	Polygonum lapathifolium L.	pale smartweed	Polygonaceae	X				1, 2, 4
PRPA5	Prunus padus L.	European bird cherry	Rosaceae	X	X		X	3, 4, 7
RUAC3	Rumex acetosella L.	sheep sorel	Polygonaceae	X	X	X	X	1, 2, 4
RUCR	Rumex crispus L.	curled dock	Polygonaceae	X		X	X	1, 2, 4
RULO2	Rumex longifolius DC.	garden dock	Polygonaceae	X				1, 2, 4
SEVA4	Securigera varia (L.) Lassen	crown vetch	Fabaceae	X				4
SEJA	Senecio jacobaea L.	tansy ragwort	Asteraceae	X				4, 6
SESY	Senecio sylvaticus L.	woodland ragwort	Asteraceae	X				14
SEVU	Senecio vulgaris L.	common groundsel	Asteraceae	X		X	X	1, 2, 4
SIDI4	Silene dioica (L.) Clairville	red catchfly	Caryophyllaceae	X			X	4, 11
SILAA3	Silene latifolia Poir. ssp. alba (P. Mill.) Greuter & Burdet	bladder campion	Caryophyllaceae	X			X	3, 4
SOAR2	Sonchus arvensis L.	perennial sow-thistle	Asteraceae	X		X		1, 2, 4

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SOOL	Sonchus oleraceus L.	common sow-thistle	Asteraceae	X				1, 2, 4
SPAR	Spergula arvensis L.	spurry	Caryophyllaceae	X			X	1, 2, 4
STME2	Stellaria media (L.) Vill.	common chickweed	Caryophyllaceae	X	X		X	1, 2, 4
TAVU	Tanacetum vulgare L.	common tansy	Asteraceae	X			X	1, 2, 4, 6
TAOFO	Taraxacum officinale ssp. officinale G.H. Weber ex Wiggers	common dandelion	Asteraceae	X	X	X	X	1, 2, 4
THAR5	Thlaspi arvense L.	pennycress	Brassicaceae	X			X	1, 2, 4
TRDU	Tragopogon dubius Scop.	yellow salsify, goatsbeard	Asteraceae	X				3, 4
TRHY	Trifolium hybridum L.	alsike clover	Fabaceae	X	X	X	X	1, 2, 4
TRPR2	Trifolium pratense L.	red clover	Fabaceae	X	X	X	X	1, 2, 4
TRRE3	Trifolium repens L.	white clover	Fabaceae	X	X	X	X	1, 2, 4
TRPE21	Tripleurospermum perforata (Merat) M. Lainz	scentless mayweed	Asteraceae	X	X	X	X	1, 2, 4
VICRC	Vicia cracca L.	bird vetch, dog pea	Fabaceae	X	X		X	1, 2, 4
VITR	Viola tricolor L.	johnny jump up	Violaceae	X			X	3, 4
ACFI	Achillea filipendulina Lam.	fernleaf yarrow	Asteraceae					11
ACPT	Achillea ptarmica L.	sneezeweed	Asteraceae					1, 2, 3, 4
ACHY	Achnatherum hymenoides (Roemer & J.A. Schultes) Barkworth	indian ricegrass	Poaceae					3
AGCR	Agropyron cristatum (Linnaeus) Gaertn.	crested wheatgrass	Poaceae					2, 4
AGDE2	Agropyron desertorum (Fisch. ex Link) J.A. Schultes		Poaceae					5
AGFR	Agropyron fragile (Roth) P. Candargy	Siberian wheatgrass	Poaceae					4
AGGI	Agrostemma githago L.	corn cockle	Caryophyllaceae					1, 2, 3
AGCA5	Agrostis capillaris L.	colonial bentgrass	Poaceae					1, 2, 3, 4

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AGGI2	Agrostis gigantea Roth	redtop	Poaceae					2, 4, 6
AGST2	Agrostis stolonifera L.	creeping bentgrass, red top	Poaceae					1, 3, 2, 4
ALMO12	Alchemilla mollis (Buser) Rothm.	lady's mantle	Rosaceae					15
ALMO4	Alchemilla monticola Opiz	hairy lady's mantle	Rosaceae					3, 7
ALPE4	Alliaria petiolata (Bieb.) Cavara & Grande	garlic mustard	Brassicaceae					4
ALGE2	Alopecurus geniculatus L.	water foxtail	Poaceae					1, 2, 3, 4, 6
ALAL3	Alyssum alyssoides (L.) L.	alyssum	Brassicaceae					7
AMAL	Amaranthus albus L.	redroot	Amaranthaceae			X		1, 2, 3
AMRE	Amaranthus retroflexus L.	redroot pigweed	Amaranthaceae					1, 2, 3, 4
AMLY	Amsinckia lycopsoides Lehm.	bugloss fiddleneck	Boraginaceae					1, 2, 3
AMME	Amsinckia menziesii (Lehm.) A. Nels. & J.F. Macbr.	Menzies' fiddleneck	Boraginaceae					1, 2, 6
ANCO2	Anthemis cotula L.	mayweed	Asteraceae				X (new to ANC)	1, 2, 4
ANTI	Anthemis tinctoria L.	yellow chamomile	Asteraceae					1, 2
ANOD	Anthoxanthum odoratum L.	sweet vernal grass	Poaceae					1, 2
ARGL	Arabis glabra (L.) Bernh.	tower rockcress	Brassicaceae					1, 2, 4, 6
ARLA3	Arctium lappa L.	giant burdock	Asteraceae					8
ARMI2	Arctium minus Bernh.	common burdock	Asteraceae					8
AREL3	Arrhenatherum elatius (L.) Beauv. ex J.& K. Presl	tall oatgrass	Poaceae					1, 2
ARBI2	Artemisia biennis Willd.	biennial sagewort, biennial wormwood	Asteraceae					2, 9
ARVU	Artemisia vulgaris L.	common wormwood	Asteraceae					10
ASOF	Asparagus officinalis L.	asparagus	Liliaceae					7
ASPR	Asperugo procumbens L.	catchweed, mudwort	Boraginaceae					1, 2, 4

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ASCI4	Astragalus cicer L.	chickpea milkvetch, cicer milkvetch	Fabaceae					3, 4
ATHO	Atriplex hortensis L.	garden orache	Chenopodiaceae					1, 3, 7
ATPA4	Atriplex patula L.	spear saltbush	Chenopodiaceae					1, 2, 6
AVFA	Avena fatua L.	wildoats	Poaceae					1, 2, 4
AVSA	Avena sativa L.	oats	Poaceae					1, 2
BEPE2	Bellis perennis L.	European daisy, English daisy	Asteraceae					1, 2
BEPE3	Betula pendula Roth	European white birch	Betulaceae					4
BICE	Bidens cernua L.	nodding beggar-ticks	Asteraceae					1, 2
BIFR	Bidens frondosa L.	devil's beggartick	Asteraceae					2, 6
BOOF	Borago officinalis L.	common borage	Boraginaceae					3
BRJU	Brassica juncea (L.) Czern.	indian mustard	Brassicaceae					1, 2, 4
BRBR5	Bromus briziformis Fisch. & C.A. Mey.	rattlesnake brome	Poaceae					2
BRHO2	Bromus hordeaceus L.	soft brome, soft chess	Poaceae					1, 2, 4, 6
BRRA2	Bromus racemosus L.	bald brome	Poaceae					2
BRSE	Bromus secalinus L.	rye brome, cheat	Poaceae					1, 2
CASES	Calystegia sepium (L.) R. Br.	sepiumhedge	Convolvulaceae					4
CASA2	Camelina sativa (L.) Crantz	false flax	Brassicaceae					1, 2
CAGL2	Campanula glomerata L.	Dane's blood	Campanulaceae					3
CARA	Campanula rapunculoides L	rampion bellflower	Campanulaceae				X (new to ANC)	3
CADE	Carex deweyana	Dewey sedge	Cyperaceae			X		
CATI	Carthamus tinctorius L.	safflower	Asteraceae					11
CEME2	Centaurea melitensis L.	Maltese star-thistle	Asteraceae					15

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CEMO	Centaurea montana L.	perennial cornflower	Asteraceae					3, 4
CEFO2	Cerastium fontanum ssp. vulgare (Hartman) Greuter & Burdet	larger mouse-eared chickweed	Caryophyllaceae		X(species at EAFB undetermined)		X (new to ANC)	1, 2, 4
CETO2	Cerastium tomentosum L.	snow in summer	Caryophyllaceae				X (new to ANC)	6
CHBEZ	Chenopodium berlandieri var. zschackii (J. Murr) J. Murr ex Aschers.	Zschacke goosefoot	Chenopodiaceae					1, 2, 4
CHLE4	Chenopodium leptophyllum (Moq.) Nutt. ex S. Wats.	narrowleaf goosefoot	Chenopodiaceae					2
CHRU	Chenopodium rubrum L.	red goosefoot	Chenopodiaceae					2
CHSA2	Chenopodium salinum Standl.	Rocky Mountain goosefoot	Chenopodiaceae					2
CHSI2	Chenopodium simplex (Torr.) Raf.	mapleleaf goosefoot	Chenopodiaceae					2
GLSE5	Chrysanthemum segetum L.	corn marigold, corn daisy	Asteraceae					2
CIIN	Cichorium intybus L.	Chicory, blue sailors	Asteraceae					4, 10
CLDO2	Clinopodium douglasii (Benth.) Kuntze	yerba buena	Lamiaceae					2
COLI2	Collomia linearis Nutt.	narrow-leaved collomia	Polemoniaceae					1, 2, 4
	Conioselinum chinense (L.) B.S.P.	Chinese hemlockparsley	Apiaceae					15
COMA7	Convallaria majalis L	European lily-of-the-valley	Liliaceae					6
COAR4	Convolvulus arvensis L.	field bindweed	Convolvulaceae					4
COCA5	Conyza canadensis (L.) Cronq.	horseweed	Asteraceae					3, 4
COCO7	Cotula coronopifolia L.	mud-disk, brass buttons	Asteraceae					1, 2
CRCA3	Crepis capillaris (L.) Wallr.	slender hawk's-	Asteraceae					2

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		beard						
CRTO4	Cryptantha torreyana (Gray) Greene	Torrey's catseye	Boraginaceae					1, 6
CYSC4	Cytisus scoparius (L.) Link	scotchbroom	Fabaceae					4, 7
DAGL	Dactylis glomerata L.	orchard grass	Poaceae					1, 2, 4
DEDA	Deschampsia danthonioides (Trin.) Munro	annual hairgrass	Poaceae					1, 2, 6
DEEL	Deschampsia elongata (Hook.) Munro	slender hairgrass	Poaceae					1, 2, 4, 6
DESO2	Descurainia sophia (L.) Webb ex Prantl	herb sophia	Brassicaceae					2, 4
DIBA	Dianthus barbatus L.	sweetwilliam	Caryophyllaceae					3
DIDE	Dianthus deltoides L.	maiden pink	Caryophyllaceae					4
DIPL	Dianthus plumarius L.	garden pink, cottage pink	Caryophyllaceae					13
DIPU	Digitalis purpurea L.	purple foxglove	Scrophulariaceae					1, 2, 4
DISA	Digitaria sanguinalis (L.) Scop.	hairy crabgrass	Poaceae					5
ECVU	Echium vulgare L.	common vipers bugloss	Boraginaceae					3
ELCA7	Elodea canadensis Michx.	waterweed	Hydrocharitaceae					3
ELCA4	Elymus canadensis L.	Canada wildrye	Poaceae					5
ERIN	Eragrostis intermedia A.S. Hitchc.	plains lovegrass	Poaceae					5
ERCI6	Erodium cicutarium (L.) L'Hér. ex Ait.	alfilaria, storksbill	Geraniaceae					1, 2, 4, 7
ESCA2	Eschscholzia californica Cham.	California poppy	Papaveraceae					3
EUPE6	Euphorbia peplus L.	spurge	Euphorbiaceae					7
EUNE3	Euphrasia nemorosa (Pers.) Wallr.	common eyebright	Scrophulariaceae					3, 10

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FAES2	Fagopyrum esculentum Moench	common buckwheat	Polygonaceae					7
GAPU	Gaillardia pulchella Foug.	firewheel	Asteraceae					3
GEBI2	Geranium bicknellii Britt.	Bicknell's cranesbill	Geraniaceae					2, 6
GECA5	Geranium carolinianum L.	carolina cranesbill	Geraniaceae					7
GERO	Geranium robertianum L.	herb Robert, Robert geranium	Geraniaceae					1, 2
GESA2	Geranium sanguineum L.	bloody geranium	Geraniaceae					7
GIAC2	Gilia achilleifolia Benth.	California gilia	Polemoniaceae					1, 2, 7
GICA5	Gilia capitata Sims	globe gilia, bluefield gilia	Polemoniaceae					1, 2, 7
GLHE2	Glechoma hederacea L.	ground ivy	Lamiaceae					1, 2
GNPA	Gnaphalium palustre Nutt.	western marsh cudweed	Asteraceae					15
GNUL	Gnaphalium uliginosum L.	cudweed	Asteraceae					1, 2
GYEL	Gypsophila elegans Bieb.	showy baby's-breath	Caryophyllaceae					7
GYPA	Gypsophila paniculata L.	baby's-breath, bachelor's button	Caryophyllaceae					11
HIMI	Hackelia micrantha (Eastw.) J.L. Gentry	Jessica sticktight	Boraginaceae					2, 6
HEHE	Hedera helix L.	English ivy	Araliaceae					15
HEAN3	Helianthus annuus L.	annual sunflower	Asteraceae					1, 2, 4
HEMA3	Hesperis matronalis L.	Dame's violet, sweet rocket	Brassicaceae					1, 2
HIFL2	Hieracium × flagellare Willd. [caespitosum × pilosella]		Asteraceae					14
HICA10	Hieracium caespitosum Dumort.	meadow hawkweed	Asteraceae			X		4
HILA8	Hieracium lachenalii K.C. Gmel.	common hawkweed	Asteraceae					4
HIPIP	Hieracium pilosella L.	mouse-ear	Asteraceae					4

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		hawkweed						
HISA	Hieracium sabaudum L.	New England hawkweed	Asteraceae					14
HISC	Hieracium scabrum Michx.	rough hawkweed	Asteraceae					14
HOLA	Holcus lanatus L.	velvet grass	Poaceae					1, 2, 4
HOCO4	Hordeum comosum J. Presl		Poaceae					5
HOJU	Hordeum jubatum	Foxtail barley	Poaceae			X		
HOMUL	Hordeum murinum L. ssp. leporinum (Link) Arcang.	leporinum barley	Poaceae					4, 11
HOVU	Hordeum vulgare L.	common barley	Poaceae					1, 2, 4, 10
IBAM	Iberis amara L.	rocket candytuft	Brassicaceae					7
ILAQ80	Ilex aquifolium L.	English holly	Aquifoliaceae					15
IRPS	Iris pseudacorus L.	paleyellow iris	Iridaceae					15
LASQ	Lappula squarrosa	European stickseed	Boraginaceae			X		1, 2, 4
LASE	Lactuca serriola L.	prickly lettuce	Asteraceae					4, 7, 12
LATA	Lactuca tatarica (L.) C.A. Mey.	blue lettuce	Asteraceae					1, 10
LAAL	Lamium album L.	white deadnettle	Lamiaceae					1, 2, 4
LAMA	Lamium maculatum L.	spotted deadnettle	Lamiaceae					7
LACO3	Lapsana communis L.	nipplewort	Asteraceae					1, 2
LAPR	Lathyrus pratensis L.	meadow pea	Fabaceae					3
LETAT	Leontodon taraxacoides ssp. taraxacoides (Vill.) Mérat	lesser hawkbit	Asteraceae					4
LECA5	Lepidium campestre (L.) Ait. f.	field pepperweed	Brassicaceae					11
LERA2	Lepidium ramosissimum A. Nels.	manybranched pepperweed	Brassicaceae					4, 11
LEVI3	Lepidium virginicum L.	wild peppergrass	Brassicaceae					1, 2

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LEMA8	Leucanthemum maximum (Ramond) DC.	max chrysanthemum	Asteraceae				X (new to ANC)	15
LEOF	Levisticum officinale W.D.J. Koch	garden lovage	Apiaceae					11
SCPH	Lolium arundinaceum (Schreb.) S.J. Darbyshire	tall fescue	Poaceae					1, 2
LOPEP	Lolium perenne L. ssp. perenne	perennial ryegrass	Poaceae					1, 2, 4, 6
SCPR4	Lolium pratense (Huds.) S.J. Darbyshire	meadow fescue	Poaceae					6
LOTE2	Lolium temulentum L.	poison darnel	Poaceae					2
LOTA	Lonicera tatarica L.	Tatarian honeysuckle	Caprifoliaceae					10
LOCO6	Lotus corniculatus L.	birdfoot deervetch	Fabaceae					4, 6
LYNU	Lysimachia nummularia L.	creeping jenny	Primulaceae					15
LYHY2	Lythrum hyssopifolium L.	hyssop loosestrife	Lythraceae					7
MAGL2	Madia glomerata Hook.	mountain tarweed	Asteraceae					2, 3
MANE	Malva neglecta Wallr.	cheeseweed, common mallow	Malvaceae					7
MAVU	Marrubium vulgare L.	horehound	Lamiaceae					1, 2
MEMI	Medicago minima (L.) L.	burr medic	Fabaceae					4
MEPO3	Medicago polymorpha L.	bur clover	Fabaceae					1, 2
MESAF	Medicago sativa L. ssp. falcata (L.) Arcang.	yellow alfalfa	Fabaceae					1, 2, 4, 11
MEPI	Mentha × piperita L. (pro sp.) [aquatica × spicata]	peppermint	Lamiaceae					1, 7
MESP3	Mentha spicata L.	spearmint	Lamiaceae					1, 2, 4
MIGR	Microsteris gracilis (Hook.) Greene	pink microsteris	Polemoniaceae					1, 2
MIOR	Misopates orontium (L.) Raf.	snapdragon	Scrophulariaceae					2
MYMU	Mycelis muralis (L.)	wall lettuce	Asteraceae					4

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	Dumort.							
MYSC	Myosotis scorpioides L.	true forget-me-not	Boraginaceae					1, 2, 4, 6
MYSP	Myrophyllum spicatum	Eurasian water milfoil	Haloragaceae			X		2
NEME	Nemophila menziesii Hook. & Arn.	baby blue-eyes	Hydrophyllaceae					1, 3, 7
NECA2	Nepeta cataria L.	catnip	Lamiaceae					1, 2
NEPA3	Neslia paniculata (L.) Desv.	ball mustard	Brassicaceae			X		1, 2, 4
NYODO	Nymphaea odorata Ait. ssp. odorata	American white waterlily	Nymphaceae					6
ONVI	Onobrychis viciifolia Scop.	sainfoin, saintfoin	Fabaceae					4
PAMI2	Panicum miliaceum L.	broomcorn millet	Poaceae					5
PARH2	Papaver rhoeas L.	corn poppy	Papaveraceae				X (new to ANC)	1, 2
PASM	Pascopyrum smithii (Rydb.) A. Löve	western wheatgrass	Poaceae					1, 2, 6
PASA2	Pastinaca sativa L.	parsnip	Apiaceae					1, 2, 7
PHMI3	Phalaris minor Retz.	littleseed Canary grass	Poaceae					2
PLFIF	Plagiobothrys figuratus (Piper) I.M. Johnston ex M.E. Peck ssp. figuratus	popcorn flower	Boraginaceae					1, 2
PLLA	Plantago lanceolata L.	ribgrass, buckhorn, English plantain	Plantaginaceae					1, 2, 4
POCO	Poa compressa L.	Canada bluegrass	Poaceae				X (new to ANC)	1, 2, 4
POPA	Poa palustris	Fowl bluegrass	Poaceae			X		
POTR2	Poa trivialis L.	rough bluegrass	Poaceae					1, 2, 4
POCO10	Polygonum convolvulus L.	black bindweed, wild buckwheat	Polygonaceae					1, 2, 4
POCU6	Polygonum cuspidatum Sieb. & Zucc.	Japanese knotweed	Polygonaceae					3, 4,

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POHY	Polygonum hydropiper L.	marshpepper knotweed	Polygonaceae					1, 2, 10
POHY2	Polygonum hydropiperoides Michx.	mild water-pepper	Polygonaceae					1, 2
POPE3	Polygonum persicaria L.	lady's-thumb	Polygonaceae				X (new to ANC)	1, 2, 4
POPO5	Polygonum polystachyum Wallich ex Meisn.	cultivated knotweed	Polygonaceae					15
PORA3	Polygonum ramosissimum Michx. var. prolificum Small	bushy knotweed	Polygonaceae					1, 10
POMO5	Polypogon monspeliensis (L.) Desf.	rabbitfoot	Poaceae					2
PRVI	Prunus virginiana L.	chokecherry	Rosaceae					7
RAAC3	Ranunculus acris L.	tall buttercup	Ranunculaceae					2, 4
RARE3	Ranunculus repens L.	creeping buttercup	Ranunculaceae				X (new to ANC)	1, 2, 4, 6
RASA2	Raphanus sativus L.	cultivated radish	Brassicaceae				X (new to ANC)	1, 2
NSOG	Rorippa nasturtium-aquaticum (L.) Hayek	watercress	Brassicaceae					1, 2
RORU	Rosa rugosa Thunb.	rugosa rose	Rosaceae					3, 7
RUDI2	Rubus discolor Weihe & Nees	Himalayan blackberry	Rosaceae					4
RUIDI	Rubus idaeus ssp. idaeus L.	cultivated raspberry	Rosaceae					7
RUHI2	Rudbeckia hirta L.	black-eyed Susan	Asteraceae					3
RUACA	Rumex acetosa ssp. acetosa L.	green sorrel	Polygonaceae					1, 2
RUMA4	Rumex maritimus L.	golden dock	Polygonaceae					1, 2
RUOB	Rumex obtusifolius L.	bitter dock	Polygonaceae					1, 2, 4
SAPR	Sagina procumbens L.	birdeye pearlwort	Caryophyllaceae					6
SAOF4	Saponaria officinalis L.	Soapwort, Bouncingbet	Caryophyllaceae					12

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SECE	Secale cereale L.	rye	Poaceae					1, 2
SEER2	Senecio eremophilus Richards.	desert groundsel	Asteraceae					2
SEVI2	Senecio viscosus L.	viscid groundsel	Asteraceae					3
SEVI4	Setaria viridis (L.) Beauv.	green bristlegrass	Poaceae					4, 11
SIAR	Silene armeria L.	sweet William silene	Caryophyllaceae					4, 11
SINO	Silene noctiflora L.	night-flowering catchfly	Caryophyllaceae	X	X			1, 2, 4
SIVU	Silene vulgaris (Moench) Garcke	bladder campion	Caryophyllaceae					3, 4
SIAR4	Sinapis arvensis L.	charlock	Brassicaceae					1, 2, 4
SIAL2	Sisymbrium altissimum L.	tumbling mustard	Brassicaceae					1, 2, 4
SIOF	Sisymbrium officinale (L.) Scop.	hedge mustard	Brassicaceae					1, 2, 3
SONI	Solanum nigrum L.	black nightshade	Solanaceae					1, 2, 7
SOPH	Solanum physalifolium Rusby	nightshade	Solanaceae					7
SOARA2	Sonchus arvensis ssp. arvensis L.	perennial sow-thistle	Asteraceae					15
SOARU	Sonchus arvensis ssp. uliginosus (Bieb.) Nyman	moist sowthistle	Asteraceae			X		11
SOAS	Sonchus asper (L.) Hill	spiny sow-thistle	Asteraceae					1, 2, 4
SOSO2	Sorbaria sorbifolia (L.) A. Braun	false spirea	Rosaceae				X (new to ANC)	3, 4
SOAU	Sorbus aucuparia L.	European mountain ash	Rosaceae				X (new to southcentral AK)	1, 2, 4
SPRU	Spergularia rubra (L.) J.& K. Presl	purple sand spurry	Caryophyllaceae					1, 2, 4
SPOL	Spinacia oleracea L.	garden spinach	Chenopodiaceae					1
SYAS	Symphytum asperum Lepechin	prickly comfrey	Boraginaceae					3

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SYOF	Symphytum officinale L.	common comfrey	Boraginaceae					4
TALA2	Taraxacum laevigatum (Willd.) DC.	rock dandelion	Asteraceae					1, 2
TRAU2	Trifolium aureum Pollich	golden clover	Fabaceae				X (new to southcentral AK)	2, 4
TRCA5	Trifolium campestre Schreb.	hop clover	Fabaceae					2
TRDU2	Trifolium dubium Sibthorp	suckling clover	Fabaceae					1, 2
TRLU	Trifolium lupinaster L.	lupine clover	Fabaceae					1, 2
TRMI4	Trifolium microcephalum Pursh	small head clover	Fabaceae					1, 2
TRVA	Trifolium variegatum Nutt.	white tip clover	Fabaceae					1, 2
TRAE	Triticum aestivum L.	wheat	Poaceae					1, 2, 4
URUR	Urtica urens L.	dog nettle	Urticaceae					1, 2
VAHI2	Vaccaria hispanica (P. Mill.) Rauschert	cowherb, cow cockle	Caryophyllaceae					1, 2
VEAN2	Veronica anagallis-aquatica L.	water speedwell	Scrophulariaceae					1, 2
VEAR	Veronica arvensis L.	corn speedwell	Scrophulariaceae					1, 2
VECH	Veronica chamaedrys L.	germander speedwell	Scrophulariaceae					1, 2
VELO2	Veronica longifolia L.	longleaf speedwell	Scrophulariaceae					3
VEOF2	Veronica officinalis L.	common gypsyweed	Scrophulariaceae					15
VEPE2	Veronica peregrina ssp. xalapensis (Kunth) Pennell	neckweed	Scrophulariaceae				X (new to southcentral AK)	2, 7
VEPE3	Veronica persica Poir.	Persian speedwell	Scrophulariaceae					1, 2
VESES	Veronica serpyllifolia ssp. serpyllifolia L.	thyme-leaf speedwell	Scrophulariaceae					1, 2, 3, 4
VISAN2	Vicia sativa ssp. nigra (L.)	common vetch	Fabaceae					1, 2

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	Ehrh.							
VIVI	Vicia villosa Roth	hairy vetch	Fabaceae					1, 2
VUMY	Vulpia myuros (L.) K.C. Gmel.	rat-tail fescue	Poaceae					2
ZEMA	Zea mays L.	corn	Poaceae					11

Other Sources for known invasive plant species in Alaska

1. Hultén, E. 1941. Flora of Alaska and Yukon. Lund, Gleerup. 10 v. 1902 pp.
2. Hultén, E. 1968. Flora of Alaska and neighboring territories. Stanford University Press, Stanford CA. 1008 pp.
3 ALA collections University of Alaska Museum/Herbarium, 907 Yukon Drive, Fairbanks AK 99775-6960.
4. AKEPIC database, Sept 1, 2006
5. Collections from Palmer Herbarium
6. Stensvold, M. 2002-2005. Unpublished.
7. Welsh, S.L.1974. Anderson's flora of Alaska and adjacent parts of Canada. Brigham Young University Press, Provo, Utah. 724pp.
8. Standley, J., Vegetation Specialist, AK Program Lead for Forestry, Range, Botany & Weeds, BLM - Alaska State Office, 222 W 7th Ave, #13 Anchorage, AK 99513 Tel: (907) 271-3082; Fax (907) 271-5479, personal communication
9. Duffy, M. 2002. List of non-native plants. Unpublished.
10. Batten, A. 2004-2005. Alien plant list for Alaska and Yukon.
11. Irina Lapina plant collection sent to ALA, ENRI, 2004
12. Bennett, B. Botanist, NatureServe Yukon (V-5N) P.O. Box 2703 Whitehorse, Yukon Y1A2C6. Tel: (867) 667-5331; fax: (867)393-6405, personal communication
13. Cody, W.J. 1996. Flora of Yukon Territory. NRC Research Press, National Research Council of Canada, Ottawa, Ontario, Canada. 643 pages. AND Cody, W.J. 2000. Addendum to the Flora of the Yukon Territory. NRC Research Press, National Research Council of Canada, Ottawa, Ontario, Canada. 24 pp.
14. Burke, T. Biological Technician (Wildlife), Kenai National Wildlife Refuge P.O. Box 2139, 1 Ski Hill Road Soldotna, AK 99669 Tel: (907) 262-7021 or (907) 260-2816
15. Shephard, M. Vegetation Ecologist Forest Health Protection State & Private Forestry 3301 C Street, Suite 202, Anchorage, AK 99503 Tel: (907) 743-9454; fax 907 743-9479, personal communication
16. Lapina, I. and M. Carlson, unpublished. 2005. Noteworthy Collections. Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, AK 99501
17. HDR Alaska Inc. 2007. Elmendorf Air Force Base Invasive Terrestrial Plant Species Survey Technical Report and Management Work Plan. Final Report. 3rd Civil Engineer Squadron, Natural and Cultural Resources Office Elmendorf AFB, AK 99506-3240 44pp.
18. McKee, P. C. 2009 Pers Communication "Exotic species found on Fort Richardson" (Partially reported by ITAM program.)

APPENDIX J. MINUTES OF INRMP REVIEW MEETINGS

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

7 December 2005

Minutes of EAFB INRMP Review
09 November 2005

Facilitator: Herman Griese

Attendance:

Name	Organization	Phone	E-Mail
Gary Larsen	US Army Alaska – Fort Richardson	384-3074	gary.larsen@us.army.mil
Matt Miller	ADF&G – Sport Fish	267-2415	matt_miller@fishgame.state.ak.us
Jeff Johnson	BLM	267-1278	jeff.d.johnson@ak.blm.gov
Mark Fullmer	BLM	2671264	mark_fullmer@ak.blm.gov
Larry Peltz	NOAA –NMFS	271-1332	Lawrence.peltz@noaa.gov
David Wigglesworth	Municipality of Anchorage	343-7116	WigglesworthDT@ci.anchorage.ak.us
Tammy Massie	ADNR/ OHMP	269-6936	Tammy_massie@dnr.state.ak.us
Patricia Joyner	ADNR/Forestry	269-8465	Patrica_joyner@dnr.state.ak.us
Edward P. Young	Elmendorf CEB	677-1993	sales@alaskacalibrationinc.com
Maria D. L. Coleman	Native Village of Eklutna	688-6020	maria@Like-The-Wind.com
Greg Schmidt	3 CES/CEVP	552-1741	Gregory.schmidt@elmendorf.af.mil
Ann Lawton	3 CES/CEVP	552-9677	Ann.lawton@elmendorf.af.mil
Daryl Magnuson	3 CES/CEVP	552-2130	Daryl.Magnuson@elmendorf.af.mil
Mary Weger	3 CES/CEVP	552-0190	Mary.weger@elmendorf.af.mil
Robert Morris	3 CES/CEVP	552-0310	Robert.Morris@elmendorf.af.mil
Herman Griese	3 CES/CEVP	552-0200	Herman.griese@elmendorf.af.mil
Absent:			
Ryan Winn	COE		Ryann.H.Winn@poa02.usace.army.mil
Rick Sinnott	ADF&G/ Wildlife Conservation	267-2185	rick_sinnott@fishgame.state.ak.us
Mary Lynn Nation	USFWS	271-3053	Mary_Nation@fws.gov

Minutes:

1. 1335 hr.: Introductions and Meeting Objectives were offered. The goal was to work toward a revised INRMP in a draft form by 15 February.
2. Agenda approval – Gary Larsen would need to depart early, his questions were moved to beginning of meeting.
3. Griese provided summary of current INRMP and accomplishments during 1995-2005.

4. Coleman recommended that study results be made available to the general public in an understandable format.
5. Griese summarized on-going survey and inventory program – in meeting packet.
6. Larsen inquired if changes to INRMP would include policy changes. Griese responded that he did not think there were any policy changes to include.
7. Larsen questioned if Elmendorf had plans to change public access. Griese replied that changes were unlikely due to sensitivity to airfield but the BRAC could result in changes.
8. Peltz indicated that KABATA studies would likely provide useful information on fish in Knik Arm to include in INRMP.
9. Coleman suggested adding an "aged tree" survey to identify culturally significant sites such as culturally modified trees.
10. A study to monitor surface water quality from streams entering Knik Arm should be added and more detailed water quality information should be included in INRMP.
11. Fullmer recommended that details of relation/MOA with BLM should be included in INRMP.
12. Coleman requested that "points of contact" for different agencies involved in land/resource management of Elmendorf be spelled out for reader benefit.
13. Wigglesworth identified an opportunity to address a waterways focus in the INRMP and suggested including opportunities to partner on Ship Creek restoration.
14. Coleman asked if Elmendorf movement studies include wildlife off base. Griese reviewed bear and wolf studies and future moose movement study.
15. Joyner suggested studies to inventory invasive plants in disturbed sites and study landscape planting successes and failures.
16. Miller reminded that pike should be part of invasive species study.
17. Miller suggested that Elmendorf consider partnering with ADF&G and Eklutna in development of visitor center at cooling pond site on Post Road. (This idea has been on Elmendorf's idea list for several years)
18. Johnson recommended contacting Campbell Creek Science Center for ideas on interpretive center.
19. Next meeting will cover "program review" of fish and wildlife resources all day on either 13 or 14 December at a location TBA.
20. Meeting adjourned 1550.

Submitted by:
H. Griese

5 January 2006

Minutes of EAFB INRMP Review
13 December 2005

Facilitator: Herman Griese

Attendance:

Name	Organization	Phone	E-Mail
Matt Miller	ADF&G – Sport Fish	267-2415	matt_miller@fishgame.state.ak.us
Tammy Massie	ADNR/ OHMP	269-6936	Tammy_massie@dnr.state.ak.us
Mary Weger	3 CES/CEVP	552-0190	Mary.weger@elmendorf.af.mil
Herman Griese	3 CES/CEVP	552-0200	Herman.griese@elmendorf.af.mil
Rick Sinnott	ADF&G/ Wildlife Conservation	267-2185	rick_sinnott@fishgame.state.ak.us
Dan Bosch	ADF&G – Sport Fish		dan_bosch@fishgame.state.ak.us
Bruce Seppi	BLM-AFO	267-1282	bseppi@ak.blm.gov
Absent:			
Ryan Winn	COE		Ryann.H.Winn@poa02.usace.army.mil
Mary Lynn Nation	USFWS	271-3053	Mary_Nation@fws.gov
Gary Larsen	US Army Alaska – Fort Richardson	384-3074	gary.larsen@us.army.mil
Jeff Johnson	BLM	267-1278	jeff.d.johnson@ak.blm.gov
Mark Fullmer	BLM	2671264	mark_fullmer@ak.blm.gov
Larry Peltz	NOAA –NMFS	271-1332	Lawrence.peltz@noaa.gov
David Wigglesworth	Municipality of Anchorage	343-7116	WigglesworthDT@ci.anchorage.ak.us
Patricia Joyner	ADNR/Forestry	269-8465	Patrica_joyner@dnr.state.ak.us
Edward P. Young	Elmendorf CEB	677-1993	sales@alaskacalibrationinc.com
Maria D. L. Coleman	Native Village of Eklutna	688-6020	maria@Like-The-Wind.com
Greg Schmidt	3 CES/CEVP	552-1741	Gregory.schmidt@elmendorf.af.mil
Ann Lawton	3 CES/CEVP	552-9677	Ann.lawton@elmendorf.af.mil
Robert Morris	3 CES/CEVP	552-0310	Robert.Morris@elmendorf.af.mil
Daryl Magnuson	3 CES/CEVP	552-2130	Daryl.Magnuson@elmendorf.af.mil

Minutes:

The 13 December meeting to review Fish and Wildlife monitoring programs in the EAFB INRMP was held at Alaska Department of Fish and Game's Anchorage office in the Dena'ina Conference room, 0830 - 1100.

21. Griese presented the list of indicator species identified in the 2001-2005 document. He made recommendations to modify the list to the following:

    a. Forest (early succession) - snowshoe hare(cyclic) and moose;
    b. Forest (mature) - northern goshawk(cyclic), black bear ?(or porcupine), and yet to be determined group of forest passerines
    c. Riparian/Wetland - Beaver, wood frog, selected birds (shorebirds and selected passerines)
    d. Aquatic - sockeye and silver salmon, loons and dragonflies

22. Griese and Weger proposed appendices to be added to the INRMP during this revision. Appendices describe the current Wildlife and Fishery monitoring programs that attempt to focus on the established "indicator species".

23. No major changes were suggested during the presentations.

24. Comments will also be accepted after the draft revision is released in mid February.

25. The next meeting of the INRMP Review process will be at the downtown AK DNR office (to be specified later) on **19 January at 0830-1100**. The topics will include current programs for:

    Soils, forestry, vegetation management, noxious/invasive species, wetland and riparian management, water quality monitoring, outdoor recreation, natural resources enforcement, environmental education, and volunteer programs

26. Meeting adjourned 1040.

Submitted by:
H. Griese

16 Feb 2006

Minutes of EAFB INRMP Review
19 January 2006

ADNR-OHMP, Conference Room. 14th Floor Atwood Bldg

Facilitator: Herman Griese

Attendance:

Name	Organization	Phone	E-Mail
Maria D. L. Coleman	Native Village of Eklutna	688-6020	maria@Like-The-Wind.com
Marc Lamorcaux	Native Village of Eklutna	688-6020	LEMarc@pobox.mtaonline.net
Shirley Chilligan	Native Village of Eklutna	688-6020	shirleychilligan@yahoo.com
Jolene Waskey	Native Village of Eklutna	688-6020	nve.nresource@eklutna-nsn.gov ??
Stewart Seaberg	ADNR/OHMP	269-6987	stewart_seaberg@dnr.state.ak.us
Patricia Joyner	ADNR/Forestry	269-8465	patricia_joyner@dnr.state.ak.us
Mark Fullmer	BLM	2671264	mark_fullmer@ak.blm.gov
Jamie Snyder	UAF, Coop Ext. Service	786-6300	fnjms2@uaf.edu
David Battle	CSU-CEMML, Fort Richardson	384-3909	david.battle@us.army.mil
Christopher Garner	US Army, Fort Richardson	384-2744	christopher.d.garner@us.army.mil
Vern McCorkle	Elmendorf-CEB	276-4373	publisher@akbizmag.com
Staff present:			
Mary Weger	3 CES/CEVP	552-0190	mary.weger@elmendorf.af.mil
Herman Griese	3 CES/CEVP	552-0200	herman.griese@elmendorf.af.mil
Greg Schmidt	3 CES/CEVP	552-1741	gregory.schmidt@elmendorf.af.mil
Ann Lawton	3 CES/CEVP	552-9677	ann.lawton@elmendorf.af.mil
Robert Morris	3 CES/CEVP	552-0310	bob.morris@elmendorf.af.mil
Daryl Magnuson	3 CES/CEVP	552-2130	daryl.magnuson@elmendorf.af.mil
Absent:			
Tammy Massie	ADNR/ OHMP	269-6936	tammy_massie@dnr.state.ak.us
Ryan Winn	COE		Ryan.H.Winn@poa02.usace.army.mil
Mary Lynn Nation	USFWS	271-3053	Mary_Nation@fws.gov
Gary Larsen	US Army AK– Fort Richardson	384-3074	gary.larsen@us.army.mil
Jeff Johnson	BLM	267-1278	jeff.d.johnson@ak.blm.gov
Bruce Seppi	BLM-AFO	267-1282	bseppi@ak.blm.gov
Larry Peltz	NOAA –NMFS	271-1332	lawrence.peltz@noaa.gov
David Wigglesworth	Municipality of Anchorage	343-7116	WigglesworthDT@ci.anchorage.ak.us
Edward P. Young	Elmendorf CEB	677-1993	sales@alaskacalibrationinc.com
Matt Miller	ADF&G – Sport Fish	267-2415	matt_miller@fishgame.state.ak.us
Rick Sinnott	ADF&G/ Wildlife	267-2185	rick_sinnott@fishgame.state.ak.us

	Conservation		
Dan Bosch	ADF&G – Sport Fish		dan_bosch@fishgame.state.ak.us

Minutes:

1. 0830 hr.: Introductions and Meeting Objectives were offered.

2. Agenda items covered by staff: Soils, Vegetation monitoring, Invasive species, Landscaping, Forestry program, Wildfire prevention, Wetlands, Surface water, Natural resources enforcement, Outdoor recreation, Volunteer programs, Environmental education, Public relations

3. McCorkle asked about plans for gravel sources to meet construction in 50 year plan.

4. Coleman asked if there were any cultural surveys conducted prior to logging activities. Morris responded, "no". The need for extensive cultural resource inventory was emphasized and culturally modified trees need to be identified in survey "far in advance".

5. Jamie Snyder of University of Alaska Fairbanks, Cooperative Extension Service offered much information on invasive plant species, including several publications/handouts specific to Alaska. Asked about presence of reed canarygrass on EAFB. Recommended caution in reseeding gravel sites to avoid invasives. Cutting should occur before seeds mature to avoid spreading. Recommended invasive species monitoring program. Roger Bernside, USDA-FS, was suggested source for invasive insects. BLM may have boiler plate plan for invasives. Contact: Ruth Gronquist, 1150 University Ave, Fairbanks AK 99709, 907-474-2377, Ruth_gronquist@ak.blm.gov

6. Garner asked if there was an "acceptable landscaping plants" list. Griese responded that there was a base plan and a PSF housing landscaping plan that was reviewed.

7. McCorkle expressed need to get information on projects and resources out to public.

8. Joyner: AK is hosting NW Conference May 06, hosted by Pat for WA, OR, ID, AK

9. McCorkle: Given our presence on the Asian Pacific Flyway, are we likely to have, need to minimize exposure to bird flu?
   Griese: No evidence of this yet.

10. Lamorcoux offered NVE written comments.

11. Meeting adjourned 1130.

Submitted by:
H. Griese

DEPARTMENT OF THE AIR FORCE

PACIFIC AIR FORCES

9 September 2008

MEMORANDUM FOR RECORD

FROM: 3 CES/CEANC
6326 Arctic Warrior Drive
Elmendorf AFB AK 99506-3240

SUBJECT: 2007 Annual Elmendorf Air Force Base Integrated Natural Resources Management Plan (INRMP) Review

1. Meeting was convened at 0930 on 9 January 2008 at Room G81 of the Alaska Lands Information Office, 4th Ave. Anchorage.

2. In attendance were:

NAME	AGENCY	PHONE	E-MAIL
Herman Griese	3 CES/CEANC	552-0200	herman.griese@elmendorf.af.mil
Frances Mann	USFWS	271-3053	frances_mann@fws.gov
Dan Bosch	AK DF&G-Sport Fish	267-2153	dan.bosch@alaska.gov
Amber Bethe	AK DF&G-Sport Fish	267-2403	amber.bethe@alaska.gov
Rick Sinnott	AK DF&G-Wildlife Cons	267-2185	rick.sinnott@alaska.gov
Jessy Coltrane	AK DF&G-Wildlife Cons	267-2811	jessica.coltrane@alaska.gov
Stephen Nickel	AK DNR-Forestry	269-8466	stephen.nickel@alaska.gov
Barbara Mahoney	NOAA-NMFS	271-3448	barbara.mahoney@noaa.gov
David Battle	USARAK-FR DPW -Nat Res.	384-3909	david.battle@us.army.mil
Chris McKee	USARAK-FR DPW -Nat Res	384-3017	chris.mckee@us.army.mil

3. H. Griese provided introductions, the meeting agenda, Elmendorf military mission, and regulatory requirement for annual review of the INRMP.

4. Griese, with input from Fort Richardson DPW-Environmental staff, explained the current uncertain status of joint basing for EAFB and Fort Richardson (JBER). Once details of JBER are established details of new INRMP requirements will be addressed. An EAFB FY11 project has been requested for the new INRMP.

5. Current 3 CES/CEANC Natural Resource staffing levels were reported to be short 3 of 4 positions. Unfilled were the Conservation Enforcement Specialist, the Biological/Forestry Technician and the Fishery Biologist. Enforcement position was approved to be filled and the technician was approved as a term position. The biologist position had been dropped. Ms. Mann (USFWS) expressed concern for the staffing shortage and requirements of the Sikes Act.

6. Griese provided a summary of species monitoring efforts for the year, presented in Appendix G of the 2006 EAFB INRMP.

7. Griese reported all must-fund projects were funded in FY07, and all but the raptor study were on schedule. 2007 projects included the conclusion of the 1) brown bear study; 2) invasive terrestrial plants survey; and 3) moose/BASH vegetation survey. The raptor/raptor habitat study is in the analysis phase. 3 CES/CEANC also participated in the DoD Legacy funded Rusty Blackbird cooperative study with 11 nests found on EAFB. The study will be funded for a second year. Griese reported that the 2008 field season should include a survey of aquatic invasive species, a project to begin control of invasive terrestrial plants and the initiation of a study to document wildlife (moose, wolves and black bears) movement corridors.

8. Griese also identified activities resulting from the KABATA and Port of Anchorage gravel extraction projects to include beluga whale surveys and mitigation projects for lost wetlands. Projects will include Salmon habitat improvements for Sixmile Creek, Sixmile Lake fish ladder and possibly Upper Sixmile Lake spawning habitat.

9. R. Sinnott provided corrections to moose survey results presented in Section 1 of Appendix G. F. Mann suggested that the Migratory Bird Treaty Act be addressed in more detail in the INRMP. No other INRMP edits or additions were presented.

10. S. Nickel encouraged EAFB's continued participation in Tree City USA and solicited participation in the Urban Tree Inventory. He also offered safety training for 3 CES landscapers.

11. EAFB staff was encouraged by F. Mann and C. McKee to participate in spring frog surveys. Suggestions were made to contact Mary Rabe of AK DF&G in Juneau for more information. Griese indicated staffing shortages would likely hinder surveys this spring.

12. Future INRMPS will include BLM and NOAA-NMFS as signatories to help address forestry management and beluga whale issues.

13. No significant direction changes were identified for the EAFB Natural Resource Program and no additional projects were identified as must fund.

14. Meeting was adjourned at 1136.

Herman Griese, YD-02
Wildlife Biologist
(907) 552-0200

Attachment:

1. Meeting agenda
2. Attendance sheet

All INRMP review and coordination requirements as specified in Sec. 2.6 of AFI32-7064 (17 Sept 2004) have been met for FY 2007.

_____

Signature block here: 3 WG/CC or his designee

DEPARTMENT OF THE AIR FORCE

PACIFIC AIR FORCES

07 February 2011

MEMORANDUM FOR RECORD

FROM: 673 CES/CEANC
6326 Arctic Warrior Drive
JBER, AK 99506-3240

SUBJECT: 2010 Annual Joint Base Elmendorf-Richardson Integrated Natural Resources Management Plan (INRMP) Review

1. Meeting was convened at 0840 on 31 January 2011 at Aerie Conference Room of the 333 Raspberry Road, Anchorage office of Alaska Department of Fish and Game.

2. In attendance were:

NAME	AGENCY	PHONE	E-MAIL
Herman Griese	673 CES/CEANC	552-0200	herman.griese@elmendorf.af.mil
Brent Koenen	673 CES/CEANC	552-1609	brent.koenen@elmendorf.af.mil
Chris McKee	673 CES/CEANC	384-3017	chris.mckee@us.af.mil
David Battle	673 CES/CEANC	384-3909	david.battle@us.army.mil
Christopher Garner	673 CES/CEANC	384.3331	christopher.d.garner@us.army.mil
Maureen deZeeuw	USFWS	271-2777	maureen_deZeeuw@fws.gov
Dan Bosch	AK DF&G-Sport Fish	267-2153	dan.bosch@alaska.gov
Gino Del Frate	AK DF&G-Wildlife Cons	267-2198	gino.del.frate@alaska.gov
Jessy Coltrane	AK DF&G-Wildlife Cons	267-2811	jessica.coltrane@alaska.gov
Barbara Mahoney	NOAA-NMFS	271-3448	barbara.mahoney@noaa.gov

3. Agenda:

I. Introductions
II. What is an INRMP and why an annual review?
III. Objectives of the annual review process
IV. Summary of changes included in the 2010 JBER INRMP
  A. Combines EAFB and USAGAK- Fort Richardson 2007 INRMPs
  B. Cook Inlet Beluga whale(CIBW) monitoring (BO requirements)
  C. Incorporating MBTA in program management
V. Review of recent, current and future projects/ biodiversity monitoring
VI. Hot topics for 2011
  A. New JBER INRMP
  B. Programmatic BA
  C. Resumption of Firing ERF- Status
  D. BLM participation in Forestry and vegetation/invasive management

VII. Partner comments/suggestions
VIII. Meeting summary and proposed actions

4. H. Griese initiated introductions and provided the meeting agenda, JBER military mission, and regulatory requirement for annual review of the INRMP.

5. Griese described results of joint basing and development of an interim JBER INRMP by combining approved INRMPs from both installations. Since both installation INRMPs were signed by the primary signatories it was assumed combining them would result in an adequate INRMP until the new JBER INRMP was completed. The contract to develop the new INRMP will be completed in February for a document in 2012. Major changes to the INRMP will be addressed during the revision.

5. Griese pointed out primary changes (in red text) to the Elmendorf INRMP to make that document a JBER INRMP meeting the new mission requirement. Changes included incorporating the MBTA application to consideration for all activities on the installation, identified as a deficiency by USFWS during the 2008 INRMP review. Changes also included the CIBW monitoring and habitat enhancement requirements to avoid the CIBW critical habitat designation, as required in Sec 4 (a) (3) (B)(i) of the ESA.

6. Garner reviewed status of the Resumption of Fire EIS, beluga whale projects and monitoring programs for JBER, listing ongoing and near future projects. B. Mahoney (NMFS) understood the JBER CIBW program as presented meets ESA and MMPA requirements as outlined in the BO and provides a unique opportunity for valuable CIBW research.

7. Griese reviewed the recently combined JBER project list pointing out the success in funding all "must fund" projects. Sixmile Lake/Creek projects not yet funded are awaiting funds from the Port of Anchorage mitigation account through the Corps of Engineers. D. Battle indicated the JBER Wildlife Movement Corridor Study should be completed in early 2012. M. deZeeuw (USFWS) identified the erroneous duplicate listings of the INRMP revision in the project list.

8. Koenen identified success in reaching JBER natural resource trained staffing levels through joint basing. Filling remaining positions will be accomplished through contractual agreements with Colorado State University CEMML. The forester and fishery biologist positions will soon be filled. Koenen also stated an intention to involve BLM in forestry management issues in JBER forestry and vegetation management.

9. McKee and Griese provided a summary of management indicator species monitoring efforts for the year, presented in Appendix G of the interim JBER INRMP.

10. D. Bosch stated he would provide additional edits to the INRMP regarding waterways and fishery details. Bosch identified the Otter Lake rehabilitation as a good candidate project for the POA mitigation funds.

11. Meeting was adjourned at 1040.
Submitted by:
Herman Griese, GS-12
Wildlife Biologist
(907) 552-0200

JBER COMMANDER CERTIFICATION OF ANNUAL REVIEW OF INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

See page iv for 673 ABW Commader signature

APPENDIX K: ADDITIONAL PERSONS COMMENTING ON 2006 REVISION

ELMENDORF AIR FORCE BASE

3rd Civil Engineer Squadron
Gilpin, Wade-Water/Wastewater Program Manager
MaHaffey, John – Contaminated Sites Project Manager
Verplancke, Glen – Remedial Project Manager
Miller, Jim – Element Chief, Environmental Quality
Lawton, Ann – Air Program manager

APPENDIX L. JBER WILDLAND FIRE MANAGEMENT

Pre-Suppression Actions

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

Pre-suppression planning stresses safety, effective fire response planning, and pre-suppression priority.

Personnel 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 apparatus, 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 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, and 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 National Wildfire Coordinating Group certified training 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.

Fire Response Planning

Fire planning is a continuing process. Most fire planning is based on five years of records including both fire weather and fire occurrence. Fire dispatch manually enters fire weather observations into the National WIMS 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 Geographic Information Systems computer 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.

The installation Range Office 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.

Pre-Suppression Priority

Pre-suppression priorities for Fort Richardson lands are established by this Integrated Wildland Fire Management Plan component of the Integrated Natural Resources Management Plan. Pre-suppression priorities are shown for each training area in Volume IV, Prescriptions.

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). All Elmendorf areas are considered full management. The fire management options are:

Critical Management Option – These lands receive maximum detection coverage and are given highest priority for attack response, which is immediate and aggressive. Land owners/managersare 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 – Areas receive maximum detection coverage as well as immediate and aggressive initial attack response. If initial attack is successful, or the fire is controlled within the first burning period, special agency notification is not required. If the fire escapes and requires

additional suppression, affected land owners/managers are notified to develop further fire suppression strategies.

Modified Management Option – This option provides a level of management equivalent to full or limited, depending on conditions. The level of management is assigned on an annual basis each summer. A high degree of protection is provided during critical burn periods, but decreases as risks are diminished. Initial attack action is based on the potential for damage, constraints on affected land, and/or discussions with the land owner/manager. If there is no initial attack, the land owner/manager is informed of the fire status daily, and unmanned fires are monitored.

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 specifically for lands managed by USAG-AK.

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. One small arms range that extends onto withdrawal lands on Fort Wainwright's Yukon Training Area is also listed as a hot zone. Fire in these areas is suppressed through backburning 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. The absence of readily available boundaries should not result in providing protection to very large geographic areas when the land manager only wants to protect a small area or specific site. 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.

Responsibilities

The 673rd Civil Enginnering Squadron, Asset Management Flight, Natural Resources Element chief is responsible for preparing and updating this Integrated Wildland Fire Management Plan, coordinating project funding, and conducting land management responsibilities on all JBER lands, to include:

- Hazard fuel reduction projects
- Fuels maps
- Compliance with cultural resource issues
- Compliance with Integrated Natural Resource Management Plan
- Wildland fire crew to carry out hazard fuel reduction projects, wildfire prevention, and fire suppression on an as-needed basis
- FireWise program with adjacent private land owners and public relation activities
- Determine landscape fire management options according to the Alaska Interagency Wildland Fire Management Plan
- Attend fall fire review meetings
- Completes Wildland Fire Situation Analysis process during wildfires
- Acts as a resource advisor during wildland fires
- Risk assessments for military lands and structures on training lands
- Fire history
- Ecosystem management considerations
- Burned area rehabilitation
- Pre and post wildland fire monitoring requirements
- Fuels and weather monitoring
- Fire planning

The JBER Directorate of Emergency Services, Fire Department is responsible for developing fire indices on a daily basis during fire season. The fire department also provides initial response and limited suppression activities. Under an agreement with the Bureau of Land Management, the State of Alaska Division of Forestry provides fire suppression on JBER.

Fire Prevention 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 of each installation. JBER and Bureau of Land Management Alaska Fire Service 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. The FireWise program will be made available to adjacent landowners along the military's wildland urban interface. During the spring each year an article will be written 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, the media, and the Public Affairs office in a timely manner. Public information notices will be issued at least two weeks in advance of all prescribed fires in newsprint and radio. Each spring the Bureau of Land Management will host public information meetings in Anchorage describing proposed prescribed burning projects for the summer.

FireWise Program

The FireWise program was established nationwide to convey information to private homeowners on how to protect their property from wildfires. The FireWise program mainly focuses on the wildland urban interface, both on JBER lands and on adjacent property owners. JBER has adopted the FireWise principles to evaluate and protect range structures and cantonment area buildings. JBER has also implemented the FireWise program to inform adjacent landowners on how to protect their property from the risk of wildfire. JBER's FireWise program strives to reduce wildfire starts on adjacent property which then have to potential of spreading onto JBER lands, damaging valuable training areas. JBER also implements an aggressive hazard fuel reduction program to reduce the threat of wildfires starting on Air Force lands and spreading to adjacent landowners. Adjacent land ownership is updated annually by going through state and borough land ownership records. The records are added to a Geographic Information System database with attributes relating to owner, contact information, and structures present.

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 game wardens), 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 350-2 or other set standard set by JBER. Range Control has authority to stop live-fire training for noncompliance with any regulation or standard operating procedures. Range Division range inspectors; maintenance, integrated training area management personnel, Directorate of Public Works Environmental, Real Estate and Grounds staff have the responsibility to report fires and/or any observed noncompliance with fire prevention procedures to Range Division safety staff. Commanders and managers must be aware and involved in fire prevention to ensure compliance with the requirements of the Wildland Fire Management Program.

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 make them 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 Integrated Wildland Fire Management Plan. 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.

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 the Army's land and fire managers to include appropriate National Environmental Policy Act documentation, and Section 7 and 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.

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 Department 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 lands 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.

The Fire Danger Rating System is outlined in U.S. Army Alaska Range Regulation 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. The Directorate of Plans, Training, Mobilization and Security Range Control is responsible for conveying and implementing the Fire Danger Rating System to the 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 May through September. Waivers for training restrictions established by the Fire Weather Index are granted by Range Control after consulting with the JBER Fire Chief and the Bureau of Land Management, Alaska Fire Service Military Zone Fire Management Officer. 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 relative 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 C2-11 is used to guide the fire manager to make accurate determinations.

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.

The fire chief has the responsibility for the computation and dissemination of the fire index on a daily basis during fire season. It is disseminated to each post Range office daily, is applicable to that particular area, and is valid for 24 hours. The Bureau of Land Management, Alaska Fire Service provides the fire chief with the information used for computation of the fire index. This information is provided by a series of remote sensors located in each of the respective range areas and provides timely, accurate information regarding the index conditions. Range Control is responsible for obtaining the daily index and disseminating that information to units using the range. The specific methodology for computation of the fire index and other technical aspects of this program will be coordinated annually in a Memorandum of Agreement between USAG-AK Installation Range Office, the Bureau of Land Management, Alaska Fire Service, the USAG-AK

Fire Chief and the United States Air Force. The instigation for this Memorandum of Agreement has an annual suspense of 1 April.

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. Army Range Regulation 350-2. This information is available from each 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.

Fire Danger Rating Restrictions.

Fire Danger Rating	**Restriction**
Low	No restrictions.
Moderate	Ball and blank ammunition may be used without restrictions. 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. Aircraft restrictions: (1) Flares or foreign equivalent will be deployed above 1,500 feet above ground level.
High	Ball and blank ammunition may be used without restriction. Non-aerial pyrotechnics permitted on the small arms complex only. All other use of pyrotechnics is restricted. Ground units will carry required firefighting equipment. Aircraft restrictions. (1) Flares or foreign equivalent will be deployed above 5,000 feet above ground level.
Extreme	Ball and blank ammunition used is restricted to the small arms complex. Use of any pyrotechnics is prohibited. Ground units will carry required firefighting equipment. Aircraft restrictions. (1) Flares or foreign equivalent will be deployed above 5,000 feet above ground level.

Only in rare circumstances may units request a waiver to these restrictions. Waivers to this portion of U.S. Army Alaska Regulation 350-2 represent a direct liability to the Command in terms of the cost for fighting any fire that results from a waived condition. Due the extremely high cost in terms

of operations/training dollars, all requests for waiver will be carefully evaluated before approval is granted. Only those training activities that significantly impact the overall readiness of the command will be considered for waiver. Authority for waivers of fire-index restrictions rests with the commanding officer of JBER or delegate. The local range manager will provide a staff recommendation to the Installation Range Office for G-3 consideration in approving any waivers. Units requesting waivers are primarily liable for costs associated with any fire that results under a waiver. JBER is ultimately responsible for all costs associated with fighting fires resulting from waived conditions.

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 fires may be prohibited during extreme fire danger conditions, check with Range Control for any restrictions. These restrictions apply to both Army and Air Force units.

Fuel Hazard Assessments

Wildfire fuel hazard assessments for structures are performed to standards set by the FireWise program (FireWise 2002). 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 Bureau of Land Management, Alaska Fire Service 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 Geographic Information System 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 Geographic Information System 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.

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: Reducing total amount of fuels so that there is not enough or as much to burn is the first method. Examples of reducing total fuels are prescribed burning, 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 are 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 has successfully conducted prescribed burns on Army training 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 disker. 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 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 alien 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. Grazing is another form of a simple biological control. Livestock such as cattle, goats, horses, and sheep are most commonly used. It is only effective in non-forest fuels where the vegetation is palatable to livestock. The livestock consume the vegetation, thus keeping the amount of fuel in check. Goats prefer forbs and shrubs, but will also eat grass, whereas cattle and horses will eat primarily grass. Sheep will eat both forbs and grass. Steep slopes can be grazed by goats, sheep, and horses, but cattle prefer not to graze slopes over 30%, making them ineffective in mountainous terrain. Livestock control requires extensive enclosures and many times is not cost effective. Complex biological measures involve organisms that will directly destroy the targeted vegetation. Normally these types of treatments are strictly implemented, monitored and tightly controlled and must be coordinated with multiple agencies because they involve the introduction of a non-native biological organism.

Fuel Breaks, Firebreaks, 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 break, the higher the probability and safer is the task of containing the fire.

Fire fuel break establishment consist 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 backline 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 6 to 10meters in width or more, but will sometimes be constrained by terrain. An annual preventive maintenance schedule for all designated firebreaks will be implemented. 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., barren lava, 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.

Use of 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 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, in cooperation with the Alaska Fire Service, conducts prescribed burns on its installations 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.

The Air Force 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 Integrated Wildland Fire Management Plan.

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 Alaska Fire Service prepares the burn plans for JBER. These plans are 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 (Army Regulation 200-3).

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 Army 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 documentation prepared after coordination between the Bureau of Land Management/NFO and the Natural Resources Branch. Alaska Fire Service prepares the burn plans for USAG-AK currently. An MOU or deviation may need to occur once JBER occurs. 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 National Environmental Policy Act documentation.

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 Integrated Natural Resource Management Plan, 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.

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 and/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 burned 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 Wildland Fire Program Manager must personally approve the prescribed fire/prescribed natural fire burn plan and any changes. Only in the absence of the Wildland Fire Program Manager 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 Bureau of Land Management, Alaska Fire Service, State of Alaska, Division of Forestry, or the JBER Fire Department working with the JBER Natural Resource Office prepare burn plans and implement prescribed fires.

Prescribed Fire Ignitions

Two types of ignitions are recognized on JBER lands: management ignition, resulting in a management (deliberate) ignited prescribed fire and training ignitions, resulting in training-ignited prescribed fire. 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 Wildland Fire Program Manager 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.

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. The 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. The Army 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: Bureau of Land
- Management, Alaska Fire Service; Directorate of Public Works; JBER Fire Department; Staff Judge Advocate; JBER Natural Resources Office, Training, Mobilization, Installation Range Office, and any other delegates that may be identified through JBER. Technical experts from outside agencies (i.e., U.S. Forest Service, National Park Service, and State of Alaska, Division of Forestry) 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 taken, 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 and approved prior to declaration of any fire as a training-initiated prescribed fire. The only location that training-initiated prescribed fire will be allowed within JBER is within the 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 Fire Department Chief or the Bureau of Land Management Wildland Fire coordinator 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 Wildland Fire ProgramManager. 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.
- Inter/intra-agency coordination, including joint planning and review where fires may cross multi-agency boundaries.
- 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.
- Analysis and decision process that provides for identification of local approval authority, identification of evaluation criteria for the initial "go/no go" decision, 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 Wildland Fire Program Manager.
- 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.
- 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.

Prescribed Fire Organization

A qualified "Burn Boss," experienced with local weather, fire behavior, fuels, and terrain conditions, shall personally supervise the burning operations on each management-ignited prescribed fire. More complex burns may require an "Ignitions Boss" and a "Holding Boss." A Prescribed Fire Manager qualified to manage prescribed management-ignited and training-initiated prescribed fires shall personally supervise operations. 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. The Prescribed Fire Manager will determine, through the development of the training-initiated prescribed fire burn plan, the organization, expertise, and positions necessary to manage the prescribed natural 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 (National Wildfire Coordinating Group Guide 310-1) to accomplish the required suppression activity. The temporary use of personnel who do not meet these qualifications is appropriate for prescribed fires that escape and are declared wildfires.

The Prescribed Fire Planning Specialist develops the prescribed fire burn plan for each management-ignited or training-initiated prescribed fire. The Prescribed Fire Planning Specialist may determine by the complexity or number of prescribed fires that a Prescribed Fire Manager is necessary. On management-ignited prescribed fires, the Burn Boss is responsible directly to the designated Prescribed Fire Manager for implementation and coordination of the assigned prescribed fire activities. The Prescribed Fire Manager 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 Prescribed Fire Manager. The burn boss has the following responsibilities that cannot be re-delegated:

- Ensuring safety of personnel.
- Supervise 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.
- To make 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.

- Ensure that the fire prescription is met before proceeding with ignition.
- Ensure 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.
- Ensure the availability of suppression resources in the event the prescribed fire escapes and is declared a wildfire.
- Control directly, or through supervision of Ignitions Bosses, the method, rate, and location of firing.
- Maintain immediate and clear communications with the Ignitions Boss and Holding Boss at all times.
- Monitor fire behavior and terminate operations if fire behavior or effects are not according to prescription.
- Accomplish mop-up to predetermined standards in accordance with the prescribed fire burn plan.
- Certify 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 Prescribed Fire Manager. 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, Prescribed Fire Manager, 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 Prescribed Fire Manager, as appropriate, at all times.

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 Army training lands can be controlled with a single attack response vehicle; in others, large numbers of firefighters, fire apparatus, and equipment may be required. Because of this range of resource needs, fire suppression can be relatively simple and straightforward or extremely complex.

Wildfire Incident Coordination

Wildfire suppression follows the incident command system (Fireline Handbook 2004). The Incident Commander is responsible for suppression and management of a wildfire. The military zone of Alaska Fire Service is dedicated to the management of wildfires on JBER lands. The JBER Fire Chief is responsible for all fires and must be informed of the status of new and ongoing wildfires (Support Agreement Alaska Fire Service/U.S. Army Alaska, 1995, will need updated to incorporate all JBER lands). Directorate of Plans, Training, Mobilization, and Security Range

Control is the land manager and must be informed of the status of new and ongoing wildfires (Support Agreement Alaska Fire Service/ U.S. Army Alaska, 1995). The USAG-AK Installation Forester acts as the resource advisor and is a liaison between the fire management staff, the Fire Chief and G3 Range Control. The Alaska Fire Service maintains incident reports for fires on the lands used by USAG-AK. Data from the reports are used to create maps and tables of fires for each installation. Recordkeeping has varied over the years. Some fires, therefore, have more information available than others.

Fire Suppression

Wildfire suppression is conducted by the Bureau of Land Management, Alaska Fire Service and/or the military fire department. The State of Alaska, Division of Forestry may be called upon for assistance as well as local fire departments. Alaska Fire Service is responsible for wildfires on JBER lands. Suppression operations are undertaken on lands with fire management options of critical, full and modified 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, dozers, saws, hand tools, pumps, aircraft and backfiring.

Fire Management Strategies

The Wildland Fire Situation Analysis is a systematic and documented decision process employed to determine the most appropriate suppression strategy for a particular situation. A Wildland Fire Situation Analysis 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 initial 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 1998).

A Wildland Fire Situation Analysis is jointly prepared by the land managers and suppression organization. The land manager approves the Wildland Fire Situation Analysis and any revisions with concurrence of the suppression organization. It is incumbent upon both the land managers and the suppression organization ensures that knowledgeable and qualified representatives are available to assist with preparing and reviewing the Wildland Fire Situation Analysis.

A Wildland Fire Situation Analysis 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, consequences of failure and cost. The selected suppression alternative must clearly identify the suppression objectives. The assigned Incident Commander and the land managers must validate the Wildland Fire Situation Analysis to insure that the selected alternative is still achievable. When the selected alternative or fire/resource management objectives are not met, the Wildland Fire Situation Analysis 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 land manager’s 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 1998).

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. 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 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 alien 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 alien vegetation introduction, through the use of dirty equipment or the creation of invasion routes, creation of erosion problems, protection of cultural sites, 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. 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 BLM managed land and those of adjacent land owners.
- Threatened, endangered, and sensitive species habitats as identified by resource specialist.

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 certified member of the environmental and/or cultural staff shall accompany bulldozers or hand crews constructing fireline in previously undisturbed locations. Minimum impact suppression tactics shall be applied to ensure protection of high valued resources.

Fire Detection and Reporting
All wildfires are to be immediately reported to Range Control. Range Control will then notify the Bureau of Land Management, Alaska Fire Service and/or the military fire department.
Anyone observing a fire in any range area will report it immediately to Range Control by one of the following methods:

- Range Control frequency (FM 38.30).
- Post fire department—dial 911 at all posts.
- Range Control has responsibility for ensuring the fire department and Bureau of Land

Management is notified of the fire. Normally, the fire and emergency services will be notified first then they will, in turn, notify the Bureau of Land Management. However, some situations may warrant simultaneous notification.

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, and in modified management areas after the conversion to limited management option 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.

Public Information
Wildfire progress monitoring is conducted by the Bureau of Land Management, Alaska Fire Service. Updates can be obtained on its 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 Alaska Fire Service. The USAG-AK Installation 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 USAG-AK Installation 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.

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 Bureau of Land Management, Alaska Fire Service; Bureau of Land Management, Anchorage Field Office; JBER Natural Resources Office; State of Alaska Division of Forestry; JBER Fire Chief, and Fort Richardson Range Controls. 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 Alaska Fire Service, which will initiate the fire management option revision process.

Rehabilitation

Firelines 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. Firelines 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.

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.

Minimum Staffing Requirements

The JBER Fire Department and Bureau of Land Management, Alaska Fire Service shall ensure that proper staffing requirements are in accordance with Department of Defense Instruction 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 Fire and Emergency Services staffs two brush trucks and two tenders to provide initial attack capability on both Fort Richardson and Elmendorf.

Firefighter Training

According to the Army Wildland Fire Policy Guidance (2002) all 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 Army personnel must meet the National Fire Prevention Association or National Wildfire Coordinating Group standards for certification. Personnel in the GS-081 job series, 21M career paths, and contractors will meet the certification standards specified in National Fire Prevention Association Standard 1051–Standard for Wildland Fire Fighter Professional Qualifications and National Fire Prevention Association Standard 1002–Standard for Fire Apparatus Driver/Operator Professional Qualifications. All other Army personnel with jobs requiring wildland fire responsibilities may use the National Wildfire Coordinating Group Wildland Fire Qualification Subsystem Guide (PMS 310-1/NFES 1414) to attain the required National Fire Prevention Association certification. Personnel who have learned skills from sources outside wildfire suppression, such as agency specific training programs or training, and work in prescribed fire, structural fire, law enforcement, search and rescue, etc., may not be required to complete specific courses in order to qualify in a wildfire position. However, position task books must be completed for documentation of certification. Personnel mobilized to participate in wildland fire management activities on properties not under Department of Defense jurisdiction, either through mutual aid agreement or other means, must be certified for the expected level of involvement under National Wildfire Coordinating Group standards. A measurable and objective evaluation test (medical exam, step-test, pack test, etc.) will be used to establish physical fitness standards for personnel that participate in wildland fire management activities. Personnel whose job description requires participation in wildland fire management activities as a primary or secondary firefighter on Army installations will meet the pre-employment medical and physical criteria contained in National Fire Prevention Association 1500 – Standard on Fire Department Occupational Safety and Health Program and receive a physical examination as specified in National Fire Prevention Association 1582–Standard on Medical Requirements for Fire Fighters. Medical and physical requirements for personnel not classified as primary/secondary wildland firefighters adhere to the same qualifications as primary/secondary wildland firefighters (U.S. Army Wildland Fire Policy Guidance 2004).

Description of Program

Courses of instruction have been developed by the National Wildfire Coordinating Group for each position in the Wildfire Incident Command System. These courses have been designed to teach the basic information required to gain a general understanding of the position and provide technical knowledge required to perform duties required by the job. These courses are similar to college courses in that they start out at a basic level (100 level basic firefighter skills) and work up through higher levels of the Incident Command System (up to 500 level national Incident Command System skills). Courses are to be taught by trained and qualified instructors, experienced in the skill being taught.

Position Task Books are used to document performance demonstrations. Position Task Books are National Wildfire Coordinating Group published booklets that apply to a specific position in the Incident Command System. A Position Task Book contains all critical tasks that are required to perform a given job. These booklets will be used by wildfire managers and supervisors to keep track of an individual's training experience. There will be a Position Task Book for most positions included in the program. The tasks in each Position Task Book have been established by the

National Wildfire Coordinating Group. Position Task Books have been designed in a format that allows documentation of a trainee's ability to perform each task. Tasks pertaining to tactical decision-making and safety are flagged and require a position performance on a wildfire. Remaining tasks can be evaluated through other means such as simulation or other emergency and non-emergency work. Successful completion of all tasks required of the position will be the basis for recommending certification for a specific position in the Incident Command System.

Certification

Position descriptions for new hires that will participate in wildland fire activities will reflect the expected level of involvement and required certifications. Position descriptions with wildland fire management duties must state if the position qualifies the position holder as a primary or secondary wildland firefighter, as described in Chapter 46 of the Office of Personnel Management Civil Service Retirement System and Federal Employees Retirement System Handbook for Personnel and Payroll Offices. Personnel not classified as a primary or secondary wildland firefighter will perform duty in wildland fire management activities as qualified. Primary and secondary wildland firefighters 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 Assistant Chief of Staff for Installation Management, Facilities and Housing Directorate, is responsible for maintaining and annually updating a list of National Wildfire Coordinating Group certified wildland firefighters for the Army. The installation Wildland Fire Program Manager is responsible for issuing, signing, maintaining, and tracking of National Wildfire Coordinating Group Qualification Card/Incident Command System (also known as "Red Cards") for installation personnel.

Training certification requirements include completion of all required training courses prior to obtaining a Position Task Book. Use of the training courses is required to prepare the employee to perform in the position. An employee will not be given a position assignment unless they have completed all necessary courses and training and applicable Position Task Books. Required training has been held to the minimum required for safe operations on a wildfire. Certification of qualification for a position in the Incident Command System will be documented and tracked by the Wildland Fire Program Manager. Upon completion of each training course, the Wildland Fire Program Manager or training agency/organization will publish a memo to the Director of Emergency Services identifying personnel who successfully completed each course by name, organization, and Incident Command System position that the individual is authorized to hold. A copy of the memo will be provided to the fire department, the individual who successfully completed the training, and the commander or director of organization that the individual belongs to. The Wildland Fire Program Manager is responsible for maintaining all memos and will compile a qualification list of all wildland trained personnel. Additionally, the Wildland Fire Program Manager may document training by issuing an incident qualification card. This is for use in identifying to outside agencies that the individual is qualified to perform in a specified position. The quality of experiences gained in a given position will be closely evaluated when making a determination for advancement to the next higher position or to a different position. The quality of experience may relate to the number of assignments in which an individual performed, the size of the incident, and the complexity of operations overseen. This program will not determine the number of times an individual should serve as a trainee or how many times a given position should be filled before advancement. Determination will be made by the supervisor based on task evaluations, position performance evaluations, and their own judgment on the quality of an individual's experience. Supervisors will submit recommendations for advancement or change in positions to the Wildland Fire Program Manager. Personnel will not be assigned any wildland fire

duties without proper certification. Personnel that have the basic Firefighter 2 can be assigned a training status to higher level positions provided that they are directly supervised by an individual qualified/certified for that position and have completed the necessary coursework.

Unless otherwise noted, the maximum time allowed for maintaining currency is five years for all positions. For example, the currency requirement for a Task Force Leader is to have functioned in a satisfactory manner in the last five years as a Task Force Leader or above. Currency requirements for positions may be met by performing the particular position or any higher position, and any specified lower or similar duties. This type of position experience will be considered as qualifying only if the individual has previously met all training and prerequisite experience requirements for the position. Serving in a position for which the individual is qualified will maintain the currency of a prerequisite position, providing that the individual was previously qualified in that position. Refresher training is also a way to maintain currency. Refresher training will be arranged at various intervals to keep personnel updated on the requirements for specific positions but also new developments within the given field. Recertification includes evaluation of personnel for recertification in cases where position qualifications have been lost as a result of a lack of current experience. A key component in the certification or recertification process is the subjective evaluation by management of an individual's capability to perform in a position. Managers can request recertification of prior qualified personnel by submitting a memo to the Wildland Fire Program Manager stating the reasons for recertification and any mitigating issues that can show the individual has either maintained or relearned skills necessary to accomplish the job. The Wildland Fire Program Manager may design a specific individual refresher course prior to recertification.

Fitness Standards

Personnel whose job description requires participation in wildland fire management activities as a primary or secondary firefighter on Army installations will meet the pre-employment medical and physical criteria contained in NFPA 1500–Standard on Fire Department Occupational Safety and Health Program and receive a physical examination as specified in NFPA 1582–Standard on Medical Requirements for Fire Fighters. Medical and physical requirements for personnel not classified as primary/secondary wildland firefighters shall be as specified in the installation Integrated Wildland Fire Management Plan.

Personnel assigned to wildfire duties are required to meet the following standards for physical fitness. The fitness level that personnel shall meet depends on what Incident Command System position they are assigned. Fitness categories include arduous, moderate, light, and no wildfire duties. Arduous duties involve fieldwork requiring physical performance, over an extended period of time, calling for above-average endurance and superior conditioning. These duties may include a demand for extraordinarily strenuous activities in emergencies under adverse environmental conditions and over extended periods of time. Requirements include running, walking, climbing, jumping, twisting, bending, and lifting more than 50 pounds; the pace of work typically is set by the emergency situation. Moderate duties involve fieldwork requiring complete control of all physical faculties and may include considerable walking over irregular ground, standing for long periods of time, lifting 25 to 50 pounds, climbing, bending, stooping, squatting, twisting, and reaching. Occasional demands may be required for moderately strenuous activities in emergencies over long periods of time. Individuals usually set their own work pace. Light duties mainly involve office type work with occasional field activity characterized by light physical exertion. Activities may include climbing stairs, standing, operating a vehicle, and long hours of work, as well as some bending, stooping, or light lifting. Individuals almost always can govern the extent and pace of

their physical activity. No wildfire fighting duties are normally performed in a controlled environment, such as an incident base or camp.

Four accepted methods of testing physical fitness are (1) a 1 and ½ mile run/walk, (2) the Pack Test, (3) the Army Physical Readiness Test, and (4) the Volume Oxygen Test. For the 1 ½ mile run/walk, the individual, of any age or sex, must run/walk a distance of 1 ½ miles on level terrain within 11 minutes and 40 seconds. The Pack Test is similar to the run/walk, where the individual carries a backpack a prescribed level distance within a prescribed time. For the arduous standard, individuals must carry a 45-lb backpack 3 miles in 45 minutes or less, for moderate, individuals must carry a 25-lb backpack 2 miles in 30 minutes or less, for light, individuals must hike 1 mile in 15 minutes with no pack. The JBER Physical Readiness Tests are also an accepted method if completed per manual guidelines. The Volume Oxygen test determines physical fitness as the measurement of an individual's ability to take in, transport, and use oxygen, which is the most important factor affecting ability to perform sustained arduous work. The best measure for determining health and functional ability is maximal oxygen consumption (Max V02). Max V02 is a measure of the maximum rate that oxygen can be consumed and is expressed in milliliters of oxygen per kilogram of body weight per minute. This ranges from about 20 milliliters for poorly conditioned people to about 80 for endurance athletes such as distance runners and cross-country skiers. Only medical staff may administer the VO2 test. This test requires a clinic with the equipment and trained staff to administer the test. The following Max V02 levels have been set for the four categories of physical fitness:

- Arduous: requires a Max V02 of 45.
- Moderate: requires a Max V02 of 40.
- Light: requires a Max V02 of 35.
- None: no testing is required.

Fire Equipment and Supplies

During critical fire periods (high and extreme), all units using ranges or training areas will carry firefighting materials. Proper firefighting tools include, but are not limited to Pulaskis, shovel, combi-tool, swatters, portable water extinguishers, and a water supply such as full water trailers or drums. Units will be prepared to assist in suppressing small range fires (up to 100 square feet) that might occur in the training areas. The requirements for training and having equipment on hand is intended for ground-based units that are at the greatest risk of being involved in a fire situation.

More specific information for the Fort Richardson section of JBER and Army ranges can be found at Fort Richardson USAG-AK 2007-2011 Integrated Natural Resources Management Plan Volume II, Annex C Forest and Wildland Fire Management C2.2.2.6.4 or U.S. Army Alaska Regulation 350-2. Fire restriction information can be found in Appendix X of this report.