JOINT BASE LEWIS-McCHORD

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Effective
2019 until revised

Joint Base Lewis-McChord
Integrated Natural Resources Management Plan

Prepared by

Joint Base Lewis-McChord
Directorate of Public Works
Environmental Division

January 2019

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503

MAY 29 2018

In Reply Refer To:
01EWFW00-2018-CPA-0013

Paul Steuke
Chief, Environmental Division
Department of the Army
Directorate of Public Work
ATTN: Environmental Division (D. Clouse)
2012 Liggett Avenue, Box 339500
Joint Base Lewis-McChord, Washington 98433-9500

Dear Mr. Steuke:

This letter is in response to your letter, dated April 30, 2018, requesting the U.S. Fish and Wildlife Service's (USFWS) approval and signature of the updated 2017 Integrated Natural Resource Management Plan (INRMP) for Joint Base Lewis-McChord (JBLM). This letter has been prepared under the authority of, and in accordance with, the Sikes Act (16 U.S.C. 67a *et seq.*), Sikes Act Improvement Amendments, and the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Per the Sikes Act (16 U.S.C. 670(b)(2)), the USFWS and state fish and wildlife agencies are to cooperate with and provide technical assistance to Department of Defense installations in the preparation of their INRMPs. Since the listing of the streaked horned lark (*Eremophila alpestris strigata*), Taylor's checkerspot butterfly (*Euphydryas editha taylori*), four subspecies of the Mazama pocket gopher (*Thomomys mazama*), and the Oregon spotted frog (*Rana pretiosa*), the USFWS has been working closely with the Washington Department of Fish and Wildlife (WDFW) and environmental resources staff at JBLM on updating the INRMP and various appendices related to species and habitat management plans. Revisions and approvals of the Endangered Species Management Plans, in particular, were instrumental in supporting the exemption of critical habitat on the base when these species were listed in 2014.

The USFWS considers three criteria to determine if an INRMP provides adequate management or protection of natural resources. These three criteria are whether the INRMP: 1) provides a conservation benefit to the species; 2) gives assurances that it will be implemented; and 3) provides assurances that conservation efforts will be effective. To evaluate whether INRMPs adequately address these criteria, we look for adequacy of information concerning threatened and endangered species, critical and suitable habitats, wetlands, migratory birds, contaminants, and law enforcement. Because there is no designated critical habitat on JBLM, there was no need for us to comment on critical habitat.

The USFWS and WDFW have reviewed and provided comments on the Endangered Species Management Components (ESMC) of the INRMP, the INRMP and Appendices related to conservation of prairies and sensitive habitats on the installation. We were provided an electronic copy of the letter requesting our approval and signature, along with the final INRMP and Appendices via secure file transfer on May 7, 2018. We received a copy of the signed signature page from the WDFW on May 23, 2018.

As requested, the State Supervisor of the Washington Fish and Wildlife Office has signed the signature page, providing our concurrence with the 2017 Integrated Natural Resource Management Plan for Joint Base Lewis-McChord. We appreciate JBLMs efforts to protect and manage the natural resources on the installation and look forward to continued collaboration with your staff to ensure that listed species and sensitive habitats are protected and military mission needs are being met on the installation. If you have further questions, please contact Martha Jensen at (360) 753-9000 or Brad Thompson at (360) 753-4652, of my staff.

Sincerely,

Eric V. Rickerson, State Supervisor
Washington Fish and Wildlife Office

Enclosure

cc:
WDFW, Olympia, WA (M. Curtis)
WA Military Department, Camp Murray, WA (E. Murphy)

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
JOINT BASE LEWIS-MCCHORD, WASHINGTON

APPROVALS

This Integrated Natural Resources Management Plan meets the requirements of the Sikes Act (16 U.S.C. 670a *et seq.*), as amended, and the Endangered Species Act Section 4(a)(3).

Nicole M. Lucas
Colonel, LG
Joint Base Commander
Joint Base Lewis McChord, Washington

3/14/19
Date

Eric V. Rickerson, State Supervisor
Washington Fish and Wildlife Office
U.S. Fish and Wildlife Service
Lacey, Washington

5/24/18
Date

Joe Stohr,
Director
Washington Department of Fish and Wildlife
Olympia, Washington

5/23/18
Date

EXECUTIVE SUMMARY

The Integrated Natural Resources Management Plan (INRMP) is a requirement of the Sikes Act, Department of Defense (DoD) Directive 4715.3 and Army Regulation (Reg.) 200-1. This INRMP implements the program providing for the conservation and rehabilitation of natural resources on lands used for military mission activities on Joint Base Lewis-McChord (JBLM) (excluding Yakima Training Center, which has their own INRMP due to the unique needs and disparate habitats of each Installation) to ensure the preparedness of the Armed Forces. This document is an update of the 2000 INRMP. A review of the 2000 INRMP was completed with a draft update produced in 2007, but it was never finalized or signed. The reason for not finalizing it was two-fold: (1): insufficient resources on behalf of both the Army and the co-signing regulatory agencies; and (2): the 2005 Base Realignment and Closure decision to combine McChord Air Force Base with Fort Lewis (which was to be effective in 2010) made the 2007 draft obsolete. It was determined best to start anew with a Joint INRMP after the Installations were combined.

Shortly after the base realignment went into effect, the U.S. Fish and Wildlife Service (USFWS) filed a multi-year work plan as part of a settlement agreement to address a large backlog of listings, which included several species found on JBLM. The proposed listing of the Streaked horned lark (*Eremophila alpestris strigata*), three subspecies of the Mazama pocket gopher (*Thomomys mazama pugetensis, T.m. glacialis, T.m. tumuli, and T.m. yelmensis*), Taylor's checkerspot butterfly (*Euphydryas editha taylori*), and the Oregon spotted frog (*Rana pretiosa*) and associated proposed critical habitat designations triggered the need for the base to update their Endangered Species Management Component (ESMCs). The updated ESMCs, which are an integral part of the INRMP, provided adequate assurances that actions taken by JBLM adequately protect and benefit listed species. As a result, the base was exempted from critical habitat designation.

Goals and Requirements

The overall goal of the INRMP, including the associated ESMC of the INRMP, is to support the military mission and provide for no net loss in the capability of JBLM lands to support training while managing for the recovery of listed species. As such, it ensures that natural resources under the stewardship of the Army at JBLM are managed to support and be consistent with the military mission, while protecting and enhancing those resources for multiple use, sustainable yield, and biological integrity.

The Sikes Act requires that the INRMP provide for:

- No net loss in the capability of lands to support the military mission; fish and wildlife management, land management, forest management, and fish and wildlife-oriented recreation;

- Fish and wildlife habitat enhancement or modifications;

- Wetland protection, enhancement, and restoration, where necessary for the support of fish, wildlife, or plants;

- Integration of, and consistency among, the various activities conducted under the INRMP;

- Establishment of specific natural resource management goals and objectives and time frames for proposed actions;

- Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources;

- Public access to JBLM as necessary or appropriate for the use described above, subject to requirements necessary to ensure safety and military security;

- Collection of fees from special Installation permits and the administration, and expenditures of these fees will provide for the protection, restoration, conservation, and management of fish and wildlife, and sustainable plants and natural resources on Federal DoD lands;

- Enforcement of applicable natural resource laws and regulations; and

- Such other activities as the Secretary of the Army determines appropriate.

Contributors, Guidance Documents, and Issues

Within JBLM, various programs within the Environmental Division, and the Integrated Training Area Management Program within Training Division/Range Control, are tasked with most aspects of preparing and implementing the INRMP. The INRMP is developed in cooperation with the USFWS and Washington Department of Fish and Wildlife (WDFW) with the goal that it will reflect the mutual agreement of these agencies and the Army concerning conservation, protection, and management of fish and wildlife resources on JBLM.

The INRMP incorporates information and guidance presented in numerous planning documents and programs, including: the ESMCs, Real Property Master Plan, and Installation regulations, the Installation Sustainability Implementation Plan, the Army Compatible Use Buffers (ACUB) Program, the Fish and Wildlife Management Plan, the Prairie Management Plan, the Wildland Fire Plan, the Outdoor Recreation Plan, Range Complex Master Plan, Bird/Wildlife Aircraft Strike Hazard (BASH) Strategy, and the Integrated Pest Management Plan (IPMP).

Key issues identified by JBLM natural resource managers and members of the training community, as well as outside stakeholders, include the need to reflect the primacy of training and the military mission in the INRMP; ensuring appropriate staff and funding are available to implement the plan; improving coordination and deconfliction among the different resource management programs; addressing the limitations in the Army's ability to control invasive species; and improving the consistency of Down-Range Law Enforcement resources.

JBLM Military Mission and Land Use

JBLM is an approximately 90,000-acre military reservation located in Western Washington. The military mission at JBLM is to operate a state-of-the-art power projection and sustainment platform for war fighters by providing them with superior training support and infrastructure. JBLM is a major facility for weapons qualification, field training, and aviation training. Training activities that characterize land use on the installation include on/off-road vehicle movement, gunnery practice, digging activities, unit assembly, helicopter flights, C-17 flights, and unit deployment exercises. The principal maneuver units are the Stryker Brigade Combat Teams. Non-military activities on the Installation include, but are not limited to, Air Expo, recreation, commercial timber harvest, nature walks, fish hatchery operations, and tribal members' traditional way-of-life.

Ultimately, the military mission is dependent on the natural resources at JBLM. Installation lands, which include forests, prairies, Oregon white oak (*Quercus* garryana) and Ponderosa pine (*Pinus ponderosa*) communities, and wetland/aquatic habitat, support the military mission and Army/Air Force training activities. Natural resources are managed to ensure the sustainability of training lands, and Army compliance with all applicable laws and regulations.

Future Management

Increases in force structure and training have increased the need for natural resources management to ensure mission and species sustainability.

JBLM will continue to manage its forests sustainably, in adherence with Forest Stewardship Council principles and criteria. Management actions will primarily consist of silvicultural treatments to develop and maintain late-successional forests and Northern spotted owl (*Strix occidentalis caurina*) habitat characteristics. The monitoring and management of root rot, and maintain discontinuous fuels for fire prevention. Scot's broom (*Cytisus scoparius*) in forest openings will be controlled using various methods. Management for Bald eagles (*Haliaeetus leucocephalus*) will include buffer zones and enhancement of food source habitat.

Prairies and oak woodlands are the focus of many of the Army's natural resource management efforts. JBLM will maintain and improve the current ecological condition of its prairies and improve the ecological conditions of Oak and Ponderosa pine

communities. The use of prescribed fire is the cornerstone of prairie, Oak, and Pine ecosystem management. Fire plays a key role in these ecosystems that cannot be achieved through other management actions. Control of Scot's broom and other invasive species is also an important aspect of prairie, Oak, and Pine habitat management. Other important management activities include repairing training-damaged lands by planting native species, avoiding high quality prairie habitat during soil disturbing activities, and removing conifers that are encroaching on prairie, Oak and Pine habitat. Additional management for listed and candidate species that occur in the prairie, Oak and Pine ecosystems is detailed in the ESMCs.

The primary means of wetland management is enforcement of regulations that protect wetland habitat, including limiting activities that can occur within 50-meters of wetlands. Additional management includes control of invasive species. These activities will help protect populations of water Howellia, federally listed amphibians, and anadromous fish, and other species of concern, with additional management dictated in ESMCs.

Implementation

The success of the INRMP in meeting natural resource management goals and objectives depends on successful implementation of the strategies identified to achieve these goals.

The INRMP will achieve no net loss to the military mission by sustaining training lands through maintaining functional ecosystems. Multiple programs, with the potential for overlap in efforts, manage natural resources on JBLM. Collaborative planning among resource management programs is necessary. The Land Use Deconfliction process (as described in 1.7.1) helps integrate land use and natural resource decisions. In addition, the ACUB Program (as described in section 3.6.1) represents efforts by the Army to remove regional threats to candidate species so training will not be impacted further.

The primary JBLM Geographical Information System (GIS) database, maintained and operated by Public Works, is a repository of data layers used as inputs for planning and natural resource management purposes. All JBLM personnel can access GIS database information, which makes deconfliction among programs possible, although there is still no required process for doing so.

Pursuant to the Sikes Act, DoD, USFWS, and Washington State Fish and Wildlife agencies must review INRMPs as to operation and effect on a regular basis, but no less than every five years. This review must be documented and signed by these parties. The review will determine whether existing INRMPs are being implemented to meet Sikes Act requirements and are contributing to the conservation and rehabilitation of natural resources on military Installations. At a minimum, reviews shall assess conservation goals, objectives, and the status of the Natural Resources Conservation Metrics.

The requirement to review the INRMP on a regular basis, but no less often than every five years, does not mean the INRMP must be revised when it is reviewed. The Sikes Act specifically directs that the INRMP be reviewed "as to operation and effect," emphasizing that the review is intended to determine whether the existing INRMP is being managed to meet the requirements of the Sikes Act and contribute to the conservation and restoration of natural resources on military Installations in accordance with the Sikes Act.

Under the Sikes Act, the Garrison Commander is authorized to implement an Installation permit fee program that must be used for the protection, conservation, and management of fish and wildlife including habitat restoration activities in accordance with the INRMP. The Installation and implementation of the IMCOM supported iSportsman program will provide long term funding that must be used specifically on the installation where fees are collected. No more than ten percent of collected fees are to be used by Directorate of Family, Morale, Welfare and Recreation (DFMWR) for the administration of the program whereas the rest of the fund – ninety percent will be managed, administered and expended by the DPW Fish and Wildlife staff for the benefit, protection, conservation, enhancement, and enforcement of INRMP requirements. All funds are required to be deposited into the Wildlife Conservation, Military Reservations Army account 21X5095.

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Appendices

Acronyms and Abbreviations

ACUB
Army Compatible Use Buffers

AFB
Air Force Base

AIA
Artillery Impact Area

BASH
Bird/Wildlife Aircraft Strike Hazard

BGEPA
Bald and Golden Eagle Protection Act

FIP
Forest Inventory Program

CIA
Central Impact Area

CUA
Controlled Use Area

Dbh
Diameter at breast height

DoD
Department of Defense

DFMWR
Directorate of Family, Morale, Welfare, and Recreation

DPTMS
Directorate of Plans, Training, Mobilization, and Security

DPW
Directorate of Public Works

Acronyms and Abbreviations - Continued

ECOLOGY
Washington State Department of Ecology

ED
Environmental Division

EO
Executive Order

EPA
Environmental Protection Agency

ESA
Endangered Species Act

ESMC
Endangered Species Management Component

FAA
Federal Aviation Administration

FL
Fort Lewis

GAAF
Grey Army Airfield

GIS
Geographic Information System

GPS
Global Positioning System

GHG
Greenhouse Gases

ICRMP
Integrated Cultural Resource Management Plan

IFR
Instrument Flight Rules

Acronyms and Abbreviations - Continued

INRMP
Integrated Natural Resource Management Plan

IPMP
Integrated Pest Management Plan

ISI
Intensive Stand Inventory

ITAM
Integrated Training Area Management

JBLM
Joint Base Lewis-McChord

LIDAR
Light Detection and Ranging

LRAM
Land Rehabilitation and Maintenance

MS4
Municipal Separate Storm Sewer System

MBTA
Migratory Bird Treaty Act

MOU
Memorandum of Understanding

NAAQS
National Ambient Air Quality Standards

NEPA
National Environmental Policy Act

NMFS
National Marine Fisheries Service

NPDES
National Pollutant Discharge Elimination System

Acronyms and Abbreviations - Continued

RTA
Rainier Training Area

RCMP
Range Complex Master Plan

REPI
Readiness and Environmental Protection Initiative

RTLA
Range and Training Land Assessment

SGCN
Species of Greatest Conservation Need

SIA
South Impact Area

SRA
Sustainable Range Awareness

SRP
Sustainable Range Program

TA
Training Area

TRI
Training Requirements Integration

USFWS
U.S. Fish and Wildlife Service

VFR
Visual Flight Requirement

WDFW
Washington Department of Fish and Wildlife

1.0. OVERVIEW

1.1. Purpose

The Sikes Act, as amended by the Sikes Act Improvement Act of 1997 requires the Secretary of Defense to carry out a program to provide for the conservation and rehabilitation of natural resources on lands used for military mission activities, consistent with the use of those lands to ensure the preparedness of the Armed Forces. For JBLM, an INRMP, prepared in cooperation with the USFWS, National Oceanic and Atmospheric Administration's, National Marine Fisheries Service (NMFS) and WDFW, serves as the means of implementing this program. Section 4(a)(3) of the Endangered Species Act (ESA) added the following "The Secretary [of the Interior] shall not designate as critical habitat any lands or other geographical areas owned or controlled by the DoD, or designated for its use, that are subject to an Integrated Natural Resources Management Plan prepared under Section 101 of the Sikes Act (16 U.S.C. 670a(B)(i)), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation." This INRMP serves this purpose for listed species and for candidate and rare species that may become listed in the future.

The purpose of this document is to prescribe a method for Natural Resources Management, which provides for no net loss in the capability of JBLM lands to support the military mission while managing for the recovery of listed species. As the approach to accomplishing this includes management strategies that produce healthy habitats and ecosystems, actions to enhance other rare, candidate, and legally protected species will be pursued as a goal, dependent upon available resources. This is consistent with species conservation, recovery, and the military mission at JBLM. Consistent with Federal stewardship requirements, this document provides the basis and criteria for protecting and enhancing natural resources at JBLM, and, in some cases, outside of JBLM, while ensuring no net loss of military mission. This document serves as a reference manual for Natural Resources Management, and a guide for sound stewardship for various programs that is fully integrated into all other management activities. While this plan will not resolve all existing and/or future environmental issues, it provides the guiding strategy, personnel requirements, and means to minimize and work toward resolution of such issues.

Federal law (Sikes Act, ESA, etc.) and Fort Lewis (FL) Regulations 200-1 and 420-5 support requirements established in this INRMP. Applicable to all civilian and military activities that occur at the Installation, whether they are under the JBLM command or a tenant organization, as well as units training or mobilizing on the Installation.

1.2. Regulatory Authority

The Sikes Act Improvement Act of 1997 (16 USC 670 at et seq.), as amended, requires the Secretary of Defense to carry out a program to provide for the conservation and rehabilitation of natural resources on lands used for military mission activities, to ensure sustainable multipurpose use of those resources, and to provide public access to

military lands, as consistent with safety requirements and the military use of those lands. This INRMP was developed in accordance with the laws and regulations in Table 1-1.

1.2.1. Compliance and Stewardship Requirements

In addition to complying with all applicable, Federal, State, and local laws and regulations that govern land and natural resource management (Table 1-1), the INRMP assures sound stewardship of the public lands entrusted to the Army. Stewardship goes beyond the compliance requirements by committing JBLM to protecting, conserving, and enhancing the native species and habitats.

Table 1-1. Natural Resources Laws, Regulations, and Policies

Laws, Regulations, and Policies
Sikes Act Amendment Act of 1997 (16 USC 670)
Endangered Species Act of 1973 (16 USC 1531-1544), as amended
National Environmental Policy Act of 1969 (42 USC 4321), as amended
Clean Air Act of 1970 (42 USC 7401)
Clean Water Act of 1972 (33 USC 1251)
Coastal Zone Management Act of 1972 (16 USC 1451), as amended
Rivers and Harbors Act of 1899 (33 USC 403)
Energy Independence and Security Act of 2007 (42 U.S.C. § 17094)
Fish and Wildlife Coordination Act of 1985 (16 USC 661)
Migratory Bird Treaty Act of 1918 (16 USC 703), as amended
Migratory Bird Hunting and Conservation Stamp Act of 1934 (16 USC 718), as amended
Marine Mammal Protection Act of 1972 (16 USC 1361), as amended
Magnuson Fishery Conservation and Management Act of 1934 (PL 94-265), as amended
Federal Noxious Weed Act of 1974 (7 USC 2801), as amended

Laws, Regulations, and Policies
Federal Insecticide, Fungicide, and Rodenticide Act of 1996 (7 USC 136), as amended
National Historic Preservation Act of 1966 (16 USC 470)
Archaeological Resources Protection Act of 1979 (16 USC 470 aa-mm), as amended
Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001)
American Indian Religious Freedom Act of 1944 (42 USC 1996), as amended
Hunting, Fishing, and Trapping on Military Lands, 28 February 1958 (Public Law 85-337)
Environmental Effects of Army Actions, 1 July 1999 (32 CFR 651)
EO 11514 Protection and Enhancement of Environmental Quality, 5 March 1970
EO 11987 Exotic Organisms, 24 May 1977
EO 11988 Floodplain Management, 10 August 1966
EO 11990 Protection of Wetlands, 24 May 1977
EO 12962 Recreational Fisheries, 7 June 1995
EO 13007 Cultural Resources, 24 May 1996
EO 13112 Invasive Species, 3 February 1999
EO 13186 Responsibilities of Federal Agencies to Protect Migratory Birds, 10 January 2001
EO 13352 Facilitation of Cooperative Conservation, 26 August 2004
MOU between the DoD and the USFWS, Subject: Ecosystem-based Management of Fish, Wildlife and Plant Resources on Military Lands, 1999
DoD Directive 4700.4, Natural Resources Management Program, 24 January 1989
DoD Directive 4715.1, Environmental Security, 24 February 1996
DoD Instruction 4150.7, DoD Pest Management Program , CH2, 31 August 2018

Laws, Regulations, and Policies
DoD Instruction 4715.03, Natural Resources Conservation Program, CH2, 31 August 2018
Army Reg. 200-1, Environmental Protection and Enhancement, 13 December 2007
Army Reg. 350-19, The Army Sustainable Range Program, 30 August 2005
FL Reg. 200-1, Environmental Protection and Enhancement, 1 November 2004
FL Reg. 350-30, Fort Lewis Range Regulations, CH1, 23 November 2005
FL Reg. 420-5, Procedures for the Protection of State and Federally Listed Threatened, Endangered, Candidate Species, Species of Concern, and Designated Critical Habitat, 9 August 2004
JBLM Reg. 215-1, Hunting, Fishing and Camping, 19 March 2018
Army Wildland Fire Policy Guidance, August 2002

1.3. Integrated Natural Resource Management Plan Vision

The Sikes Act requires the Secretary of Defense to carry out a program to provide for the conservation and rehabilitation of natural resources on lands used for military mission activities, consistent with the use of those lands to ensure the preparedness of the Armed Forces. To the maximum extent practicable, the programs and practices described in the INRMP are based on scientifically sound conservation procedures and techniques, and use scientific methods and an ecosystem-based approach to attain conservation management goals.

As stated in Department of Defense Instruction 4715.03 – Natural Resources Conservation Program[1], the goal of 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, this approach is intended to maintain and improve the sustainability and biological diversity of terrestrial and aquatic ecosystems while supporting the environment required for realistic military training operations.

In order to effectively provide a plan that meets the aforementioned goals, the INRMP must integrate all plans, programs, and projects that affect natural resources (e.g., Training Plans, Master Plans, IPMPs, Endangered Species Management Plans, Grounds Maintenance Plans, and land use activities) to ensure their compatibility.

[1] Military regulations referenced in this document are provided on an accompanying CD.

Changes addressed in the INRMP include new or updated regulations and/or management plans that affect natural resources management on, and in some cases off, JBLM, changes in species' status, changes in program goals, new monitoring data, and other changes and new information that affect or pertain to natural resources and their management on JBLM.

A thorough discussion of cultural resources management may be found in the JBLM Integrated Cultural Resources Management Plan (ICRMP) (JBLM, 2012), which is incorporated by reference. In addition, Yakima Training Center (a sub-installation of JBLM) has its own Cultural and Natural Resource Management Plan that is not covered in this document, due to the uniqueness of its habitat and distance from JBLM.

1.4. Strategic Goals and Objectives

The Sikes Act lists four main goals for the INRMP:

1. To conserve and rehabilitate natural resources on the installation;

2. To provide for sustainable multipurpose use of the resources, including hunting, fishing, and non- consumptive uses; and

3. To provide for public access to the installation to facilitate its use, subject to safety and military security requirements, and

4. To provide a mechanism for the collection of installation special use/access fees to support requirements outlined in the INRMP.

- Maintaining the capability of JBLM lands to support the military mission (no net loss).
- Fish and Wildlife management, land management, forest management, and fish- and wildlife - oriented recreation.
- Fish and wildlife habitat enhancement or modifications.
- Wetland protection, enhancement, and restoration, where necessary for support of fish, wildlife, or plants.
- Integration of, and consistency among, the various activities conducted under the plan.
- Establishment of specific natural resource management goals, objectives, and time frames for proposed actions.

- Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources.

- Public access to JBLM as necessary or appropriate for the use described above, subject to requirements necessary to ensure safety and military security.

- Enforcement of applicable natural resource laws (including regulations); and

- Such other activities as the Secretary of the Army determines appropriate.

The INRMP is developed and prepared in cooperation with the USFWS, NMFS, and WDFW, with a goal that it will reflect the mutual agreement of these agencies and the DoD concerning conservation, protection, and management of fish and wildlife resources on JBLM.

1.5. Review and Revision Process

Section 101(b)(2) of the Sikes Act [16 USC 670a(b)(2)] states that each INRMP "must be reviewed as to operation and effect by the parties thereto on a regular basis, but not less often than every five years." At JBLM, annual reviews determine whether the existing INRMP is being implemented to meet the requirements of the Sikes Act and is effectively contributing to the conservation and rehabilitation of natural resources on military installations. Because the Sikes Act specifically directs that the INRMP be reviewed "as to operation and effect," the annual review provides a mechanism for incorporating adaptive management into the INRMP. Integrated Natural Resource Management Plans are intended to be flexible documents, the annual review allows natural resource managers to assess and reallocate project priorities, as needed, to address changes that occurred over the past year. During the annual review process, INRMP projects not completed due to inadequate funding, manpower, a change in mission requirements, and/or other circumstances, will be reviewed in accordance with the INRMP' s goals to determine where adjustments are necessary.

Although the Sikes Act specifies that formal review of the INRMP occurs no less often than every five years, DoD policy requires installations to review INRMPs annually *in cooperation* with the other parties to the INRMP (USFWS, NMFS, and WDFW). Documentation of the INRMP review should be recorded and maintained. No less often than every five years, the annual review should discuss whether a revision or addendum to the current INRMP is required. Changes in species listings, new or updated regulations, and/or management plans, and/or changes in program goals that affect natural resources and their management are examples of changes that could validate the need for an INRMP revision. If the INRMP has been in effect for five years and all signatory parties agree there are no major changes, the current INRMP will stay in effect.

Although not expressly required by the Sikes Act, written documentation will be jointly executed or in some way reflects the parties' mutual agreement.

1.5.1. Implementation

Implementation of the INRMP is subject to the availability of funding and manpower and to the mission requirements. Implementation of the INRMP involves the execution of all "must fund" projects and activities (i.e., those that are required to meet recurring natural and cultural resource management requirements or current compliance needs) in accordance with the specific time frames identified in the INRMP. Therefore, the INRMP will be considered fully implemented if JBLM does all of the following:

- Actively requests, receives, implements, and uses funds for "must fund" projects and activities.
- Ensures that sufficient numbers of professionally trained natural resources management personnel are available to perform the tasks required by the INRMP.
- Coordinates annually with cooperating offices.
- Documents specific INRMP action accomplishments undertaken each year.
- Install and implement the iSportsman program Installation wide under the management of the DPW Fish and Wildlife staff.

1.5.2. Project Funding Criteria

At the Federal level, funds for different programs are made available to military Installations under the Defense Appropriations Act, which is enacted by Congress every year. Funding for environmental projects, including INRMP activities, comes mainly from an Operations and Maintenance budget. Funding for Integrated Training Area Management (ITAM) projects comes from a separate budget, which is allocated by the Office of the Deputy Chief of Staff for Operations and Plans. The U.S. Army Installation Management Agency is responsible for determining how appropriated funds are allocated among Army Installations. Funds from alternative sources (i.e., non-appropriated funds) are used to support INRMP actions and initiatives as well.

1.6. Responsibilities

Preparation and implementation of the INRMP is the responsibility of numerous installation personnel. The Joint Base Commander has ultimate responsibility and authority for all aspects of the installation, including natural resources management. This includes ensuring that the INRMP is developed, implemented, and fully supported at the installation. Under the Joint Base Commander, the Environmental Division (ED) within the Directorate of Public Works (DPW), serves as the primary proponent for

developing and implementing the INRMP, with support from the ITAM Program within the Directorate of Plans, Mobilization, Training, and Security (DPTMS) Training Division/Range Control.

1.6.1. Environmental Division

DPW Fish and Wildlife, Forestry, and the Installation Pest Management Coordinator are all within ED. These branches are responsible for fish, wildlife, forestry, threatened and endangered species, and pest management. ED activities and responsibilities support the mission through the following goals:

- Enhance military mission opportunities through deliberate and responsible management activities when needed and through education and guidance;
- Comply with all Federal and State laws, mandates, and regulations that apply to JBLM;
- Make ecosystem management the basis for land management decisions;
- Generate revenue to support future land management practices; and
- Foster and maintain positive community relations.

1.6.2. Directorate of Plans, Mobilization, Training and Security Training Division/Range Control/Integrated Training Area Management Program

Range Control provides access to ranges and training lands to all units and directorates on the installation. The ITAM Program within the DPTMS Training Division/Range Control, serves as the Army's comprehensive approach to land utilization for training. ITAM provides for the monitoring and maintenance of Army training land in order to ensure quality training and realism, reduce environmental damage, and enhance the public image of the Army as a conscientious land steward. ITAM is comprised of Training Requirements Integration (TRI), Range and Training Land Assessment (RTLA), Land Rehabilitation and Maintenance (LRAM), and Sustainable Range Program (SRP) Geographic Information System (GIS) components. The ITAM coordinator is the major player in keeping INRMP activities compatible with military training needs. The ITAM Program provides a management and decision-making process to integrate Army training and other mission requirements for land use with sound natural resources management. It integrates elements of operational, environmental, master planning and other programs that identify and assess land use alternatives. The intent is to manage the lands in a sound manner to ensure no net loss of training capabilities and support current and future training and mission requirements. The ITAM Program supports sound natural and cultural resources management practices and stewardship of land assets to support training, testing, and other installation missions. The ITAM staff must repair training lands. However, due to funding criteria, their natural resource management efforts are focused on areas that are most intensively used for training or areas formerly used for training.

1.6.3. Joint Base Lewis-McChord Police Department

The JBLM Conservation Law Enforcement provides support and enforcement of regulations in training areas, including those that pertain to the protection of natural resources (firewood, fishing, and hunting regulations). Close coordination between ED Program Managers and the JBLM Down-Range Law Enforcement is essential in achieving INRMP goals. In order to ensure compliance with Federal mandates the fees collected from the iSportsman program may be used to support required training for Conservation Law Enforcement so they may enforce INRMP requirements.

The primary mission of the Conservation Law Enforcement Section is to deter trespassers on training areas and investigate violations of JBLM regulations, Washington State law, and Federal law committed by both civilians and military units. Because civilians who enter the Installation without permission commit the vast majority of violations in laws and regulations pertaining to natural resources protection, limiting trespassing is the most effective means of reducing damage to natural resources caused by unauthorized activities. Common violations include poaching, illegal dumping, off-road vehicle driving, and illegal harvest of forest products. Conservation Law Enforcement staff will continue to keep statistics on how many illegal activities they address down-range on a weekly basis. These infractions are separated into categories (e.g., dumpsites, abandoned vehicles) so that law enforcement personnel know which activities are the biggest problems. This type of monitoring will track the frequency of violations. In addition, it will help determine where and how staff may best be used for greatest effect.

Law enforcement personnel communicate with natural resources staff about down-range issues, as appropriate. Field crews report any suspicious or illegal activity that they observe in the training areas, and law enforcement personnel tell natural resource personnel about new damage to natural resources observed during patrols. ‘Spot Reports’ serve as a communication tool between the programs, which is used to convey enforcement and/or natural resources issues or concerns identified down-range. In addition, law enforcement personnel communicate frequently with regular users of the installation (training units, WDFW staff, recreational users, etc.) who help report illegal activity.

Since illegal use of training lands spikes when the frequency of patrols decreases, the primary objective for meeting the INRMP goals is to establish a consistent and frequent law enforcement presence in training areas. This objective, however, is highly dependent on the number of personnel available, which changes frequently. An increase in permanent law enforcement personnel is essential for complying with the INRMP.

1.6.4. Directorate of Family and Morale, Welfare and Recreation

DFMWR oversees the Outdoor Recreation Program at JBLM. The Outdoor Recreation Program oversees the Northwest Adventure Center, which assists ED by providing

customer service and serving as a registration/permitting station for hunting and fishing activities.

1.7. Partnerships

Given that natural resources on JBLM are managed by multiple programs, with the potential for overlap in efforts, management of natural resources requires collaborative planning. Since the natural areas on JBLM are significant from a regional perspective, partnering and collaborating with outside stakeholders is also necessary to ensure that the Army's management goals are compatible with and complementary to those of other resource management entities.

1.7.1. Internal Collaboration

Internal collaboration among resource management programs, and between these programs and the training community, continues to improve on JBLM. Currently, the following forms of collaboration occur regularly:

- Plan meetings between ITAM, ED, and the training community prior to large-scale training exercises and major construction projects in the training areas. During these meetings, ITAM and ED suggest ways for reducing impacts to natural resources.

- Land Use Deconfliction Process, are meetings, which involve representatives from the Planning Division, resource management programs, tenants, and the training community. The Land Use Deconfliction Process allows comments on proposed projects, so that a suitable project location can be chosen, and issues can be addressed early in the planning process.

- An ongoing working relationship between DPW Fish and Wildlife and Forestry staff that involves regular coordination of projects.

- Meetings between the DPW Fish and Wildlife, Forestry, and the ITAM Programs prior to the field season to coordinate efforts and avoid overlap.

- Incorporate spatial and tabular natural resource data into the GIS database, where it is accessible to all programs.

- Annual coordination meetings by DPW Forestry for timber sales. Representatives from Range Control, other resource management programs, and the training community are invited.

- Annual meetings hosted by the ITAM Program that present a summary of program projects.

Although each resource program has its own management goals and objectives, the INRMP is the overarching planning document that increases knowledge of other resource programs and allows efficient use of limited funds and manpower.

1.7.2. External Collaboration

JBLM collaborates with numerous regional resource management entities, particularly on projects and issues pertaining to listed species and regionally sensitive species and ecosystems (e.g., prairies and prairie candidate species). At present, JBLM is participating in the following collaborative projects:

The primary partnerships are with the Center for Natural Lands Management, USFWS, WDFW, Natural Resources Conservation Service, the Washington Department of Natural Resources, and Wolf Haven International, who are cooperators in the JBLM ACUB Program. ACUB is the Army's implementation of the Department of Defense's Readiness and Environmental Protection Initiative (REPI), established by 12 USC §2648a. This legislation allows the military services to enter into cooperative agreements with State and local governments and non-governmental conservation organizations to reduce the effects of encroachment on military installations. Encroachment is a reduction in the ability to train and test associated with factors at work beyond installation boundaries. The two major types of encroachment dealt with by REPI are incompatible development (e.g., suburban development along an installation boundary) and environmental encroachment (e.g., training restrictions associated with ESA listings). JBLM's ACUB began in 2006, its purpose being to minimize the potential training restrictions associated with upcoming ESA listings of three proposed species that depend on prairie habitat: the Taylor's checkerspot butterfly, Streaked horned lark, and Mazama pocket gopher. To date, the DoD, the Army, and the partners have spent nearly $18 million acquiring prairie lands in the South Puget Sound region, restoring these lands to suitable habitat for these and other prairie-dependent species, and reintroducing some of these species onto the properties.

Salmon Habitat Enhancement Projects

DPW Fish and Wildlife collaborates with WDFW, NMFS, and the Nisqually Indian Tribe on Salmon enhancement projects, such as spawning habitat restoration.

The Nisqually River Council

JBLM is a member of this coordination, advocacy, and educational organization that seeks to integrate the history, culture, environment, and economy of the Nisqually River Watershed. The Nisqually River Council consists of 19 members, including State and County agencies and other regional stakeholders. The council implements the Nisqually River Management Plan.

Streaked Horned Lark Working Group, Taylor's Checkerspot Working Group, and Mazama Pocket Gopher Working Group
These informal, collaborative working groups include representatives from JBLM, Federal, State, and county agencies, and conservation organizations. The members of the group work together to share expertise, share data, develop resources, and effectively plan and implement future conservation activities. The goal of the group is to develop and implement strategies for the long-term recovery of these species.

1.8. Relationships to Other Plans

In order to effectively provide a plan that meets the aforementioned goals, the INRMP must integrate all plans, programs, and projects that affect natural resources (e.g., training plans, master plans, grounds maintenance plans, and land use activities) to ensure their compatibility. The INRMP incorporates information and guidance presented in numerous installation, regional, and adjacent landowner planning documents and programs. Plans that are incorporated into this INRMP by reference, but not included in the Appendices of this document, are described below.

The Fort Lewis Real Property Master Plan (Department of the Army 1997) is the main planning document for the installation as a whole, and is an overall plan for how JBLM lands will be used to meet the military mission. A new master plan is currently being developed to encompass McChord actions. Within the Master Plan, land use maps delineate land use designations throughout the installation that direct what types of activities can occur in certain areas. The land use portion of the Master Plan allocates sufficient space to accommodate activities in compatible use zones, and serves as a screening mechanism to ensure new activities are provided space in appropriate areas. All leases, easements, and other land uses are routed through the Real Property office to ensure all conditions of these agreements are consistent with the military mission and natural resources conservation and protection.

The JBLM ICRMP is the Joint Base Garrison Commander's decision document for cultural resource management actions and specific compliance procedures. It integrates the entirety of the installation cultural resources program with ongoing mission activities, allows for ready identification of potential conflicts between the installation's mission and cultural resources, and identifies compliance actions necessary to maintain the availability of mission-essential properties and acreage. The ICRMP is incorporated into the INRMP (by reference) and guides management of historical and cultural resources on JBLM.

The Range Complex Master Plan (RCMP) establishes the range and maneuver training land requirements needed to support unit and institutional training requirements. It identifies encroachment issues that impact the use of the range complex. The plan is designed as a road map for the future development of the range complex to ensure that the installation meets its current and future training missions. The integration of INRMP requirements into the RCMP will ensure compliance with Federal laws and mandates.

Close coordination with Range Operations on the implementation of the RCMP is critical to the effective implementation of the INRMP.

The purpose of the ITAM Plan is to identify the scope and requirements of the JBLM ITAM Program in support of the JBLM prioritized Senior Commander training needs.

This plan is required by Army Reg. 350-19, and is used by the JBLM ITAM staff to plan and monitor execution of all ITAM actions. The ITAM Plan drives the Installation annual requirement submittal, and will be updated annually. The ITAM Program is instrumental in supporting the protection of environmentally sensitive areas by the installation and maintenance of Siebert Stakes throughout the Installation.

The JBLM ACUB Implementation Plan lays out the overall goals and objectives, and the annual targets and milestones, for the ACUB Program. It describes each property enrolled in the program and the types of conservation actions taken on behalf of each candidate or listed species.

The Installation Sustainability Program follows a proactive strategy to mitigate encroachment (defined as the cumulative result of any and all outside influences that inhibit military training and testing) and other environmental concerns that constrain training or have the potential to do so in the near future, and that have a bearing on the health and safety of the troops and neighboring communities. Under the guidance of the Installation Sustainability Program, JBLM developed 25-year sustainability goals, which address goals for obtaining a healthy, resilient JBLM and regional lands, and participate in the recovery of all listed and candidate Federal species in the South Puget Sound region. The INRMP incorporates this sustainability strategy.

The Installation Sustainability Program has identified strategic long-term goals that address the effects of JBLM activities on installation and regional natural resources.

These sustainability goals are listed below:

Air Quality Strategic Goals

- Reduce traffic congestion and air emissions by 85 percent by 2025;
- Reduce air pollutants from training without a reduction in training activity; and
- Reduce stationary source air emissions by 85 percent by 2025.

Energy/Infrastructure Strategic Goals

- Sustain all activities on post using renewable energy sources, and generate all electricity on post by 2025.

- Ensure that all facilities adhere to the Leadership in Energy and Environmental Design (LEED™) Platinum standard for sustainable facilities by 2025.

Products/Material Procurement Strategic Goals

- Cycle all material use to achieve zero net waste by 2025.

Training Lands Strategic Goals

- Attain healthy, resilient JBLM and regional lands that support training, ecosystem, cultural, and economic values by 2025.

- Assist in the regional recovery all listed and candidate Federal species in the South Puget Sound region.

Water Resources Strategic Goals

- Achieve zero discharge of wastewaters to Puget Sound by 2025.

- Reduce JBLM potable water consumption by 75 percent by 2025.

- Contribute no pollutants to groundwater and remediate all contaminated groundwater by 2025.

- Develop an effective regional aquifer and watershed management program by 2012.

Five sustainability-working teams (i.e., Air Quality, Energy/Infrastructure, Products and Materials, Sustainable Training Lands, and Water Resources) meet on a periodic basis to come up with short-term objectives and associating supporting actions for meeting the long-term goals. Members include personnel from a broad spectrum of installation programs. Recent sustainability accomplishments are highlighted in annual reports presented on the JBLM Sustainability web page (http://www.lewis.army.mil/publicworks/).

2.0. CURRENT CONDITIONS AND USE

2.1. Installation Background and General Land Use

JBLM is an approximately 90,000-acre military reservation located in Western Washington, in Pierce and Thurston counties; roughly seven miles South of the City of Tacoma and seven miles Northeast of Olympia (Figure 2- 1). Interstate-5 (I-5), which is the main transportation corridor in the Puget Sound region, runs through the Installation. JBLM is bordered on the North by suburban and commercial development; on the East and South by rural areas, forested land, and several small communities; and on the West by Puget Sound, the Nisqually Indian Reservation, and the rural areas surrounding Olympia.

JBLM was established after the 2005 Base Realignment and Closure Commission recommended the transfer of installation support functions from McChord Air Force Base (AFB) to Fort Lewis. In 2008, the Joint Base Implementation Guidance was issued and JBLM began formal operation in January of 2010. Major land uses within the JBLM boundary include the cantonment area (approximately 14,260 acres), training areas (approximately 62,600 acres), and impact areas (approximately 12,900 acres). Land uses in the cantonment area include: housing, open space, industrial and maintenance, medical and community services, administration, aviation, training, reserve component support facility, and deployment facility.

2.1.1. Historic Land Use Relating to Natural Resources

Prior to European settlement in the mid-1880' s, the area within the present-day JBLM boundary was utilized by the Nisqually, Puyallup, and Steilacoom people for various food resources (Kreutzer et al. 1994, Dugas and Larson 1998). Evidence suggests that Native Americans actively burned prairie vegetation to maintain an open landscape structure and sustain hunting and food gathering opportunities (Lang 1961, Kruckeberg 1991). Native American fires are thought to have resulted in a more open, prairie setting in oak-dominated communities. As Euro-American's settled the area, Native American and natural fires were largely eliminated. In their absence, oak forests became denser and conifer trees invaded grasslands. In recent years, this absence of burning has resulted in the establishment of plant species that are not well adapted to recurring fires (e.g. the invasive weed Scot's broom) in oak and prairie communities (Rolph 1993).

After European settlement of the region, most of the JBLM area was homestead or ranch land used for dairy and sheep farms and agriculture. During this time, fire was controlled where possible and substantial land disturbance occurred from grazing and farming operations. In forested areas, extensive logging occurred, and most of the extensive stands of timber in the Pierce County portion of JBLM were logged by 1910. Most of the JBLM area in Thurston County (Rainier Training Area), Training Areas 19 to 23, were harvested or burned by forest fires before the military acquisition at the beginning of World War II. Timber harvesting continued after the Army acquired the land.

Training and other military activities began in 1917, when Camp Lewis was established and served as the nation's largest Army post. Training levels on the installation varied over the years in response to military needs. The U.S. Army Air Corps officially designated McChord Field on May 5, 1938, and became McChord Air Force Base in 1947. The JBLM Integrated Cultural Resources Management Plan provides a detailed history of historic land use and the history of troops stationed JBLM.

2.1.2. Current Installation Land Use

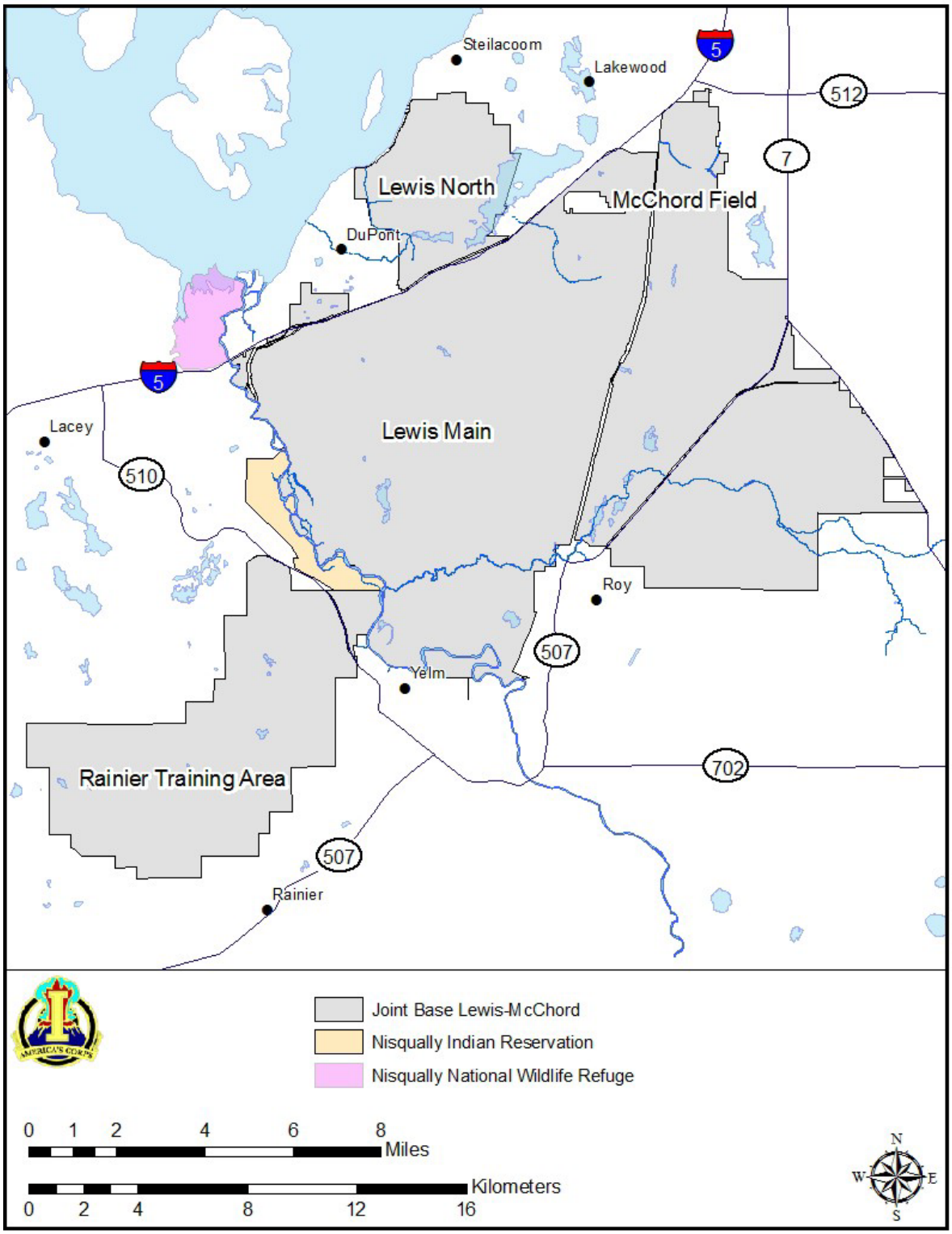
Cantonment Area
The cantonment area is the developed portion of the installation. It serves as the center for most activities on JBLM apart from field training. Land uses in the cantonment area include family and troop housing, administrative uses, commercial uses (e.g., shops and medical services), industrial uses (maintenance, logistics, and transportation), and open space maintained for training, recreation, and future development.

Training Areas
Training areas on JBLM, which are collectively referred to as the Range Complex, include maneuver, impact, range, and other training areas. They include forestland, wetland, prairie, brush, and marine environments.

Training activities that characterize land use at JBLM include on/off-road vehicle movement, placement of temporary targets, gunnery practice, digging activities (vehicle positions, tactical operation centers, and foxholes), unit assembly, and unit deployment exercises.

JBLM training areas also accommodates a variety of nonmilitary activities, such as outdoor recreation, commercial timber harvest, nature walks, fish hatchery operations, and tribal members' traditional way-of- life.

Figure 2-1. Joint Base Lewis-McChord



Controlled Use Areas

Certain portions of JBLM have been designated as Controlled Use Areas (CUAs), where specific land use activities are restricted either seasonally or year-round. These areas contain unique attributes that require preservation, conservation, or restoration, or pose a safety or human health hazard. In some cases, land use restrictions in CUAs are associated with regulatory compliance (e.g., Bald eagle nest and roost site buffers). In other cases, restrictions have been put in place to prevent additional restrictions on training in the future (e.g., priority habitat - areas occupied by listed species and/or contain high quality prairie that provides habitat for listed species [see endangered species management components]). Figure 2-2 shows the locations of CUAs on JBLM. Areas designated as CUAs include wetlands and streams and their associated buffers, buffers for listed species (priority habitat), and other natural resource areas; cultural sites; and environmental hazards such as landfills. These CUAs are overlaid on the Military Installation Map to produce the Environmental Coordination Map, a military training aid.

There are four restriction levels for CUAs:

1. Access is prohibited; a safety and/or human health risk is present (red areas on corresponding map).

2. Digging, bivouacking, assembly areas, and/or off-road vehicle activities are not authorized. Dismounted activities are allowed (purple areas on map).

3. Digging, bivouacking, and assembly areas are not authorized. Off-road maneuver is allowed. There are no CUAs with this restriction level at present.

4. Digging without a permit is not authorized. There are no CUAs with this restriction level at present.

In all CUAs, wheeled and tracked vehicles are authorized on established primary and secondary roads. Additional information on CUAs is provided in Appendix A.

Areas selected by program managers for protection by statute, Executive Order, or regulation will continue to make up the CUAs depicted on the Environmental Coordination Map. CUAs will be the focal point of many aspects of natural resource management. Natural resource managers will consider CUA designations when developing management programs to ensure that the desired management outcome is not in conflict with the military land use of a particular area. Habitat enhancement projects for rare species will initially occur in areas with limited disturbance by military training activities, such as the Artillery Impact Area (AIA), South Impact Area (SIA), Central Impact Area (CIA), Johnson, South Weir, and Upper Weir prairies, and wetland buffers. A small percentage of the safety buffer portions of the impact areas are used for military vehicle maneuvers, as permitted and overseen by Range Control. Natural resources management actions in these same areas are likewise limited to non-ground

disturbing activities such as herbicide spraying, seeding, and surveying and only when Explosive Ordinance Disposal escort is present.

Airspace

Fixed-wing aircraft and helicopters use Gray Army Airfield (GAAF), which occupies approximately 600 acres within the cantonment area. It consists of a 6,125-foot runway, associated fixed- and rotary-wing aircraft hangers, airfield operations facilities, and a simulator facility. Most of the rotary-wing aircraft operations based out of GAAF are conducted within the limits of JBLM under Visual Flight Rules (VFR) conditions (ENSR 2000). GAAF control tower can support VFR and limited Instrument Flight Rules (IFR) operations 24 hours a day. Most fixed-wing aircraft missions originate out of McChord Field airfield, but limited operation of fixed-wing aircraft occurs at GAAF. The McChord Field airfield aircraft control tower has VFR and IFR capability 24 hours a day. The majority of fixed-wing aircraft support missions conducted at JBLM involve troop transport missions, transport of very important persons, operational support airlift, or low-level flights over the various drop zones for airborne training. McChord Field airfield can accommodate a variety of aircraft including the largest military cargo and commercial transport aircraft. Battalions and Companies deploy by air from McChord Field airfield.

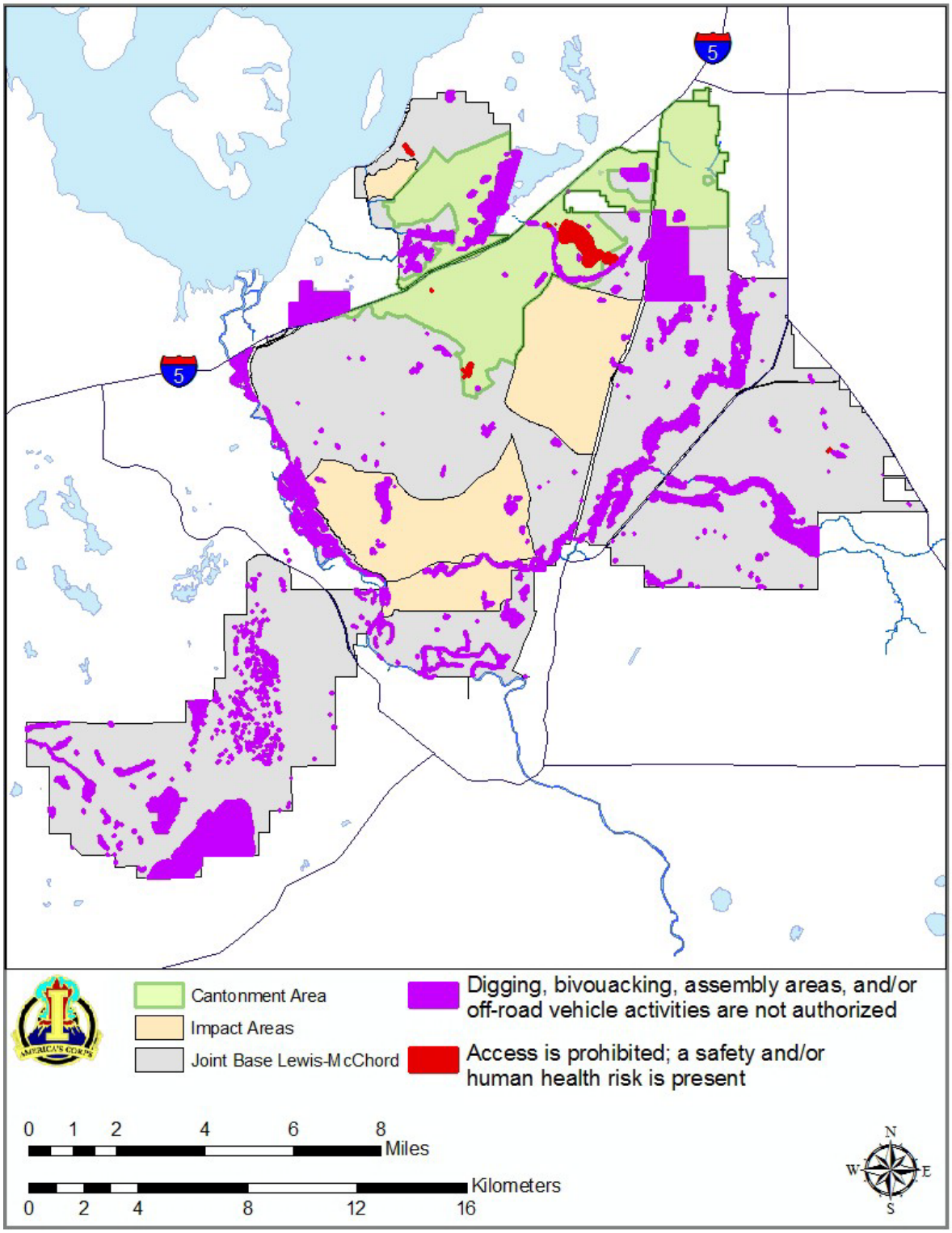
The JBLM airspace includes Restricted Airspace R6703 and the Rainier Military Operations Area. R6703 is airspace allocated to JBLM by the Federal Aviation Administration (FAA) for indirect-fire, parachute, and aviation training. No indirect-fire weapons may shoot from outside R6703. Certain portions of R6703 are continuously available during certain hours every day; other portions require two-hour advance notification.

The FAA must reroute air traffic when R6703 is in use.

The Rainier Military Operations Area is the vertical and lateral JBLM airspace allocated by the FAA to segregate military aviation from other IFR operations, and to identify to other VFR traffic the location of these military activities. The Rainier Military Operations Area is FAA controlled for JBLM use under Range Control Scheduling Authority. FAA Seattle Tower activates the Military Operations Area on a real time basis upon notification by Training Division/Range Control or participating fixed-wing aircraft. The Military Operations Area is not activated for or by Army rotary-wing aircraft.

Aircraft operations originating out of GAAF and McChord Field airfield take place near a variety of jet routes and other designated air traffic control areas, particularly those associated with the Seattle-Tacoma International Airport located 22 miles North of the installation. All aircraft operating out of the GAAF and McChord Field airfields are subject to FAA regulations. The Installation tower controllers and local and regional FAA Air Traffic Controllers control all rotary-wing and fixed-wing aircraft operating out of the airfields under IFR conditions.

Figure 2-2. Controlled Use Areas at Joint Base Lewis-McChord



Installation Restoration Sites
In the 1980' s and 1990' s, Fort Lewis and McChord AFB independently identified over 100 sites that represented potential environmental hazards to each installation. As of 2011, all but nine sites require no further active remediation. Restoration sites have included active and former landfills, disposal pits, contaminated buildings, abandoned munitions ranges, and spill sites. Primary contaminants included organic solvents, heavy metals, and fuels. The remaining nine sites are currently undergoing active environmental restoration. Detailed information on active and inactive sites is presented in the Final Environmental Baseline Survey for Fort Lewis, Washington (ENSR 2001), the Phase I Records Search Report (CH2M Hill 1982) and the Final Installation Restoration Plan Phase II Confirmation/Quantification Stage 2 Report for McChord AFB (CH2M Hill 1982 and SAIC 1984) for McChord AFB.

The Environmental Restoration Program staff in Public Works manages the Installation Restoration Program. Implementation of the program is executed in-house with additional assistance from contract consultants and remediation contractors. An important task of the program is to manage the long term monitoring and land use controls, which may extend for a number of years for some of the sites.

2.1.3. Future Land Use Planning

Future land use at JBLM will be dependent on the military mission and the needs of trainers. In general, land use should not change substantially. Training lands will continue to support a variety of training activities, and the cantonment area will continue to house soldiers and their families, and support administrative, commercial, and industrial needs. Training lands and airspace may see more intense use as JBLM is tasked with ensuring the military readiness of additional units. The most recent Base Realignment and Closure Commission proposed reducing military training land areas, placing more units on the remaining Installations, and increasing the training pressure by concentrating training on fewer overall acres throughout the United States.

Planning and Land Use Deconfliction
JBLM has developed a Land Use Deconfliction Process, an integrated planning process that combines information sources with knowledgeable personnel, to facilitate well-informed decision making for actions on and affecting the Installation. Land Use Deconfliction meetings involving JBLM units, tenants, and Joint Base Command staff focus on combining information sources with institutional knowledge to coordinate and integrate activities and projects on the installation. The meetings ensure that planning activities do not conflict with the varying stakeholders on the Installation (Range Control, Infrastructure and Utilities, Environmental, etc.). Geographical Information System layers are primarily used for highlighting conflicting land uses and determining alternative locations. The ED participates in Land Use Deconfliction meetings to ensure planned development and land use changes are consistent with the goals and objectives of the INRMP. Natural resources GIS layers (wetland buffers, oak, prairie, and priority habitat) allow for easy identification of potential issues.

2.2. Military Mission

The military mission at JBLM is to provide rapid mobility for America's Armed Forces to any problem area in the world. Airlifting troops, equipment and operating a state-of-the-art power projection and sustainment platform for warfighters by providing them with superior training support and infrastructure; support the transformation of I Corps and JBLM; ensure the well-being of its Service members, civilians, retirees, and their families; and remain a committed Pacific Northwest neighbor.

The primary and tenant organizations at the Installation include:

I Corps
1st Special Forces Group
2nd Stryker Brigade, 2nd Infantry Division
2nd Battalion, 75th Ranger Regiment
3rd Stryker Brigade 2nd ID
4th Stryker Brigade, 2nd ID
4th Battalion, 160th Special Operations Aviation Regiment
4th Squadron, 6th Air Calvary
6th Military Police Group
8th ROTC Brigade
16th Combat Aviation Brigade
17th Fire Brigade
42nd Military Police Brigade
51st Signal battalion
62d Medical Brigade
66th Theater Aviation Command
191st Infantry Brigade
201st Battlefield Surveillance Brigade
311th Corps Support Command
404th Army Filed Support Brigade
555th Engineer Brigade
3rd EOD
110th Chemical Battalion
593rd Sustainment Brigade
902nd Contingency Contracting Battalion
Battle Command Training Center
Center for Health Promotion Preventive Medicine
Henry H. Lind – NCO Academy
Inspector General
Madigan Healthcare System
National Center for Telehealth & Technology
Warrior Transitional Battalion
Western Regional Medical Command
Yakima Training Center
62nd Airlift Wing
446th Airlift Wing
1st Air Support Operations Group
262nd Information Warfare Aggressor Squadron
Western Air Defense Sector
22nd Special Tactics Squadron
361st Recruiting Squadron
229th ATK Battalion
189th Training Support Brigade
Allen United States Army Reserve Center
70th Regional Readiness Command (USAR)
ACC Joint Regional Correction Facility
Army Audit Agency
Defense Security Service
Air Force Audit Agency
Defense Logistics Agency
4th Tank Battalion (USMC)
Mobile Construction BN-18 (USN)
4th Landing Support BN (USMC)

2.2.1. Operation and Activities

The primary activities that take place on JBLM training lands are live-fire training, tactical field exercises and C-17 training and missions. To support these activities, JBLM training facilities include ranges, non- firing facilities, impact areas, airfields, airstrips, helicopter landing zones, drop zones, and numbered training areas (Figure 2-3).

Live fire military training is conducted on four impact areas on Lewis Main and Lewis North. (1) North Impact Area (small arms, with 14 firing ranges); (2) CIA (small arms, with 48 separately scheduled ranges); (3) AIA (with 13 separately scheduled small arms and live fire maneuver/combined arms live fire exercise ranges; also serves 37 artillery firing points and 13 mortar points); and (4) SIA (with eight separately scheduled small arms and live fire maneuver/combined arms live fire exercise ranges and one mortar firing point). Off-road maneuver training occurs primarily in five maneuver areas: (1) Training Area (TA) 4 and 5 (Scouts Out Road Corridor); (2) TA 6 (Point Salines drop zone); (3) TA 14 (13 Division Prairie); (4) the Northeast corner of TA 8; and (5) TA 18 (Marion drop zone). Urban combat training takes place at Leschi Town, the Regenburg MOUT, Afghan villages in TAs 10 and 19, TA 13 Objective, Point De Hoc Objective, TA 4 Objective, Warrior Road, and temporary shantytowns emplaced in maneuver areas, where units take part in exercises that mimic conflict scenarios in urban settings and Forward Operating Bases/Tactical Training Bases. Amphibious operations take place at Solo Point, located on the Puget Sound, and at various lakes on the Installation. There are numerous drop zones where soldiers and equipment may be parachuted from helicopters and fixed-wing aircraft. Other common training activities include unit deployment exercises via land, sea, and air.

C-17 training and missions primarily occur at the McChord Field airfield with some C-17 activities occurring at GAAF on Lewis Main. Parachuting activities occur periodically in the McChord Field airfield area. Rodeo, an international competition, occurs in odd-numbered years, during the summer months, on the airfield, the South Approach Zone, and other areas on McChord Field. The Prime Beef area and other areas in the South Approach Zone of McChord Field, which are controlled through McChord Field, provide a troop training area for airmen. Fire and Explosive Ordinance Disposal training areas are located near the Southeast area of the airfield. An obstacle course is located in the Porter Hills area of McChord Field. Various training activities are conducted on a regular basis to ensure that any emergencies can be handled.

2.2.2. Military Mission and Strategic Vision of Future Land Use

The JBLM vision is of an enduring strategic installation, teamed and ready to project combat power for decisive victory. A primary intent of the INRMP is to help fulfill this vision by ensuring that natural resources on JBLM are managed to ensure no net loss in their capability for supporting the military mission. As it pertains to land use, this vision includes the following:

- Provide training areas, modern ranges and other support facilities that meet the needs of assigned units and tenant activities;
- Develop and maintain state-of-the-art simulation facilities;
- Provide and maintain world-class power projection facilities;
- Provide first class living and working environments for the total force;
- Ensure quality services that meet the continuing professional requirements of soldiers and civilian employees and the personal needs of soldiers, their families, and other authorized individuals; and
- Demonstrate leadership and innovation in environmental stewardship.

Specifics of future mission requirements are unknown, since they are constantly changing in response to the needs of the Army's combat commanders. However, the current reorganization and restructuring of the Army provides some insight into future mission requirements on JBLM. Over the past few years, the Army has proposed numerous stationing actions that have and will continue to result in the stationing of a significant number of additional troops at JBLM. JBLM has been and will continue to be required to support a substantial increase in training, both on the ground and in its airspace.

Training lands must continue to provide diverse natural landscapes to support all required military training exercises, such that the condition of natural resources does not degrade to the point that environmental laws and/or regulations require additional restrictions to be placed on military training (for example, if one or more additional installation species become listed under ESA). An understanding of future mission requirements is helpful if resource managers are to effectively plan programs for sustaining resources.

As a result of Army restructuring that began in 2000, changes in the force structure at JBLM have been implemented. Due to changes in stationing and training, these mission changes resulted in the following at JBLM:

Increased Troop Strength
An increase in the number of soldiers stationed on JBLM has resulted in the construction of additional facilities in the cantonment area. It is likely that human presence in the cantonment area as well as training areas will increase, and more natural resources will be consumed and waste produced.

Increased Ground Training
The stationing of a third Stryker Brigade Combat Team as well as additional units on JBLM will require that training lands be used more frequently and more intensively. The Grow the Army Environmental Impact Statement limits off-road miles to 156,000 per year.

Increased Aviation Training
The stationing of the 4/6 Air Cavalry Squadron, 16th CAB and the 4/160 Special Operations Aviation Regiment will require that GAAF and airspace be used more extensively than at present. The increased air traffic is likely to lead to additional noise disturbance to wildlife and an increased risk of bird strikes.

2.2.3. How Natural Resources and the Mission Interact

Ultimately, the military mission is dependent on the natural resources at JBLM. Installation lands, which include forested, prairie, and aquatic habitats, support the mission and training activities described above. A reduction in the quantity or quality of training environments can adversely affect the military mission by reducing the amount of training that can be sustained or the ability of training lands to support the types of training that are required to prepare for mission activities. For example, loss or alteration of prairie habitats may result in a reduction in open habitats required for maneuver training and other activities. Because training lands must be maintained to support mission activities, natural resources on JBLM must be managed to ensure that these lands are not degraded. Sustainable management of natural resources is designed to ensure the continued ability of the Installation to support mission activities into the future. Appendix B shows the annual timeline of Training Area/Impact Area access needs for Natural Resource Management activities.

Many management actions have the ultimate result of benefiting training and the military mission because they improve the overall condition of resources. Because the goal of the ITAM Program is to sustain use of training lands, management activities by ITAM (e.g., removal of Scot's broom, re-vegetation of training-degraded areas) are carried out in support of the military mission. Furthermore, ITAM is directly involved in training event planning by informing units of environmentally sensitive issues within a proposed footprint in order to minimize impacts to natural resources. Many of the activities by ED, such as removal of Scot's broom and other invasive species, directly benefit the military mission by improving the quality of ecosystems and training on JBLM. Other management actions by ED benefit training by reducing the likelihood that future legally mandated restrictions will impact training. Efforts under the ACUB Program to acquire and manage buffer lands are examples of management actions that intend to reduce the pressures on training associated with encroachment.

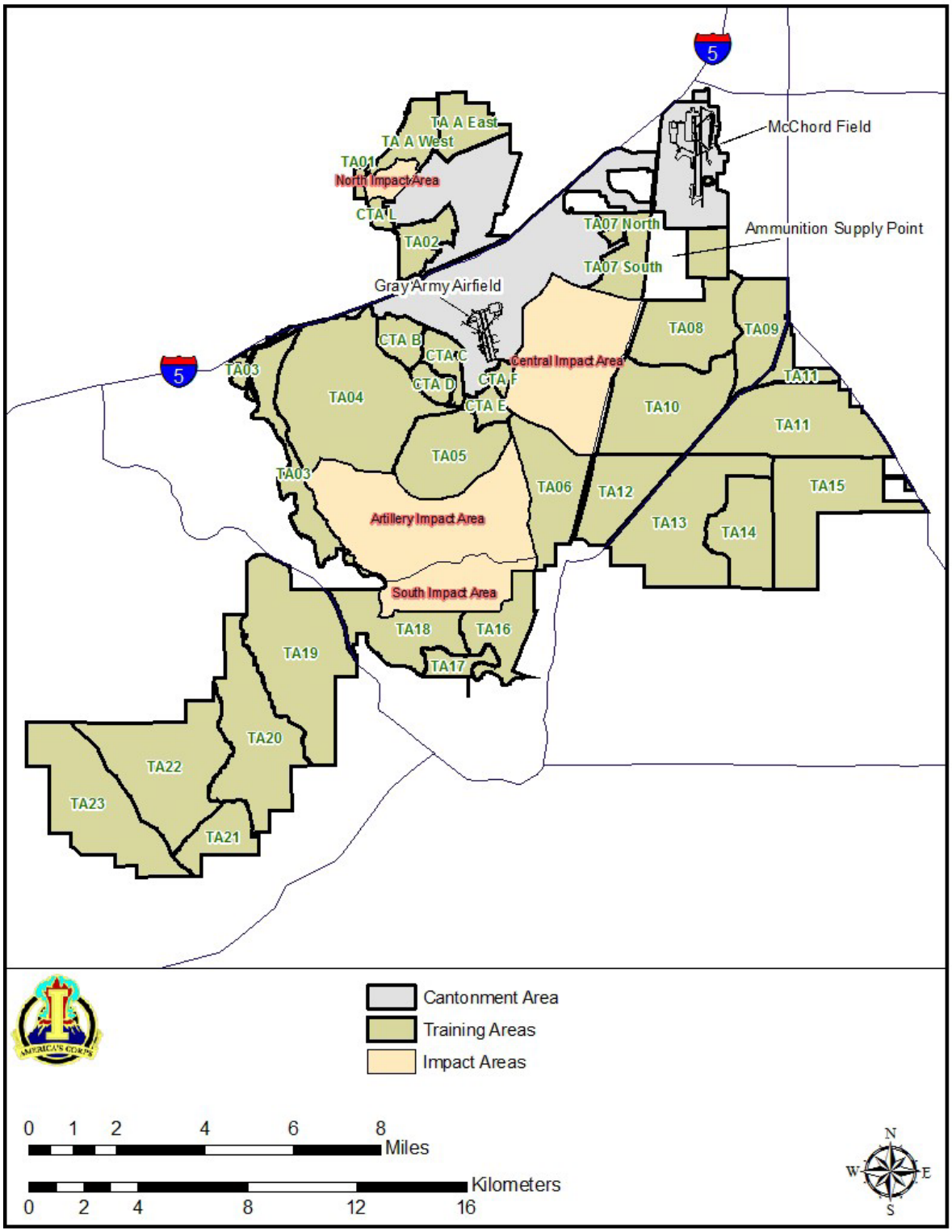
In order to ensure no net loss to military training opportunities, JBLM balances training needs with management of natural resources. The ED and DPTMS staff work together to maximize compatibility of management actions and training activities. Some management activities may not be compatible with certain types of training. With the

stationing of three Stryker Brigade Combat Teams on JBLM, having sufficient off-road maneuver space for these vehicles is crucial to their ability to train to doctrinal Army standards. Because management of forests for old growth conditions does not support vehicular off-road maneuver, consideration is being given to thinning the forests in selected areas. This should help offset the loss of ability to maneuver across prairies where restrictions are in place to protect listed species.

Federal land ownership has provided a benefit to natural resources in the South Puget Sound region. The establishment of Camp Lewis, now known as JBLM, as a military reservation and the subsequent use of its natural areas for training purposes has resulted in the protection of a large, contiguous parcel of land from development. As a result, JBLM includes some important natural resources, from a conservation perspective, including the largest remaining tracts of prairie in the South Puget Sound region, and forests that could potentially establish population connectivity between the Olympic and Cascade populations of the Northern spotted owl (*Strix occidentalis caurina*) (Bottorff and Rohde 1994). The use of JBLM to support mission activities is likely to continue to benefit resources on a regional scale, because training lands will remain undeveloped.

On a day-to-day basis, mission activities, primarily training, can adversely affect natural resources. Prairie habitats, associated Pine, and Oak woodlands are the most susceptible to degradation because they are open areas that support vehicle maneuvers, gunnery, and digging activities. Maneuver training by heavy vehicles leads to soil disturbance and compaction, and contributes to the loss of native vegetation and the spread of invasive species. Due in part to the shallow nature of prairie soils over a base of rock and sand, major digging exercises such as vehicle fighting positioning, which involves heavy excavating equipment, substantially alters soil structure, potentially reducing the capability of the area to support native vegetation over the long term. Munitions fired in ranges and impact areas contain chemical components that may be toxic to wildlife. Furthermore, live-fire munitions are the source of fires, which can cause considerable damage if they burn through sensitive habitats. Regular fires as a result of live-fire munitions in the AIA, however, provide a benefit to prairie habitat in this area by maintaining the prairie in a relatively good condition, by reducing the encroachment of Douglas-fir (*Pseudotsuga menziesii*) seedlings from the surrounding forests, and by helping to control Scot's broom infestations.

Figure 2-3. Training Areas at Joint Base Lewis-McChord



2.3. General Physical Environment

2.3.1. Topography and Geology

Continental glacial deposits, originating during the Vashon stage of the Fraser Glaciation approximately 13,500 years ago, dominate the geology of JBLM. Overall, the geologic materials at JBLM is comprised of outwash gravels and till, with localized areas of peat and alluvium surrounding the Nisqually River and Muck Creek. The majority of JBLM North of the Nisqually River is comprised of a series of glacial outwash terraces, channels, and glacial ponds. The low hills in the Western portion of this area are comprised of glacial deposits of undifferentiated till, often mixed with outwash gravels. The hills of the Rainier Training Area (RTA), TAs 19 to 23 are predominantly Vashon moraine and some till, with a small area of older (pre-Fraser) glacial drift near the Southwestern boundary.

The topography at JBLM is typically flat to gently rolling, with localized areas of moderately sloping land. The portion of JBLM where field maneuvers occur is a nearly level plain, with isolated hills rising about 100 feet above the surrounding terrain. The slopes are generally less than 15 percent, except for the steep escarpments along the Nisqually River and Puget Sound. The elevation throughout most of the Installation ranges between 250 and 400 feet above sea level, but varies from sea level at Puget Sound to 567 feet in the extreme Southwestern portion of JBLM, Lewis Main at the RTA (Public Forestry Foundation 1995).

2.3.2. Climate

The Puget Sound region has a relatively mild climate typically described as Pacific Coast marine, and is characterized by cool, wet winters and warm, dry summers. Temperatures range from a mean of 37 degrees Fahrenheit (˚F) in the winter to 65 °F in the summer. Average precipitation in the region is 30 to 40 inches per year. The Olympic Mountains serve as a buffer that helps protect the area from weather arriving from the Pacific Ocean. Numerous storm fronts pass through the Puget Sound area during the spring and fall, and occasionally during the winter. These fronts are typically the source of the region's predominantly southerly winds.

During the summer, the weather is often dominated by persistent high-pressure cells combined with light and variable winds, which result in stagnant air conditions. This weather pattern can contribute to the formation of photochemical smog, as indicated by ozone concentrations downwind from urban centers. During the winter, the weather can produce stable or stagnant conditions that coincide with temperature inversions.

2.3.3. Air Quality

Air Quality Standards

Air Quality is considered in this document as it is related to the JBLM use of prescribed fire management, which is used for habitat enhancement and wildfire management.

Under the Clean Air Act, as amended in 1990, states are the primary regulators of air quality. The extent of local regulations largely depends upon whether the local area is in attainment of the National Ambient Air Quality Standards (NAAQS).

The EPA has divided the country into geographical regions known as Air Quality Control Regions to evaluate compliance with NAAQS. These standards have been established for six criteria pollutants: carbon monoxide (CO), nitrogen oxides (NO_x), sulfur oxides (SO_x), particulate matter less than ten micrometers in diameter (PM_{10}), ozone, and lead. Criteria pollutants are those the EPA has placed the greatest emphasis and developed health-based concentrations for ambient air. There are primary NAAQS for protection of public health, and secondary NAAQS for protection of public welfare (effects on soils, vegetation, economic value, and personal comfort). Other types of pollutants, called non-criteria pollutants, are not subject to the NAAQS, but are regulated by State and local toxic air pollutant regulations.

States are required to have State Implementation Plans to maintain Federal Air Quality standards. Army Installations must review these plans and identify any federally enforceable standards. JBLM is under the jurisdiction of EPA Region 10, and air quality on the Installation is under the authority of the Washington State Department of Ecology (Ecology). Air quality regulation is carried out by the Puget Sound Clean Air Agency in Pierce County, and by the Olympic Region Clean Air Agency in Thurston County.

Opacity is regulated at JBLM under the jurisdiction of the local Air Pollution Control agencies. Opacity is defined as the degree to which an object seen through a plume is obscured, stated as a percentage. The regulations state that it is unlawful to cause or allow the emission of any air contaminant (such as PM_{10}) in excess of 20 percent visual density (opacity) for more than three minutes in any one-hour period.

Air Quality and Emissions on Joint Base Lewis-McChord

The existing air quality in the JBLM area is good. The major sources of pollution in the Puget Sound region are particulate matter and vehicular emissions, which contribute to the formation of ozone.

Ecology has designated the entire State of Washington as in attainment with the NAAQS for ozone. In addition, the entire Western Washington region is either in attainment or is designated as unclassified/attainment for CO. Areas with the unclassified/attainment designation, including JBLM, cannot be completely classified because of a lack of information, and are treated as attainment areas by Ecology. JBLM is located in an unclassifiable area for PM_{10}, and in an area that was previously designated as a nonattainment area for both ozone and CO, though it is currently in attainment for these pollutants. As part of the re-designation process, Ecology submitted a maintenance plan under which JBLM can continue to maintain attainment standards for a ten-year period. Areas that are currently in attainment, but were previously in nonattainment are referred to as maintenance areas. The nearest PM_{10}

nonattainment areas to JBLM are the Lacey-Olympia-Tumwater region in Thurston County, which is impacted by wood stove emissions, and the Tacoma metropolitan area in Pierce County. Neither of these areas is significantly affected by emissions from JBLM.

The primary emission sources at JBLM are motor vehicles and industrial sources. Industrial sources include aerospace maintenance and rework operations, fuel burning, fuel storage and dispensing, degreasing, woodworking, and painting operations. A 2004 inventory of emissions from the major air pollution sources on the Installation is provided in Table 2-1.

Table 2-1. Air Emission Inventory for Joint Base Lewis-McChord

Pollutant	Tons/Year (2010)
Carbon monoxide	60
Nitrogen oxides	55
Sulfur dioxide	3.0
Volatile organic compounds	35
Particulate matter	5.0
Total hazardous air pollutants	5.0
Total toxic air contaminants	----

2.3.4. Soils

Soil of the Puget Sound lowlands, including JBLM, developed predominately from glacial deposits, such as outwash and till, deposited approximately 13,500 years ago at the end of the last (Fraser) glaciation (Anderson et al. 1955, Zulauf 1979, Pringle 1990). Soil on the Installation formed on these deposits through the processes of physical and chemical weathering and biological action. Soil fertility is low to moderate, with relatively shallow soil that is well drained to excessively well drained. Over 90 percent of JBLM soils are characterized as being somewhat excessively drained, gravelly, sandy loams up to 2 feet thick (Figure 2-4). The most common soil types are excessively well drained, sandy-gravelly prairie soils over glacial outwash. These soil types are represented by the Spanaway and Nisqually soil series and are widely distributed across the entire installation. Other major soil types include moderately well drained, sandy-gravelly forest soils over glacial till, which are common in the Southern portion of JBLM located in Thurston County. These soil types are represented by Alderwood and Everett soil series, which typically supports forests vegetation. The major soil types found on the Installation are discussed in more detail below. Other soil types found in small amounts scattered across JBLM include finer-textured (sandy-silty) forest soils, alluvial soils along the Nisqually River, and isolated patches of poorly drained wetland and organic (peat) soils, particularly in areas associated with localized drainages and wetlands.

Spanaway Series
Spanaway soils, which cover nearly half of the Installation, are gravelly to stony sandy loams developed on level to slightly sloping glacial outwash. They are porous, droughty, and of low fertility. On JBLM, these soils were originally vegetated with native grasses. However, non-native grasses and Scot's broom, a non-native shrub, now dominate many of these areas. In addition, more than 10,000 acres are now occupied by dry conifer forests up to 150 years of age.

Everett Series
Everett soils, which occur on glaciated uplands, have developed from loose, poorly sorted glacial drift, granite, or quartzite materials. These soils were originally occupied by Douglas-fir or red alder forests. These areas were logged and are now generally occupied by moderately dry conifer forest.

Pilchuck Series
Pilchuck soils occupy the floodplain along the Nisqually River. They developed on recently deposited sandy alluvium and are comprised of sand or loamy sand. The floodplain areas are dominated by deciduous forest, but in some places, coniferous species provide an important vegetative component.

Nisqually Series
Nisqually soils developed on undulating glacial outwash in association with the Spanaway series soils; however, the Nisqually series is comprised of finer particle sizes and lacking the gravel component. These soils are loamy sand in texture and somewhat excessively drained. They are more fertile and less droughty than the Spanaway soils, and were used for agriculture prior to Army acquisition of these lands. A large portion of the land on which these soils occur is now covered by dry conifer forest.

Alderwood Series
Alderwood soils formed in glacial till on the broad uplands. They are one of the most extensive soils in Pierce County. These soils are moderately well drained and consist of a one to two inch gravelly sandy loam surface layer, and subsoil to a depth of 40 inches that is gravelly sandy loam. The lower part of the substratum, to a depth of more than 60 inches, is composed of a weakly cemented compact glacial till.

Although these soils are used for agriculture, the compact glacial till limits the suitability of these soils for deep-rooted crops. These soils are generally covered by moist conifer and hardwood forests.

Muck and Peat Series
Muck and peat soils are organic soils in different stages of decomposition. They developed in shallow depressions from organic materials, and are poorly drained and saturated for much of the year.

2.3.5. Water Resources

Surface Water

The surface water resources at JBLM include rivers, streams, lakes, wetlands, and marine areas (Figure 2- 5). Four major source water drainage basins occur on JBLM: (1) the Nisqually River basin; (2) the Sequalitchew Creek basin (including American Lake); (3) the Deschutes River basin; and (4) the Chambers/Clover Creek basin (Clover Creek runs through McChord Field). Because of the gentle topography and generally permeable soils, surface water runoff is very low, with few perennial streams, and poorly defined surface water sub- basins. Subsurface drainage is determined by the topography of impermeable strata that occurs at varying depths below the ground.

Streams on JBLM include Clover Creek, Morey Creek, Lacamas Creek, Muck Creek, Murray Creek, and Sequalitchew Creek. There are 29 lakes on the Installation, with the largest being American, Lewis, Nisqually, and Sequalitchew lakes. Over 50 percent of JBLM (48,000 acres) falls within the Nisqually River basin. The Nisqually River crosses the Installation in a Southeast to Northwest direction and discharges into Puget Sound at the Nisqually Reach.

Muck Creek is located to the East of the Nisqually River. A significant portion (approximately 84 percent) of its sub-basin is on JBLM, with the remaining section upstream of the Installation. Muck Creek drains directly into the Nisqually River. Muck Creek flows through or drains several important marshes and lakes, including Shaver Lake, Chambers Lake, Dailman Lake, Hamilton Lake, Johnson Marsh, and Halverson Marsh. South and Lacamas creeks are small tributaries of Muck Creek.

South of the Nisqually River, groundwater originating on JBLM, surfaces just outside the Installation boundary and seeps directly into the Nisqually River. Surface water basins are defined topographically, but no substantial surface stream exist South of the Nisqually River within the JBLM boundary. Based on the topography of the Installation, South of the Nisqually River approximately 7,900 acres of the RTA falls within the Thompson Creek sub-basin, forming a portion of the Nisqually River basin. Another 10,600 acres of the RTA are drained by the Skookumchuck and Spurgeon creeks, which are sub-basins of the Deschutes River drainage.

Murray Creek discharges into American Lake within the Sequalitchew Creek basin. Sequalitchew Creek is a small marshy stream that is four miles in length and empties into Puget Sound. The topography of the Sequalitchew Creek basin (including Sequalitchew lake and the drainage) is relatively flat with the greatest topographic relief occurring at the East end of the lake, where the banks rise as much as 50 feet above the water surface (Shapiro and Associates 1997). Originating from Sequalitchew Lake, Sequalitchew Creek is the only surface water outlet for the Murray/Sequalitchew watershed. The creek flows through Hamer Marsh and Edmond Marsh and then a steep canyon before discharging into Puget Sound. There is a bypass channel near

Sequalitchew Lake that re-routes water directly to Puget Sound whenever the water level of the lake becomes too high. Although no surface water connection exists between American Lake and Sequalitchew Lake, there is a groundwater connection between these two bodies of water.

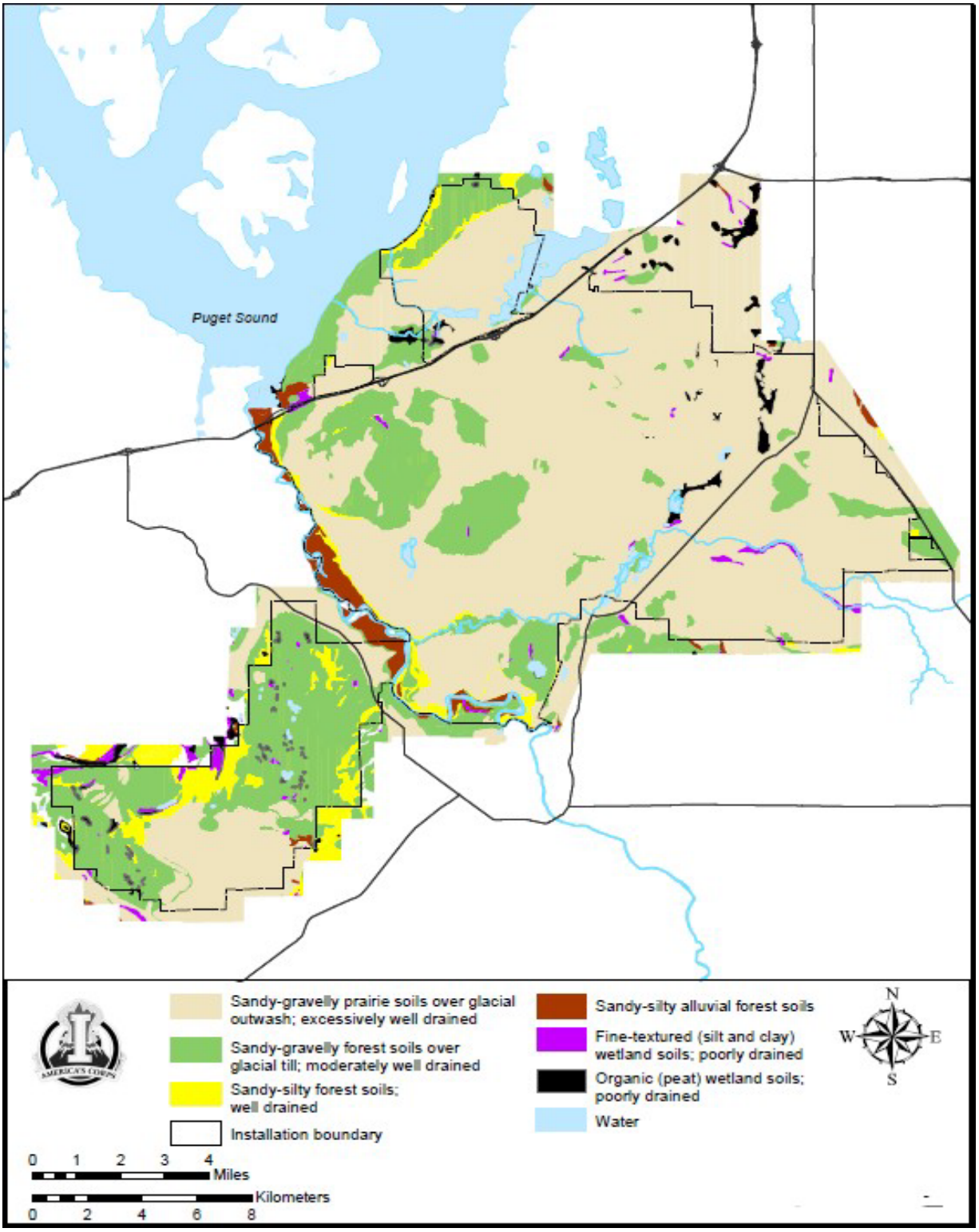
About 6,260 acres of Northeast JBLM falls within the Spanaway Basin of the Chambers Creek watershed, which drains directly into Puget Sound via surface and groundwater. A formal Groundwater Management Plan for the Chambers Creek basin is administered by the Tacoma-Pierce County Health Department.

Clover Creek enters McChord Field on the Eastern edge of the Installation and travels through two 12-foot diameter culverts beneath Perimeter Road. Morey Creek also enters McChord Field on the East Installation boundary, flows through Morey Pond, down the Morey Creek Dam bypass where it merges with Clover Creek, East of the runways. Clover Creek then flows westward through twin 12-foot culverts under the airfield and emerges West of the airfield near the industrial portion of the base. The creek exits the base at its Western boundary and flows into Lake Steilacoom. Lake Steilacoom empties into Chambers Creek, which discharges to Chambers Bay at Puget Sound. A spillway and substation are located on Chambers Creek at its entrance to Chambers Bay.

Stormwater from developed areas on the Installation discharges to groundwater, via onsite infiltration or through surface water drainage systems, to Puget Sound or other surface waters on JBLM, such as Clover Creek, Murray Creek, American Lake, or marshes in the vicinity of Sequalitchew Creeks. Stormwater runoff from one drainage basin on Lewis North passes through an oil/water separator before continuing down a constructed storm drainage channel (JBLM Canal) that discharges to Puget Sound near the Wastewater Treatment Plant at the Northwest corner of the Installation.

Under the JBLM Municipal Separate Storm Sewer System (MS4) Permit (WAS-026638), new construction projects are required to provide onsite management and treatment of stormwater, which reduces stormwater discharges to surface waters and increases onsite infiltration and aquifer recharge. Stormwater from commercial and industrial sectors of the cantonment area are routed through stormwater treatment facilities, which may include oil/water separators, prior to discharge to the JBLM MS4. Industrial and commercial process wastewater is routed through oil/water separators, grease traps, or other treatment devices prior to discharge to the sanitary sewer for further treatment at the Wastewater Treatment Plant before effluent is discharged to the Puget Sound.

Figure 2.4. Soils on Joint Base Lewis-McChord



U.S. Army Corps of Engineers completed a floodplain survey for McChord AFB in September 2000. McChord AFB was delineated as having 102 acres within a 100-year floodplain, and 182 acres within a 500-year floodplain. The 100-year floodplain and the 500-year floodplain were mapped. Areas included in the floodplain included the airfield, grasslands, and a limited, very narrow riparian area.

Groundwater

The flow of groundwater underlying JBLM is controlled by a system of hydro geologic units consisting of alternating aquifers (water-bearing strata of sand and gravel) and aquitards (strata composed of silts and clays not capable of producing significant amounts of water; Public Forestry Foundation 1995). Depths to groundwater in the unconfined aquifers throughout JBLM range from ten to thirty feet, with lesser depths near lakes and streams and greater depths beneath hilly areas. The remaining aquifers are characterized by aquitards with low permeability that contains groundwater under confined conditions. Confined aquifers are generally less susceptible to surface sources of contamination than unconfined aquifers.

Groundwater recharge on a regional scale originates as precipitation on the Western flank of the Cascade Mountains, is transmitted in a generally westerly direction through the hydro stratigraphic system, and discharges to the Puyallup and Nisqually river valleys and Puget Sound. Local recharge of groundwater is provided by infiltration of precipitation, stormwater runoff, and lakes and streams that lie above the prevailing water table.

Groundwater in the shallow Vashon Drift aquifer generally flows in a West/Northwest direction across JBLM, but changes direction in the vicinity of discharge areas such as major lakes, creeks, and the Nisqually River. Flow of groundwater in the deeper aquifers also is generally in a West/Northwest direction. Groundwater elevations decrease with aquifer depth, indicating a downward vertical gradient, and velocities have been estimated at 0.02 to two feet per day for the shallow Vashon Drift aquifer and 0.1 to one foot per day for the Salmon Springs aquifer (Envirosphere Company 1988).

The groundwater in the JBLM area is generally low in total dissolved solids and shows a predominance of calcium and bicarbonate as major constituents, with lower concentrations of magnesium, sulfate, and chloride (Brown and Caldwell 1985). Discharges from septic tanks and stormwater recharge systems (dry wells) have resulted in detectable increases in constituents such as nitrates and chlorides in developed portions of Pierce County. Monitoring records for the JBLM water system indicate that, with few exceptions, water quality complies with State and local requirements for water supplies (Gray and Osborne 1991). The groundwater quality beneath specific areas of JBLM, mainly within the cantonment area, has been adversely affected by past activities, including waste disposal, leakage, and spillage of chemicals.

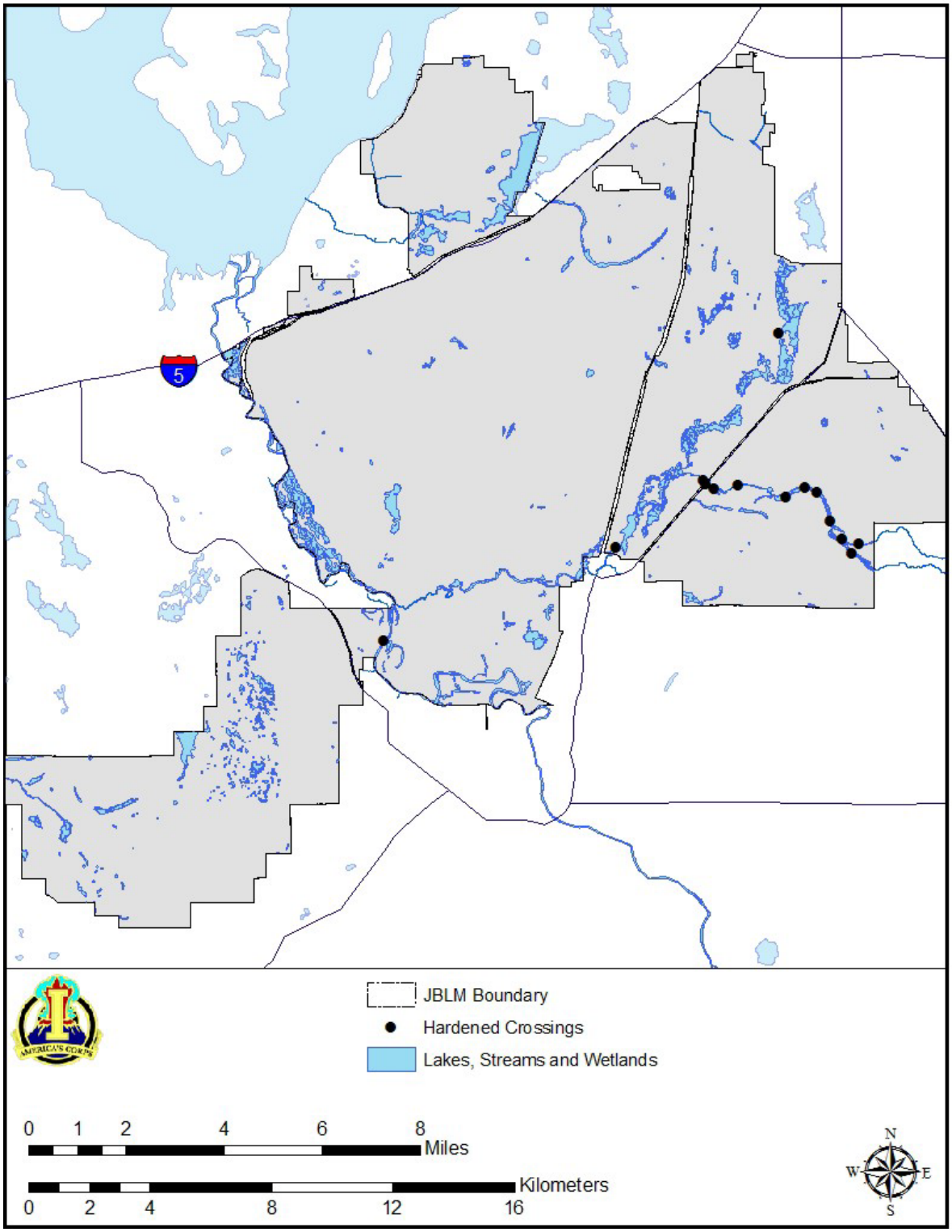
In May 1987, a petition for sole-source aquifer designation of the Clover/Chambers Creek basin was submitted by the Tacoma-Pierce County Health Department to the Environmental Protection Agency (EPA) as a key component of a basin-wide management strategy. EPA designated the unconfined aquifer under Pierce County as a sole-source aquifer in 1993; Thurston County never applied for this status. Because of the sole source designation, new solid waste landfill cells cannot be constructed on JBLM and groundwater conditions may impact future land-use decisions on the Installation.

Water Quality

Stormwater originating in developed areas on the Installation is in accordance with applicable United States Environmental Protection Agency National Pollutant Discharge Elimination System (NPDES) Permits and Washington State water quality requirements. The NPDES permitting process addresses stormwater impacts to aquatic species and habitats downstream. Furthermore, efforts to reduce potable water consumption and efforts to manage stormwater or reclaimed water through infiltration could help increase the quantity of water in Sequalitchew Creek.

JBLM has taken several measures to assure compliance with the Washington State Coastal Zone Management Program. Erosion beyond natural processes is very minor due to management actions such as riparian enhancement projects on JBLM streams, stream crossing only occur at designated hardened crossing sites, and a 50-meter buffer zone is established along all bodies of water. The buffer zone excludes any ground disturbing activities within the buffer. As a result of these actions, human caused sedimentation is so minor that none would ever reach the coastal zone. In addition, JBLM constructed a new sewage treatment plant, which began operating in August 2016. The treatment plant is designed to support a projected population of 100,000 people by providing biological nutrient removal, tertiary membrane filtration, and UV disinfection. This advanced treatment improves the quality of water discharged to Puget Sound to Class A level. This water will be re-distributed for use on the base once the infrastructure for distribution is in place.

Figure 2-5. Water Resources at Joint Base Lewis-McChord



2.4. General Biotic Environment

The general biotic environment is described in the sections below. Because of the importance of these individual resource areas, supplemental information has been included later in the document.

Flora

A wide variety of plant community types occurs on JBLM, and approximately 700 species of vascular plants are found on the Installation (Appendix C). There are four main habitat types: coniferous/mixed forests, oak/oak-mixed woodlands, prairies, and wetlands/riparian areas (also see Fish and Wildlife Management Plan (Appendix D)).

Coniferous/Mixed Forests

Approximately 52,600 acres of JBLM are forested. There are three main forest types: dry Douglas-fir (*Pseudotsuga menziesii*) forest, moist Douglas-fir/red cedar (*Thuja plicata*)/Western hemlock (*Tsuga heterophylla*) forest, and wetland/floodplain forest (Figure 2.6). Dry Douglas-fir forests comprise approximately 70 percent of the forests on the Installation and are characterized by plants that thrive under relatively dry forest conditions. This category has been further divided into one) dry forests on prairie soils and two) dry forests on forest soils (Department of the Army 1999). Dry forests on prairie soils are “colonization” Douglas-fir stands that occupy former prairies that are underlain by prairie soils formed on glacial outwash. These stands have little coarse woody debris. Dry forests on forest soils consist of Douglas-fir stands growing in areas that historically were forest and are underlain by forest soils on glacial till and moraine. These stands typically have more coarse woody debris than dry forests on prairie soils.

Approximately 25 percent of forest is the moist forest type, which tends to contain more red cedar and hemlock and deciduous trees, such as big leaf maple (*Acer macrophyllum*), than dry forest stands. These stands are found on till, moraine, and depressions in glacial outwash. About two percent of the Installation contains wetland/floodplain forest dominated by hardwood trees, mostly along the Nisqually River.

Since the late 1800s, fire has ceased to be a major agent of ecological change, and during the 1930’ s and 1940’ s, most of the Installation’s forests were clear-cut. Thus, most of the forest stands on JBLM are of similar age and do not contain trees that have developed the structural characteristics of mature and old- growth forests.

Prairies

An estimated 20,000 acres of prairie habitat (this includes a small acreage of riparian meadows) occur on JBLM. These prairies vary in quality, with quality typically defined in terms of the amount of native vegetation relative to the amount of non-native vegetation on a given site. According to descriptions provided by the Washington Natural Heritage Program, relatively undisturbed South Puget Sound prairies can be defined by the Roemer’s fescue – white-top Aster association community type.

Disturbed prairies, which typically support substantial populations of invasive species, are defined by several different disturbance community types, which vary on the basis of their species assemblages.

Historically, prairies formed a dynamic vegetation complex with Oregon white oak, Ponderosa pine, and Douglas-fir savannas.

2.4.1. Fauna

JBLM provides habitat for numerous wildlife species (Appendix C), including federally listed species, candidates for listing, and other special status species. The Fish and Wildlife Management Plan (Appendix D) primarily direct management for wildlife populations and habitats.

In forests, management focuses on maintaining a variety of forest habitats utilized by wildlife. From a habitat perspective, silvicultural treatments by DPW Forestry staff provide structural and stand diversity suitable for a wide range of forest species. DPW Fish and Wildlife biologists provide recommendations to DPW Forestry staff for forest-dwelling wildlife pertaining to proposed timber sales and other activities. Creation of openings within timber stands creates habitat for early successional species. Variable-density thinning, along with the retention of key habitat elements (e.g., decadent trees, coarse woody debris, and snags), helps encourage the development of mature forest habitats. The goal of variable-density thinning is for the post-harvest stand to be more heterogeneous than the pre-harvest stand. In contrast, traditional thinning has as its goal a more homogeneous post-harvest stand than the pre-harvest stand. In addition, DPW Fish and Wildlife staff place nest boxes in key areas to enhance the habitat cavity dependent species and install nest platforms for raptors.

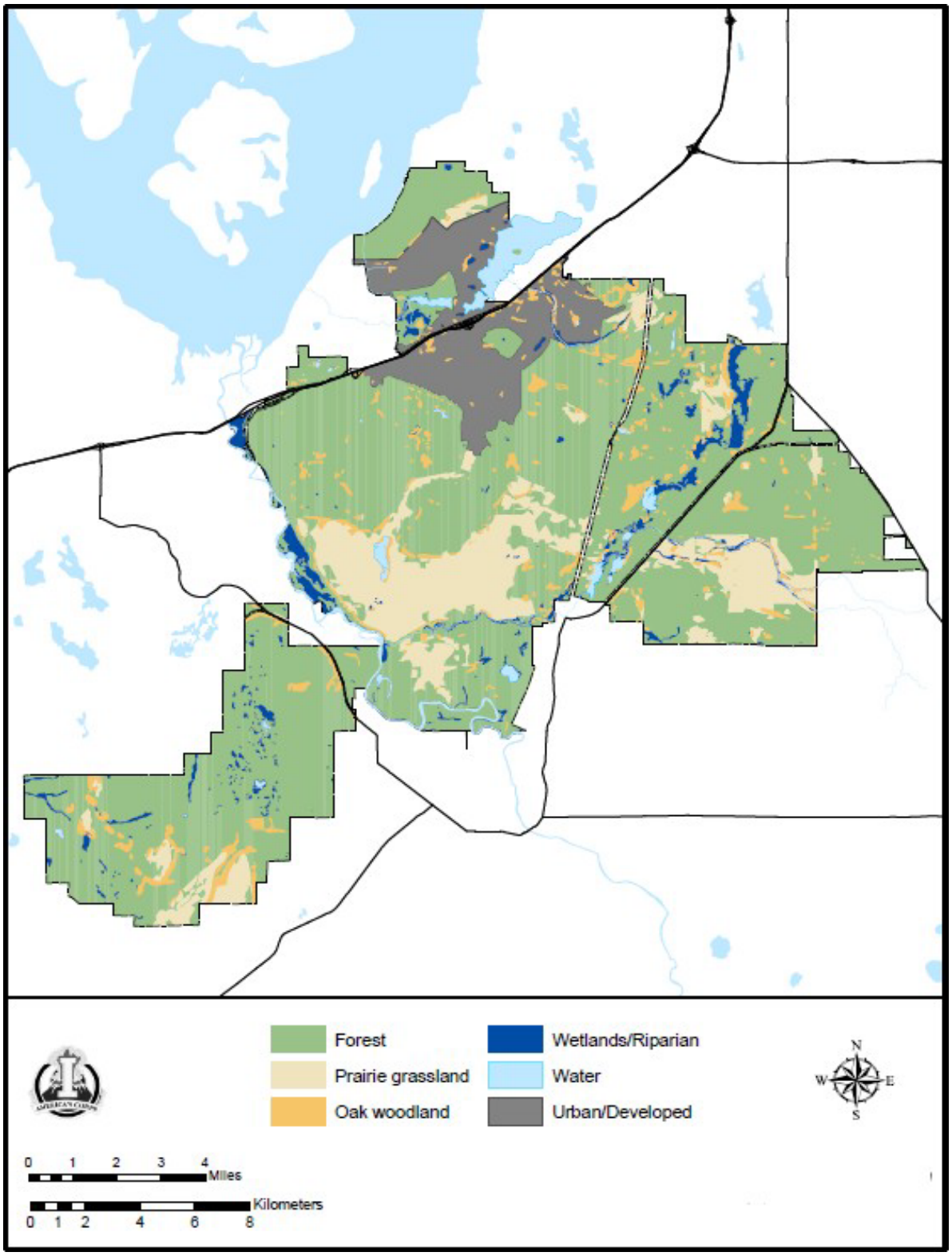
In prairies, wildlife management focuses on developing and maintaining structural elements that support native species. The use of prescribed burning is essential to achieve this management goal. Mowing and herbicide treatments are also used as management tools. DPW Fish and Wildlife's management efforts are directed at providing unique opportunities to support various aspects of military training by maintaining, restoring, and increasing the native vegetation components of prairies, which also improves habitat for a suite of prairie wildlife species.

Oregon white oak communities offer a structural complexity not found in the surrounding prairies and conifer forests, which provide a variety of wildlife habitat elements for feeding, breeding, resting, and shelter (Larsen and Morgan 1998). The WDFW has defined Oregon white oak communities as Washington State priority habitats because they contribute significantly to the diversity of wildlife found in Washington. General wildlife management in the Oregon white oak community focuses on increasing the size and openness of oak habitats, increasing connectivity, and reducing catastrophic fire risks.

Management of fish and wildlife habitat in wetlands and aquatic habitats and their associated buffers focuses on enforcing regulations that protect wetlands and enhancing wetland and aquatic habitats for native fish and wildlife species. Vegetation management is the primary strategy for wetland habitat enhancement, but enhancement of spawning habitat and planting native plant species occurs.

In addition to general fish and wildlife habitat management by ecosystem type, there are species specific management actions directed at maintaining populations of rare, sensitive, and listed species, as well as game species that occur on JBLM. Additional information on these management strategies are found in the specific ESMCs in Appendix E and Fish and Wildlife Management Plan in Appendix D.

Figure 2-6. General Habitat Types at Joint Base Lewis-McChord



3.0. ENVIRONMENTAL MANAGEMENT STRATEGY AND MISSION SUSTAINABILITY

3.1. Management Strategies

3.1.1. Ecosystem Management

Ecosystem management is a goal-driven approach to environmental management at a scale compatible with natural process; is cognizant of nature's time frames; recognizes social and economic viability within functioning ecosystems; 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 part of the whole (DoD Ecosystem Management Principles).

An ecosystem management approach not only considers issues covering a greater region (increased spatial scale), but also issues spanning many years (increased time scale). Furthermore, implementation of an ecosystem approach requires decision making on a whole host of issues both local and regional, short-, and long-term, and involving participation by many different groups.

Natural resources on JBLM are managed to provide a variety of environments for military training. For the most part, resource management occurs at the ecosystem level, with the intent of providing sustainable, healthy, biologically diverse ecosystems that support the military mission over the long term.

For the purposes of ecosystem management, JBLM is divided into the following ecosystem types: forests, prairies/grasslands, Oregon white oak woodlands, and wetlands.

3.1.2. Biodiversity

Ecosystem management dictates managing the land for a high level of natural biodiversity. There are four hierarchical levels of biodiversity:

1. Genetic diversity – the variety of different genetic combinations within a species in a given area.

2. Species diversity – the variety of different species in a given area.

3. Community diversity – the variety of different interacting, plant and animal assemblages in a given area.

4. Ecosystem diversity – the variety of different ecosystems in a given area.

3.1.3. Landscape

Fully understanding the importance of an ecosystem's response to any influence, the spatial and temporal context of the event must be considered at the landscape level. Many processes occur across a landscape, which can be regional in scope. A landscape contains many ecosystems, and many spatially distinct occurrences of those ecosystems. The landscape perspective is essential since events that impact particular ecosystems may originate in part or in whole outside their boundaries.

3.1.4. Multiple Use

Multiple-use was and still is the focus of natural resources management on JBLM. Multiple-use is an obvious management philosophy for military installations, offering military training plus wildlife, fisheries, forestry and recreation values. Multiple-use land values are consistent with ecosystem management principles since they incorporate people and their needs. The general philosophy of ecosystem management is if the health of the ecosystem or landscape is maintained, the land will be in the best condition to support a diversity of species, products, and uses.

3.1.5. Science and Data Collection

Science and the information it generates are integral to ecosystem management and must be fully incorporated into decision-making. Wise decisions are supported by credible, objective, unbiased, relevant, and timely information that is widely available, easily accessible, and usable. Ecosystem management uses data from many sources, including inventories, surveys, assessments, classifications, and research. This information is required for baseline determinations, monitoring, evaluations, and adaptive management approaches. Ecosystem management integrates scientific and experiential knowledge across a spectrum of ecological, economic, and social values and opportunities. Successful ecosystem management depends upon a clear role for science and scientists in the decision-making process as well as a clear path for scientific information to flow to and from all participants, which is key for adaptive management practices.

3.2. Supporting Sustainability and the Military Mission

In 2002, JBLM and associated stakeholders established long-term Installation sustainability goals for the Installation Sustainability Program. These goals provided a cohesive strategic direction for the various projects happening on JBLM.

Two of the goals (five and six) pertain to sustaining training lands:

1. Goal 5: Maintain the ability of JBLM to meet its current and future military missions without compromising the integrity of natural and cultural resources, both on the Installation and regionally.

2. Goal 6: Participate in regional recovery of all listed and candidate Federal species in the South Puget Sound Region.

Progress towards meeting these goals will be accomplished by carrying out the management strategies contained in component parts of this INRMP that include the ESMCs, Fish and Wildlife Management Plan, Forest Management Plan, Prairie Management Plan and the ACUB Program.

3.3. GIS Data Management and Integration

One tool for accessing, assessing, and integrating spatial natural resource data is the JBLM GIS. This system, maintained and operated by DPW, consists of numerous datasets, many with multiple data layers that can be used as inputs for planning purposes. Examples of layers that are important for natural resource management include environmental hazards, safety zones, wetlands and wetland buffers, Seibert-staked areas, timber sales, unique habitats and soils, and layers pertaining to land use. Even though some of these data come from outside parties, they will still be sought and incorporated into program management. DPW Fish and Wildlife and other branch staff will update layers including defining attributes within metadata and create new layers as the information is obtained. The creation of layers will be consistent with data management plans created prior to data collection. Data management plans will include; project description, project name, data source type, data processing steps, quality checks, data format, where the data will be stored, who will be collecting the data, backup and storage, and access and sharing.

Currently, all JBLM personnel have access to the data by making requests for information and layers of interest. Sensitive data such as rare species locations require approval on a case-by-case basis. JBLM will expand the GIS database and the Land Use Deconfliction process. The goal is to have readily available data layers that visually document where all activities that could affect natural resources and military training are going to be taking place, and actively use the layers to deconflict these activities. It should be noted that the Land Use Deconfliction process is limited to existing available data that are currently in the database, and may not provide a complete picture. Additional field investigations are usually required, especially for planning new building locations.

3.4. Natural Resources Consultation Requirements

JBLM complies with Section 7 of the ESA by consulting with USFWS or NMFS for any actions authorized, funded, or carried out by the Installation that may affect federally listed species (endangered, listed, or proposed). Actions are assessed to determine if they may affect listed or proposed species. If it is determined that an action may affect listed or proposed species, proposed critical habitat or designated critical habitat, a biological assessment is conducted and a request for conferencing or consultation is presented to the USFWS.

JBLM consults with NMFS on any current or proposed actions that may adversely affect Essential Fish Habitat. JBLM submits a description of the proposed action, an analysis of impacts, and effect determination to NMFS. Upon receipt of conservation

recommendations from NMFS, JBLM proceeds with implementation of the recommendations.

3.5. National Environmental Policy Act Compliance

The National Environmental Policy Act (NEPA) of 1969, is the fundamental environmental planning process that must be undertaken by all Federal agencies before initiating actions that may affect the environment. NEPA, along with its implementing regulations, essentially is the planning tool for the government to assess the potential environmental effects of its actions. The NEPA process includes the systematic examination of possible and probable environmental consequences of implementing a proposed action. The goal of NEPA review is to integrate environmental review and environmental consideration into all planning activities that occur at JBLM. To ensure effectiveness, all proposed Federal actions and/or activities, are reviewed for environmental impact at the earliest time possible through the Land Use Deconfliction process. NEPA is an integral part of the natural resources management on the Installation, because it ensures that environmental impacts are considered as part of project planning and highlights project's potential incompatible uses or conflicts with natural resources. NEPA establishes policies and goals for the protection of the environment. Section 102(2) of NEPA contains certain procedural requirements directed toward the attainment of such goals. For this INRMP, an Environmental Assessment that has been provided to the public for 30 days of review and comment, along with its associated Finding of No Significant Impact, has been completed and is located at Appendix K.

3.6. Beneficial Partnerships

Many organizations and individuals may have an interest in environmental stewardship efforts at JBLM. Partnering involves common goals and mutual interests, whether it is related to addressing regulatory compliance issues or achieving conservation and stewardship goals. A partnership typically is not a legally binding relationship; rather, it is a commitment and agreement between two or more groups.

3.6.1. Army Compatible Use Buffer Program

JBLM's ACUB Program was started in 2006 to relieve environmental encroachment associated with the anticipated listings of Taylor's checkerspot, Streaked horned lark, and Mazama pocket gopher under the Endangered Species Act. On August 29, 2013, the USFWS listed the Oregon spotted frog as a threatened species (78 FR 53581) and on October 3, 2013, the Taylor's checkerspot butterfly was listed as endangered and the Streaked horned lark was listed as threatened (78 FR 61451). On April 9, 2014, the USFWS listed four subspecies of the Mazama pocket gopher as threatened (79 FR 19759). Two of these subspecies, the Roy Prairie and Yelm pocket gopher, occur on the base. Finally, on October 3, 2014, the yellow-billed cuckoo was listed as a threatened species (79 FR 59991). Military training and restoration activities on JBLM are covered under a section 7 consultation. To reduce the potential for additional restrictions, the Army has undertaken proactive conservation actions, both on JBLM, as

described in detail in this INRMP, and off JBLM, under the ACUB Program, as described in more detail in each of the ESMCs (Appendix E).

The goal of the ACUB Program is to:

Reduce environmental encroachment (restrictions on training) on JBLM associated with species listed under the Endangered Species Act by supporting the conservation of these species on lands off of the Installation.

The ACUB objectives are:

- Acquire an interest in parcels containing existing or restorable prairie, primarily in the South Puget Sound area;
- Manage these parcels, jointly with currently protected (public or private ownership) prairie lands, for recovery of listed, proposed and candidate prairie species; and
- Accomplish the above objectives through partnerships.

Six types of conservation actions are funded by ACUB:

1. Land acquisition.
2. Habitat restoration and maintenance.
3. Increase sizes and numbers of candidate species populations.
4. Planning.
5. Monitoring.
6. Research.

The last three actions support each of the first three actions.

Since 2006, the ACUB Program has acquired 2,139 acres of prairie land, which, added to 2,917 acres of prairie land already in conservation status in 2006, yields a total of 5,056 acres of protected prairie land in the South Puget Sound region outside of JBLM. In addition, ACUB has upgraded prairie habitat quality across more than 3,300 acres and is carrying out four reintroductions, two of Taylor's checkerspot and two of Mazama pocket gopher, on ACUB properties. Ecological restoration plans are completed for each ACUB property, monitoring protocols developed for prairie quality and the status of each of the listed species, and research to

fill information gaps on each species' biology and effective methods of habitat restoration. We have also completed projects on regulatory relief, conservation credits, and education/outreach, using fiscal year 2013 REPI Challenge funding. In addition, we are participants in the JBLM Sentinel Landscape, the first such designated landscape in the nation, which includes projects on working (ranch) lands.

3.6.2. Interagency Agreements

Contractual and funding mechanisms must be in place for ED to access the assistance of a Federal agency outside DoD for natural resources management. An Interagency Agreement (IA) allows another agency to provide specific assistance for species recovery and/or INRMP implementation. The IA may or may not be linked to an existing Memorandum of Understanding (MOU). For example, an MOU between DoD or a specific Military Department and a Federal agency may exist that describes, in general, a range of cooperative support and activities that are permitted between the two groups. In this case, an IA may be the mechanism used when a specific installation receives support from a specific office of the agency. Whether associated with an MOU or not, the IA should include standard contract components and should cite the respective authorities for executing the IA and how the agency will be reimbursed for the services to be provided.

3.6.3. Cooperative Agreements

Cooperative Agreements (CAs) to acquire goods and/or services can be utilized to support INRMP implementation. CAs is typically made to transfer money, property, services, or anything of value to support an activity undertaken for the public good. These agreements may be made with other Federal agencies, Native American Tribes, States, local governments, private nonprofit organizations, or individuals. CAs is an excellent mechanism for developing successful, long-term partnerships with organizations or individuals that can provide you with specialist or unique, needed services. DoD Installations are authorized to enter into CAs under a number of Federal laws. Section 670c-1 of the Sikes Act of 1997 and DoD Instruction 4715.3, Environmental Conservation Program, specifically identify CAs as a means to accomplish work in support of INRMP implementation. The CAs may be used for “inventories, monitoring, habitat enhancement, research, minor construction and maintenance, public awareness, and other work that supports the DoD conservation program.”

4.0. PROGRAM ELEMENTS

The following terms are used throughout the INRMP in reference to natural resources:

Goal. The term goal refers to a broadly defined end state or condition that an entity is attempting to reach. In this INRMP, goals are the primary products of long-range plans for management of natural resources. In some cases, goals are presented as desired future conditions of a particular resource.

Objective. Objectives are statements of achievement that lead to the accomplishment of a goal, and as such may be used to provide indicators of progress. During natural resources planning, objectives are identified to lay out an approach for attaining broader goals.

Strategy. A strategy refers to a plan of action for using staff and funding to accomplish specific objectives and ultimately reach goals. Strategies refer to specific management actions and monitoring programs that will be completed by a given natural resources management program in order to meet objectives, and ultimately goals.

Priority Habitat. Habitat on JBLM that was proposed by the USFWS in the Federal Register as potential critical habitat for the Mazama pocket gopher, Taylor's checkerspot butterfly, and Streaked horned lark, was exempted in the final designations due to the conservation commitments outlined in the ESMCs and the past, current and future management actions conducted by the Army and Air Force on JBLM to protect these species. This is based on Section 4(a)(3)(B)(i) of the ESA, which exempts lands from critical habitat if an INRMP is in place that provides adequate DoD benefit to species for which critical habitat is proposed. All of the priority habitats on the base are either currently occupied and/or were determined by the USFWS to be essential for the recovery of the species.

Table 4.1. Joint Base Lewis-McChord Priority Habitat

Species	Acres
Mazama Pocket Gopher	6,345
Taylor's Checkerspot Butterfly	2,323
Streaked Horned Lark	2,813
TOTAL (combined overlap)	**11,481**
TOTAL (discounting overlap)	**8,994**

Potential Habitat. Habitat that possesses some of the key habitat characteristics required by the species, but currently is not suitable for the species due to habitat degradation. Potential habitat could become suitable habitat with appropriate management actions.

Suitable Habitat. Habitat that possesses all of the key habitat characteristics to support the species. Suitable habitat includes occupied and unoccupied habitat and can be property both on and off JBLM.

Occupied Habitat. Habitat that is suitable and currently occupied by the species to included buffered areas as defined in the ESMCs for each species.

Unoccupied Habitat. Habitat that is suitable but currently unoccupied by the species

4.1. Federally Endangered, Threatened, Proposed and Candidate Species Management

Table 4-2 lists plant and animal species that occur, or are potentially impacted by JBLM operations, on JBLM and are given a special status at the Federal level based on their risk of extirpation and decline. Included in this table are some species that once occurred on JBLM, but are not thought to occur there currently. Detailed background information and management strategies on these species may be found in Appendix E.

Table 4-2. Federally Listed, Proposed or Candidate Species Potentially Impacted by Joint Base Lewis-McChord Operations

Common Name	Scientific Name	Primary Habitat	Federal Status
Plants			
Water Howellia	*Howellia aquatilis*	Wetland	T
Invertebrates			
Taylor's checkerspot	*Euphydryas editha taylori*	Prairie	E
Reptiles and Amphibians			
Oregon spotted frog	*Rana pretiosa*	Wetland	T
Birds			
Marbled murrelet[1]	*Brachyramphus marmoratus*	Forest, Marine	T
Northern spotted owl[2]	*Strix occidentalis caurina*	Forest	T
Streaked horned lark	*Eremophila alpestris strigata*	Prairie	T
Yellow-billed cuckoo[2]	*Coccyzus americanus*	Riparian	T
Mammals			
Mazama pocket gopher	*Thomomys mazama*	Prairie	T
Fish			
Bull trout	*Salvelinus confluentus*	Aquatic	T
Chinook salmon	*Oncorhynchus tshawytscha*	Aquatic	T
Steelhead trout	*Oncorhyncus mykiss*	Aquatic	T

Common Name	*Scientific Name*	Primary Habitat	Federal Status
Boccacio rockfish	*Sebastes paucispinis*	Marine	E
Canary rockfish	*Sebastes pinniger*	Marine	T
Yelloweye rockfish	*Sebastes rubberimus*	Marine	T
Marine Mammals			
Southern resident killer whale	*(Orcinus orca)*	Marine	E
Humpback whale	*(Megaptera novaeangliae)*	Marine	E
Steller sea lion	*(Eumetopias jubatus)*	Marine	T
C = candidate; E = endangered; P = proposed for listing. 1 – This species is not known to nest on JBLM, but foraging marbled murrelets may be found in marine waters within the Installations vicinity. 2 – This species is not known to occur on JBLM. Sources: National Oceanic and Atmospheric Administration National Marine Fisheries Service (2007), U.S. Fish and Wildlife Service (2007a), Washington Department of Fish and Wildlife (2007), and Washington Natural Heritage Program (2005, 2007).			

4.1.1. Endangered Species Management Components for Endangered Species

Currently there are ESMCs for Taylor's checkerspot, Chinook Salmon, Steelhead, Bull Trout, Mazama pocket gopher, Streaked horned lark, Water Howellia, Boccacio (*Sebastes paucispinis),* Canary *(S. pinniger),* and Yelloweye *(S. rubberimus*) rockfish. These species are not discussed within the general INRMP as they are adequately covered under the ESMCs. Other listed species that do not have ESMCs which is the case when no critical habitat was proposed for the species on JBLM, or species that are rare or sensitive species are discussed below.

4.1.2. Oregon Spotted Frog

Management will focus on protection and enhancement of wetland habitats on JBLM.

Regulations. Vehicle traffic is required to stay on established roads within 50-meters of wetland buffers. Any construction or training activities that are proposed within the 50-meter wetland buffer will require coordination with DPW Fish and Wildlife staff (FL Reg. 200-1).

Objective 1: Protect wetlands on JBLM.

Strategies:

- Implement and enforce all restrictions pertaining to wetland habitats listed in FL Reg. 200-1 (not to dig or drive off-road within 50-meters of wetlands); and

- Continue to regulate construction and other ground disturbing activities in and near wetlands so that they will not impact potential habitat.

Objective 2: Monitor Oregon spotted frog populations.

Strategy: Conduct annual oviposition surveys within Oregon spotted frog in the Muck creek system, which has the highest potential for occupancy. Surveys will be conducted between 15 February and 15 April.

Objective 3: Implement habitat enhancement projects within potential Oregon spotted from habitat.

Strategy: Conduct management actions to achieve desired habitat conditions for the Oregon spotted frog to include mechanical treatment, herbicide treatment, and vegetation mats.

4.1.3. Marbled Murrelet

Marbled murrelets (*Brachyramphus marmoratus*) are not actively managed at JBLM. Marbled murrelets are small seabirds that spend the majority of their lives within, or adjacent to the marine environment.

Marbled murrelets nest in-land, primarily within mature and old growth forests. There is currently no potential nesting habitat for the species on JBLM. Marbled murrelets are presently not known to nest on the Installation, but do forage within the marine near shore areas of Puget Sound adjacent to lands managed by the DoD (such as Solo Point). Radar surveys conducted in 2009 picked up a very low percentage of potential murrelet targets (Hamer 2009). Habitat surveyed included Proposed activities that have the potential to impact marbled murrelets (amphibious operations training, waste water treatment, etc.) are reviewed, and consultation with USFWS is initiated as appropriate.

4.1.4. Northern Spotted Owl

Although the species has not been documented on JBLM, it is possible that they were present in the Installation's forests in the past and could potentially inhabit them in the future. The Northern spotted owl is a nocturnal bird of late-successional forest habitats. This subspecies is associated with mature coniferous forests in the Pacific Northwest, and has a well-defined set of basic nesting, roosting, and habitat characteristics. These characteristics include features that are commonly, though not exclusively, associated with mature forests, such as closed canopies, multi-storied stands, snags, and coarse woody debris.

JBLM manages its forests to support recovery efforts as required under the ESA, within an Owl Habitat Focus Area in the RTA. A Northern Spotted Owl ESMC (Appendix E) was prepared to guide the Army in the management of JBLM forests to benefit Northern Spotted Owls. Since forests on JBLM primarily are comprised of young Douglas-fir

stands, and the landscape are very different from forest landscapes that typically support Spotted owls, silvicultural prescriptions are necessary to encourage the development of Spotted owl habitat characteristics.

Objective: Manage JBLM forests within the Owl Habitat Focus Area to develop spotted owl habitat characteristics. Desired future conditions for owl habitat are based on the Primary Constituent Elements for the owl (US Fish and Wildlife Service 2012):

Nesting and Roosting Habitat: Sufficient foraging habitat to meet the home range needs of territorial pairs of Northern spotted owls throughout the year.

Stands for nesting and roosting that are generally characterized by:

- Moderate to high canopy closure (60 to over 80 percent);
- Multilayered, multispecies canopies with large (20 to 30 inches or greater diameter at breast height (dbh)) overstory trees;
- High basal area (greater than 240 ft^2/acre);
- High diversity of different diameters of trees;
- High incidence of large live trees with various deformities (e.g., large cavities, broken tops, mistletoe infections, and other evidence of decadence);
- Large snags and large accumulations of fallen trees and other woody debris on the ground; and
- Sufficient open space below the canopy for Northern spotted owls to fly.

Foraging habitat: Across most of the owl's range, nesting and roosting habitat is also foraging habitat, but in the Western Cascades of Washington, Northern spotted owls may additionally use other habitat types for foraging as well. Characteristics of these types are:

- Younger forests with some structural characteristics (legacy features) of old forests, hardwood forest patches, and edges between old forest and hardwoods;
- Moderate to high canopy closure (60 to over 80 percent);

- A diversity of tree diameters and heights;
- Increasing density of trees greater than or equal to 31 inches dbh increases foraging habitat quality (especially above 12 trees per acre);
- Increasing density of trees 20 to 31 inches dbh increases foraging habitat quality (especially above 24 trees per acre);
- Increasing snag basal area, snag volume, and density of snags greater than 20 in dbh all contribute to increasing foraging habitat quality, especially above 4 snags per acre;
- Large accumulations of fallen trees and other woody debris on the ground; and
- Sufficient open space below the canopy for Northern spotted owls to fly.

Strategies:

- Identify which stands on JBLM currently provide owl nesting/roosting, foraging, or dispersal habitat;
- In multiple stands within the Owl Habitat Focus Area, implement silvicultural treatments that will promote the development of late-successional forest (i.e., owl nesting/roosting habitat) within the Owl Habitat Focus Area. These treatments may include a combination of variable-density thinning, canopy gap creation, and planting of shade-tolerant species; and
- As overstory trees become larger, those that die will provide large snags, which, in turn, when they fall down, will provide large logs. Thus, large coarse woody debris will accumulate in owl nesting/roosting habitat.

4.1.5. Marine Mammals

Marine mammals are not actively managed at JBLM because installation activities are primarily land based and do not impact these species. Nevertheless, several species of marine mammals listed under the ESA have the potential to occur within the vicinity of JBLM including Southern Resident killer whale (SRKW) (*Orcinus orca*), Humpback whale (*Megaptera novaeangliae*), and Steller sea lion (*Eumetopias jubatus*). The Marine Mammal Protection Act provides protection to all marine mammals within the JBLM vicinity. Proposed activities that have the potential to impact marine mammals (amphibious operations training, waste water treatment, etc.) are reviewed, and consultation with NMFS is initiated as appropriate for these species.

4.2. State Listed and Rare Species

This section discusses management for species that are listed as Washington State Species of Greatest Conservation Need (which includes species classified as State

endangered, threatened, candidate, or sensitive) as listed in the 2015 update to the Washington State Wildlife Action Plan (WDFW 2015). A list of special status species occurring on JBLM can be found in Table 4-3 below. For more detailed information on special status species, refer to the Fish and Wildlife Management Plan (Appendix D). Management actions in supporting these species will not require or result in any modifications of military training activity.

4.2.1. Rare Plants

The only special status plant species likely to occur in forests on JBLM is Pine-foot, which is listed as threatened at the State level. The one known occurrence of this species in the State was discovered in second-growth Douglas-fir forest on JBLM in the 1990' s. Despite annual surveys, plants have not been found in this area since 1997, and the status of the population on JBLM is unknown (Chramiec 2003). No Army management activities are specifically directed at Pine-foot.

Two special status plant species occur in prairie habitats on JBLM: white-top aster and Hall's aster. White-top aster is found on all prairies on JBLM, but is most common on prairies with a large native species component. Numerous populations are located in areas with CUA designations, and are protected from destructive impacts resulting from military training activities. Hall's aster is found in Johnson and Lower Weir prairies, which are designated as CUAs. Activities to control Scot's broom and other invasive prairie species benefit these native prairie forbs by reducing competition and the likelihood of displacement.

Small-flowered trillium is a State sensitive plant species that grows in moist oak woodlands on JBLM. Populations of this species were located and mapped in 1997.

The majority of populations are located in Seibert-staked areas, which provides adequate protection from vehicular traffic.

Bristly sedge (*Carex comosa*) and floating water pennywort (*Hydrocotyle ranunculoides*) are State sensitive species that occur in wetlands on JBLM. These species are protected from most disturbances by wetland buffers described in FL Reg. 200-1. In addition, efforts by DPW Fish and Wildlife staff to control populations of invasive species in wetlands help prevent these species from being displaced by more competitive non-native species. No Army management activities are specifically directed at bristly sedge or floating water pennywort.

Objective: Protect and enhance populations of special status plant species.

Strategies:

- Survey for special status plant species, map populations using Global Positioning System (GPS), and integrate the data into the GIS database;

- Consider locations and account for populations of rare State-listed plants when scheduling and implementing management actions and other activities with the potential to harm plants; and

- Monitor populations regularly to track fluctuations.

Table 4-3. Special Status Species that Occur on Joint Base Lewis-McChord

Common Name	Scientific Name	Primary Habitat	Federal Status	State Status
Plants				
floating water pennywort	*Hydrocotyle ranunculoides*	Wetland	--	S
Bristly sedge	*Carex comosa*	Wetland	--	S
Hall's aster	*Symphyotrichum hallii*	Prairie	--	T
Pine-foot	*Pityopus californica*	Forest	--	T
Siskiyou Mountain ragwort	*Packera macounii*	Prairie	--	T
Small-flowered trillium	*Trillium parviflorum*	Oak woodland	--	S
Scouler's catchfly	*Silene scouleri ssp scouleri*	Prairie	--	S
Texas toadflax	*Nuttalanthus texanus*	Prairie	--	T
White-top aster	*Sericocarpus rigidus*	Prairie	SC	S
Torrey's peavine	*Lathyrus torreyi*	Open forest	SC	T
Invertebrates				
Rainier roachfly	*Soliperla fenderi*	Aquatic	SC	SGCN
Puget blue	*Icaricia icarioides blackmorei*	Prairie	--	C
Mardon skipper	*Polites mardon*	Prairie	--	E
Valley silverspot	*Speyeria zerene bremnerii*	Prairie	--	C
Hoary Elfin	*Callophrys polios*	Prairie	--	SGCN
Puget Sound Fritillary	*Speyeria cybele pugetensis*	Prairie	--	SGCN
Oregon branded skipper	*Hesperia colorado*	Prairie	--	SGCN
Western Pearlshell	*Margaritifera falcata*	Aquatic	--	SGCN
Reptiles and Amphibians				
Western toad	*Bufo boreas*	Wetland	--	C
Birds				
Bald eagle	*Haliaeetus leucocephalus*	Forest	FCO	SGCN
Common loon	*Gavia immer*	Wetland	--	C
Merlin	*Falco columbarius*	Forest	--	--
Olive-sided flycatcher	*Contopus borealis*	Forest	--	--

Common Name	Scientific Name	Primary Habitat	Federal Status	State Status
Peregrine falcon	*Falco peregrinus*	Urban	FCO	S
Purple martin	*Progne subis*	Forest	--	C
Sandhill crane	*Grus canadensis*	Wetland/Prairie	--	E
Vaux's swift	*Chaetura vauxi*	Forest	--	--
Western bluebird	*Sialia mexicana*	Prairie/Forest Edge	--	SGCN
Yellow-billed cuckoo	*Coccyzus americanus*	Riparian	C	C
Slender billed white breasted nuthatch	*Sitta carolinensis aculeata*	Oak woodland	--	C
Band-tailed pigeon	*Patagioenas fasciata*	Oak woodland/open forest/Prairie	--	SGCN
Mammals				
Pacific Townsend's big-eared bat	*Corynorhinus townsendii townsendii*	Forest	--	C
Western gray squirrel	*Sciurus griseus*	Oak woodland	--	T
Fish				
Coastal cutthroat trout	*Oncorhynchus clarki clarki*	Aquatic	--	--
Pacific lamprey	*Lampetra tridentata*	Aquatic	SC	SGCN
River lamprey	*Lampetra ayresi*	Aquatic	SC	C

C = candidate; E = endangered; SGCN = Species of Greatest Conservation Need; S = sensitive; SC = federal species of concern; FCO = federal species of concern, and T = threatened. Sources: Washington Department of Fish and Wildlife (2017) (http://wdfw.wa.gov/publications/01742/5_Chapter3.pdf)

4.2.2. Rare Butterflies

The Mardon skipper, Puget blue, Hoary elfin, Oregon branded skipper, Great spangled fritillary, and the Valley silverspot butterflies benefit indirectly from management of the Taylor's checkerspot butterfly, which is covered separately under an ESMC. The ESMC does not cover these species specifically and therefore specific management measures are covered here.

Because prairie butterflies generally are associated with open, high quality native prairie habitat, overall prairie management strategies to reduce Scot's broom and other invasive species increase the suitability of habitat for these butterfly species. Prescribed fire is essential to maintain the high quality native prairie habitat that is needed by these butterfly species. Portions of the AIA burn annually, due to wildfires caused by military ordinance. These management strategies in open areas allow

butterflies access to food and nectar plants. In addition, habitat improvement efforts in high butterfly use areas include replanting of key nectar and host plants. Furthermore, DPW Fish and Wildlife staff conducts annual surveys to monitor populations of rare butterfly species so that their habitats may be mapped and protected. Natural resources management actions in potentially duded areas are limited to non-ground disturbing activities such as herbicide spraying, seeding, and surveying.

4.2.3. Western Gray Squirrel

The Western gray squirrel is Washington's largest native tree squirrel (Ryan 1997). Western gray squirrels inhabit a variety of mast-producing conifer-hardwood forest types. On JBLM, Western gray squirrels are often associated with open understory conifer forests that are adjacent to Oregon white oak and/or Ponderosa pine woodland stands. These areas are often transitional habitats between Douglas-fir forests and prairies. The basic requirements of Western gray squirrel habitat include nuts, seeds, fungi, a connected canopy for arboreal travel and escape, relatively open understory and protected locations for nesting, foraging, and reproduction (Gilman 1986, Foster 1992, Ryan and Carey 1995). On JBLM, Western gray squirrels make extensive use of Douglas-fir trees to build their shelter nests and primarily used natural cavities in large firs as natal dens to rear young (Johnson, 2013).

DPW Fish and Wildlife staff biologists consider the habitat needs of the Western gray squirrel when making recommendations to DPW Forestry about management in occupied and potential Western gray squirrel habitat on JBLM. Silvicultural treatments, including removing overtopping Douglas-fir and prescribed burning treatments, are used to provide for the release and growth of Oak trees, reduce dense understories of native and non-native shrubs and trees, and improve the suitability of habitat for Western gray squirrels. Prescribed burns may also increase the availability of acorns by reducing populations of insects that feed on acorns (Boyd 1999). Additional management activities include working with DPW Forestry staff to design and conduct specific timber sales for the express purpose of improving Western gray squirrel habitat. The management approach for the next five years is to protect and improve populations and habitat. Management actions will focus on protecting and enhancing populations, maintaining currently occupied and potential habitat in a suitable condition, and surveying monitor existing occupied stands and to locate new population centers and core Western gray squirrel habitat.

Objective 1: Protect existing Western gray squirrel populations.

Strategies:

DPW Fish and Wildlife staff will review Forestry timber sales to suggest ways to reduce or eliminate impacts. Timber sales will be surveyed for Western gray squirrel nests prior to timber marking. Nest trees will be marked with orange paint or wildlife tree signs signifying that they are not to be cut. Areas that are considered core habitat and that are likely to receive high use by squirrels will be delineated and either avoided or excluded from the timber sale.

Monitor existing Western gray squirrel populations.

Objective 2: Protect and maintain occupied and potential Western gray squirrel habitat.

Strategies:

- Assess all proposed projects within occupied or potential Western gray squirrel habitat for adverse impacts, and provide comments and recommendations to avoid or minimize impacts so long as it does not impact military training requirements.

- Coordinate forest management activities within the area of influence of Oak/Pine/Fir communities containing Western gray squirrel populations with DPW Forestry to address appropriate scale, distribution, and timing issues. Prior to timber sales, survey occupied or potential habitat for Western gray squirrel nests and mark nest trees and appropriate core area habitats to maintain habitat conditions of occupied areas.

- Manage occupied or potential habitat for encroachment of invasive shrubs and fuel loads that could trigger a stand replacing fire.

- Use prescribed fire, mowing, herbicide treatment, or brush cutting to create an open understory and prevent catastrophic fires in fire dependent conifer and hardwood communities.

- Retain all Oregon white oak and Ponderosa pine whenever possible. Apply silivicultural treatments only when necessary for stand health, as ultimately determined by the Installation Forester.

- Plant native mast producing trees and shrubs as food resources for Western gray squirrels.

- The monitoring of Western gray squirrels on JBLM will be focused on (1) distribution and occupancy fluctuations in response to habitat management actions (e.g., forest management, invasive species control); (2) primary core habitat and nest surveys within scheduled timber sale units; and (3) habitat condition monitoring for disturbance and spread of invasive non-native plant species. Further management strategies for the Western gray squirrel are outlined in the Fish and Wildlife Management Plan (Appendix D).

4.2.4. Slender-billed White-breasted Nuthatch

The Slender-billed White-breasted nuthatch is the Western Washington subspecies of White-breasted nuthatch, a primarily permanent resident in habitats where it occurs. In Washington, Slender-billed White-breasted nuthatches inhabit Oregon white oak woodlands, and may occasionally use Douglas-fir and black cottonwood stands (Seattle

Audubon Society 2002). Nests are built in natural cavities or old woodpecker holes. In 2015, Slender-billed White-breasted nuthatches were observed on the Installation in the vicinity of Weir Prairie.

Activities by the DPW Forestry staff that increase the suitability of Oak woodlands for Slender-billed White-breasted nuthatches include retaining and creating/promoting snags with natural cavities and woodpecker holes, particularly around wetland edges and in fragmented forests. The use of prescribed fire in Oak woodlands promotes habitat characteristics needed by Slender-billed White-breasted nuthatches. Prescribed fires maintain an open understory and promote the creation of nest cavities.

Objective: Support regional efforts to recover this species.

Strategy: Continue using prescribed fire and mowing within Oak habitat to maintain understory conditions suitable for Oak dependent species.

4.2.5. Other Special Status Species

Management for special status species (Table 4-3) not covered specifically within management plans focuses on maintaining or enhancing populations and habitats. Specific management strategies for species that are not covered in ESMCs are presented in the Fish and Wildlife Management Plan (Appendix D).

4.3. Fish and Wildlife

JBLM provides habitat for numerous wildlife species, including listed species, candidates for listing, and other special status species. Management for wildlife populations and habitats is primarily directed in the Fish and Wildlife Management Plan (Appendix D).

In forests, management focuses on maintaining a variety of forest habitats utilized by wildlife. From a habitat perspective, silvicultural treatments by the DPW Forestry staff provide structural and stand diversity suitable for a wide range of forest species. DPW Fish and Wildlife biologists provide recommendations for proposed timber sales and other activities by DPW Forestry staff pertaining to forest-dwelling wildlife. Creation of openings within timber stands creates habitat for early successional species. Variable-density thinning treatments and retention of key habitat elements (e.g., decadent trees, coarse woody debris, and snags) help encourage the development of mature forest habitats. In addition, DPW Fish and Wildlife staff place nest boxes in key areas to enhance the habitat cavity dependent species and construct and appropriately place nest platforms for raptors.

In prairies, wildlife management focuses on developing and maintaining structural elements that support native species. The use of prescribed burning is essential to achieving this management goal. DPW Fish and Wildlife's management efforts are directed at maintaining, restoring, and increasing the native vegetation components of prairies, with the goal of improving habitat for a suite of prairie wildlife species.

Oregon white oak woodlands offer a structural complexity not found in the surrounding grasslands and conifer forests, which provide a variety of wildlife habitat elements for feeding, breeding, resting, and shelter (Larsen and Morgan 1998). General wildlife management in Oak woodlands focuses on increasing the size and openness of Oak habitats, increasing connectivity, and reducing catastrophic fire risks. The risk of catastrophic fire is reduced through use of prescribed burning. Prescribed burning reduces the fuel loadings within Oak communities and provides essential ecosystem functions that cannot be achieved through other management techniques, such as mowing and herbicide application. Oak trees are allowed to grow larger, which is beneficial for wildlife species, such as the Western gray squirrel, that utilize Oaks to help meet life requisites.

Management of fish and wildlife habitat in wetlands and aquatic habitats and their associated buffers focuses on enforcing regulations that protect wetlands and enhancing wetland and aquatic habitats for native fish and wildlife species. Vegetation management is the primary wetland habitat enhancement strategy, but enhancement of spawning habitat and planting native plant species also occurs.

In addition to general fish and wildlife habitat management by ecosystem type, species specific management actions directed at maintaining populations of rare, sensitive, and listed species, as well as game species occur on JBLM. Additional information on these management strategies is found in the specific ESMCs in Appendix E and Fish and Wildlife Management Plan in Appendix D.

4.3.1. Game Species Management

The Fish and Wildlife Management Plan addresses game species that occur on JBLM. For the most part, these species benefit from the vegetation management discussed previously. In forest habitats, variable-density thinning provides open patches for forage while retaining dense areas that provide hiding and thermal cover for large upland game species (black bear, black-tailed deer). Variable-density thinning also creates forest openings of varying sizes and shapes providing forage and cover for small upland game (ruffed grouse and blue grouse). In prairies and Oak woodlands, efforts to maintain and increase native plant communities and structure of habitats, especially Scot's broom removal, improve the quality of forage for big game species (Black bear, Black-tailed deer, and Roosevelt elk). Furthermore, these activities improve forage and hiding cover for small game species (Blue grouse, California quail, Bobwhite, and Ring-necked pheasant).

JBLM contains many lakes, ponds, and marshes inhabited by a variety of game fish and waterfowl. Reed canarygrass has been identified as the primary reason for the loss of game fish habitat on JBLM. Efforts to control invasive species help improve habitat utilized by game fish species. In addition the WDFW stocks fish in bodies of water that are open to the public. Waterfowl benefit from 50-meter buffers, control of invasive wetland plants, maintenance, and creation of snags, and management of major

wetlands for up to 50 percent open water. Furthermore, DPW Fish and Wildlife staff biologists provide additional nesting cavities for waterfowl through nest box and cavity creation programs.

Objective: Maintain viable population levels of game species that utilize forest habitats.

Strategies:

- Conduct variable-density thinning treatments to provide suitable habitat for big game and small upland game species. This strategy is also compatible with Northern Spotted Owl Management strategies.

- This management approach should provide the necessary habitat to maintain populations of game species; no additional strategies specific to game species have been developed. No monitoring program exists for game species. Consequently, JBLM cannot measure population trends of game animals on the installation.

Objective: Maintain viable population levels of game species that utilize prairie habitats.

Strategy: Maintain prairie condition, particularly through control of Scot's broom, to provide suitable foraging habitat for wildlife associated with prairie habitats.

Objective: Maintain viable populations of game species that utilize Oak and Pine community habitats.

Strategy: Use silvicultural treatments and prescribed fire to maintain Oaks, reduce Scot's broom, and increase the amount of Oaks and native understory species to provide suitable foraging habitat and hiding cover for game species that utilize Oak woodland habitats.

Objective: Maintain viable populations of waterfowl and game fish.

Strategies:

- Enforce regulations that restrict vehicular traffic to established roads (FL Reg. 200-1) and within 50-meter buffer of wetlands;

- Maintain existing snags, retain damaged trees for future snags, and create snags to provide habitat for cavity nesting species;

- Supplement existing natural cavities with nest boxes for cavity nesting species;

- Manage Chambers Lake and Spanaway, Hardhack, Johnson, and Halverson marshes for approximately 50 percent open water; and

- Create and maintain open water habitat in wetlands and streams that support populations of game fish.

4.4. Migratory Birds

The Migratory Bird Treaty Act (MBTA) (16 USC 703-712) prohibits the taking, killing, or possessing of migratory birds unless permitted by regulations promulgated by the Secretary of the Interior. Conserving migratory birds is a key component to managing for biological diversity and ecosystem management and is accomplished through conserving, protecting, and managing species habitats at JBLM. The NEPA review process considers migratory birds and their habitats when conducting environmental reviews. In addition, surveys for these species are conducted as resources allow.

Research projects targeting migratory birds will be encouraged to increase our knowledge of these species and their habitat utilization and migratory patterns on the Installation. Monitoring and predicting migratory patterns can further efforts to help prevent BASH. The efforts to prevent bird strikes, which can result in loss of personnel and equipment, as well as the inadvertent taking of the species include: long-term monitoring of migratory bird habitat use and survivorship; monitoring and predictive modeling of movements during migrations and in response to training activities, using radar and satellite tracking; and monitoring birds of prey and waterfowl on training lands to comply with legal requirements (Appendix G).

Objective: Maintain and protect viable populations of migratory bird on JBLM.

Strategies:

- Monitor borrow pits, and prohibit the removal of material if nesting activity is evident;

- Maintain proper sloping in sand borrow pits to discourage nesting;

- Avoid large-scale habitat manipulation such as prescribed burning during nesting seasons;

- Support research requests that provide greater insight on species habitat needs and population trends;

- Manage habitats through a variety of methods to include timber sales, prescribed burning, mechanical mowing, and invasive species control; and

- Maintain artificial nesting structures for bluebirds and provide technical guidance to volunteer nest box monitors.

4.5. Bald and Golden Eagle

Although this species is delisted under the ESA, it remains protected under the Bald and Golden Eagle Protection Act (BGEPA), as well as the MBTA. The BGEPA (16 USC 668-668c), prohibits the taking of bald eagles, including their parts, nests, or eggs without a permit issued by USFWS. Under the BGEPA, a "take" is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb." Under this Act, military activities are regulated primarily to ensure that eagle disturbance does not result in a taking of the species. Bald eagles are year-round residents on JBLM. Upwards of 270 bald eagles may winter on the Installation (Stalmaster and ENSR 2004). Currently, JBLM is implementing management actions for the protection of twelve bald eagle nesting territories.

Food supplies are the most important factor in maintaining the wintering population at JBLM (Stalmaster 1992, Stalmaster and ENSR 2003). Additional concerns are the maintenance of habitat near and within extensively used roost sites and foraging areas, particularly along Muck Creek and Carter Woods along the Nisqually River, and disturbance factors that could preclude bald eagles from using suitable habitat.

As described in FL Reg. 420-5, JBLM requires protection zones for nest sites, communal night roost sites, and foraging habitat. Nest and roost sites have a primary (400-meter radius) and secondary (800-meter radius) protection zones. Critical winter foraging habitat along Muck Creek and the Nisqually River has a 1,000-meter protection zone (500-meters on both sides of the creek or river). Within these zones, protective measures are in place to avoid adverse impacts to eagles. Activities likely to disturb or harm eagles (e.g., construction, timber harvest, military training (AIA use is exempt), blasting, and recreational activities) are prohibited or minimized within these zones during times of the year when eagles are likely to be present. Projects within 660 feet of a nesting site may require permitting from the USFWS. Surveys of primary wintering areas on the Installation are conducted every three years, and nest surveys are conducted at each active nest site two times each year during the nesting period.

Management actions will focus on critical nesting and wintering habitat components. JBLM supports twelve occupied nesting territories, eleven communal night roosts, and key foraging areas and perch trees in both nesting and winter habitat (Stalmaster and ENSR 2004). Of the twelve occupied nesting territories surveyed in 2012, seven nests were situated on JBLM and five were located just off of JBLM, but within the 400-meter buffer zone (Stalmaster 2012).

JBLM will follow and enforce all restrictions for Bald eagles listed in JBLM Reg. 95-1 and FL Reg. 420-5. These restrictions, designed to protect primary Bald eagle use areas from disturbance during critical periods and from adverse habitat alteration, acknowledge buffer zones around nest sites and foraging corridors along the Nisqually River and Muck Creek. These buffer zones are designated as seasonal CUAs.

Restrictions:

- Exclude logging, construction, habitat management, military activities, and other activities that would have permanent effects within 400 meters of active nests or roosts, or within 800 meters where the nest or roost is within line of sight. Exceptions include certain military activities and activities determined by the USFWS to be beneficial or have no adverse effect on eagles or their habitat.

- Do not use toxic chemicals that adversely affect eagles on the Installation (applies year-round).

- Prohibit blasting, use of firearms (use of AIA is exempt), camping, and picnicking within buffer zones during critical periods.

- Prohibit bivouacs around nests and roosts during critical periods (December 1 through August 31).

- Obey nest-specific and wintering eagle roost overflight restrictions found in FL Reg. 420-5 and JBLM Reg. 95-1.

- All activities within primary eagle foraging sites (corridors along the Nisqually River and Muck Creek, respectively) must obtain approval from ED.

Objective 1: Protect existing nesting territories and winter use areas.

Strategies:

- Within 50-meters of major bodies of water, retain all dominant fir trees, especially those exhibiting open spacious limb growth or forked tops, as well as large cottonwood trees, as potential nest sites.

- Retain all dominant trees within 50-meters of known or potential foraging sites (lakes, major wetlands, streams, and rivers).

- Manage areas within 50-meters of major water bodies from an even-aged stand structure to a multi-layered canopy. Target selected trees exhibiting open limb structure, or deformities that would be conducive to nesting or perching for continual retention.

- In addition, JBLM identified numerous management strategies specific to each of the twelve nesting territories. These strategies are listed in the Fish and Wildlife Management Plan (Appendix D).

- If the number of active nesting territories (eleven territories) and historic productivity rates (one young per territory) remain constant or increase, nest protection goals will be met. If peak wintering counts fall within or above the range observed over the last five years (176 to 278 birds), protection goals for wintering populations will have been met.

Objective 2: Maintain and enhance primary food sources habitat in nesting and wintering habitat. Fish and waterfowl are the primary food sources for nesting and wintering bald eagles. Under this objective, habitats of the primary food sources will be maintained and enhanced.

Strategies:

- Improve stream channel stability to reduce sediment inputs to spawning gravel beds;

- Increase riparian vegetation by controlling reed canarygrass and planting riparian shrubs and trees;

- Conduct routine inspections of fish ladders and spawning streams to identify and remove barriers to fish migration;

- During the waterfowl nesting season (February through June), maintain proper water levels at Johnson and Spanaway marshes by regulating head gates at each location; and

- Control vegetation at Johnson and Spanaway marshes to maintain approximately 50 percent open water using mechanical and/or chemical methods.

4.6. Oak and Pine Management Strategy

The majority of the Oak and Pine communities on JBLM occur as Eco tones between open prairies and closed conifer forests. For this reason, they may share characteristics with either ecosystem type and are often difficult to delineate. Because Oak and Pine communities are unlikely to be self-sustaining, regular management to mimic historical processes, e.g. wild fire intervals, is necessary to retain specific ecosystem functions. Management goals and strategies will differ depending on the quality of existing stands.

The Forest Management Plan directs management actions for Oregon white oak communities and classifies oak cover types at JBLM as Oak dominant, Oak-conifer, Oak savanna, and Conifer-oak on the basis of total tree cover, percent oak cover, and percent conifer cover. The general management approach for oak communities is to maintain and protect high quality Oak habitats and improve the condition of lesser quality stands at risk for stand replacing wildfires and conversion to conifer forest. Since most Oak communities are an Eco tone habitat, certain aspects of the prairie

management may apply as well. It is estimated that Oak communities of various types currently cover approximately 4,000 acres, or over four percent of JBLM. In general, oak communities are managed to increase the size and openness of Oak stands.

On JBLM, Oak communities range from open stands of large, scattered Oaks to dense stands with closed canopies and a large component of Douglas-fir. Oak communities are defined by the presence of Oregon white oak, which is Washington's only native Oak. Oak communities are designated as a priority habitat by Washington State. Oregon white oaks are slow growing and easily outcompeted by conifers. Oak communities are a fire-dependent ecosystem and fire provides key ecosystem functions that cannot be achieved with other management techniques. In the absence of fire, encroaching conifers overtop, suppress, and eventually replace oaks. Frequent low intensity fires reduce the amount of understory vegetation found in Oak communities. If fire is suppressed for too long, this understory vegetation builds to a point that catastrophic stand-replacing fires become likely.

DPW Forestry staff manages Oak communities jointly with DPW Fish and Wildlife. The predominant silvicultural treatment is thinning of Douglas-fir to maintain existing communities with considerations for Western gray squirrel's utilization of fir for nesting and aerial movement. Thinning removes competing conifers and reduces stand density to encourage release and growth of Oaks. Oak stands adjacent to Conifer timber sale units are sometimes included in timber sales to take advantage of opportunities to enhance Oak stands. Mowing, girdling, and prescribed burning are additional techniques used by DPW Fish and Wildlife and Forestry staff to remove encroaching Douglas-fir from Oak stands. Other recommended work includes thinning small trees, removing Scot's broom, and planting Oak and other mast-producing species.

Current management for Ponderosa pine is similar to the management of Oregon white oak. In areas where stands of Ponderosa pine occur, selective cutting or thinning of Douglas-fir is done to favor the Pine component. Within the Bower Woods area, a CUA, DPW Fish and Wildlife and Forestry are actively restoring and maintaining open Pine savanna conditions by harvesting, slashing, or girdling Douglas-fir, mowing Scot's broom, conducting prescribed burns, and planting Pine seedlings. Pine savannahs provide habitat for several rare species including the Western gray squirrel. Like Oak communities, Ponderosa pine communities are a fire-dependent ecosystem. Historically, frequent low- intensity fires kept understory growth down and prevented the encroachment of Douglas-fir. Currently, prescribed burning is being used in combination with mechanical methods to control understory vegetation, including Scot's broom. This reduces the risk of catastrophic stand replacing fires and promotes the health and diversity of Pine savannas by encouraging the growth of native fire-adapted vegetation.

There are two broad management goals for Oak and Pine communities on JBLM:

1. Maintain and restore native biological diversity and rare plant communities.

2. Provide suitable habitats for unique and rare wildlife species.

The management strategies that will be used to work toward these goals will maintain healthy, intact ecosystems that support military training needs. Associated with the management goals are two broad desired future conditions for Oak and Pine communities:

Improved ecological structure, composition, and function at the stand level.
A mosaic of Oak and Pine habitats created, managed, and maintained across the landscape.

Fuel reduction through the use of prescribed fire is essential to achieving these management goals. Oak and Pine communities are fire dependent ecosystems that rely on frequent low intensity fires.

All landmark Oregon white oak trees shall be retained, along with any native understory, within a protection zone one and one-half times the radius of the Oak's canopy. Landmark trees are defined as having a single trunk minimum measurement of 24 inches diameter at breast height or for multi-trunk trees a minimum measurement of 30 inches diameter at breast height. The tree must be healthy, well- formed, and poses no safety hazard as determined by DPW.

Development or construction activities occurring anywhere on JBLM that results in the loss of Oregon white oak trees will be subject to DPW mitigation measures. Mitigation measures will include, at a minimum, the project proponent to replant six Oregon white oak seedlings to every one tree (less than four-inch diameter at breast height (dbh)) that is removed through the direction and coordination with DPW Fish and Wildlife. In select cases, mitigation measures other than replanting Oak seedlings may be considered.

Objective 1: Protect and maintain the remaining high quality Oak and Pine stands to prevent further deterioration.

Strategies:

- Use prescribed fire to maintain quality over and understories. Fire will be the primary means of maintaining high quality Oak and Pine stands.

- Remove encroaching Douglas-fir, while considering habitat for rare species.

- Retain large Oaks and Pines in a balanced distribution of tree age classes.

- Thin overly dense Pine and Oak stands are at risk of catastrophic fires due to overgrowth. Open understories promote the use by wildlife species, particularly the Western gray squirrel, and increases the diversity of underbrush. During thinning, strive to minimize soil disturbance. In stands with native understory, implement thinning on an experimental basis. Stand densities will be based on plant and animal enhancement objectives and may vary significant between project sites.

- Where practicable, salvage younger Oak trees selected during thinning operations or eliminated by construction activities and relocate them to enhancement areas.

- Control exotic invasive and increase native species.

Objective 2: Prevent decline of Pines and Oaks due to conifer encroachment and enhance these components across all types.

Strategies:

- Increase total Oak acreage and proportion of Oak-dominant stands via conversion of Oak-conifer stands;

- Increase the depth of Oak-dominant stands within the Oak ecotone;

- Strategically reduce fuel loads to improve wildfire resistance;

- Reduce fragmentation and improve connectivity;

- Plant or sow native understory species; and

- Encourage Oak and Pine regeneration.

Objective 3: Retain and enhance unique Oak and Pine habitat attributes for wildlife species.

- Efforts to increase the quality and quantity of Oak woodlands on JBLM will benefit most wildlife that uses Oak habitats. Data from Intensive Stand Inventory (ISI) plots in Oak stands will provide information on the effects of silvicultural treatments and changes in stand structure over time. Habitat attributes measured will include tree species composition, tree size, presence, and size of logs and snags, and degree of openness of stands. The Fort Lewis Oak Management Strategy (GBA Forestry, 2002), as found in the Forest Management Plan in Appendix F, lists the following recommendations for desired future conditions for wildlife species in Oak woodlands:

- Use prescribed fires to reduce the amount of pests and parasites within Oak woodlands in an effort to increase production of viable acorns.

- Encourage more mast-producing tree species and age classes.

- Retain and create decadent (broken tops, portions of bark missing, and break down of wood fiber has started) live trees, snags, and logs.

- Protect, enhance, and restore habitats near water.

- Increase the mean size of Oak stands.

- The Oak Management Strategy provides additional information on the types of treatments that could be used in each type of Oak stand to obtain improved landscape characteristics.

4.7. Prairie Management Strategy

Overview
JBLM has most of the remaining prairie habitat in South Puget Sound, particularly prairies of higher quality, such as those found in the Artillery Impact Area and Rainier Training Area. Roughly, 11,500 acres of prairie occur on JBLM (Crawford and Hall, 1997), which represents 90 percent of the remaining prairie in the South Puget Sound. These prairies occur within a gradient of Douglas-fir forest, Oak woodlands, Pine woodlands, wetlands, and open grasslands throughout the base.

Fire is the most important ecological process that shaped the South Puget Sound prairie landscape. Historically, prairies were maintained by regularly occurring fires set by Native Americans (Lang 1961, Agee 1993). Prairie plant species evolved in an environment where fires were frequent and thus adapted to these conditions. Fire also limited the establishment and development of trees and other woody vegetation. Fire has several other important impacts including opening up bare soil sites suitable for seed germination and establishment (Agee 1993). Fire also aids in nutrient cycling and has been shown to stimulate germination in fire-adapted species. The combination of a bunch grass, Roemer's fescue (*Festucaroemeri*), as the dominant grassland species, helps ensure that an entire suite of forbs and grasses will have sufficient sites for establishment between the bunch grasses. Much of the prairie degradation that has occurred over the last century is the result of fire exclusion and invasive plants.

Another type of ecological disturbance that creates site conditions for plant establishment is the diggings of pocket gophers. These fossorial animals create extensive systems of tunnels under the prairie. Much of the dirt excavated during tunnel formation is pushed to the surface and forms small piles of bare earth. In the South Puget Sound prairies, Pocket gopher disturbances are correlated with the occurrence of

White-top aster, an endemic species (Hartway and Steinberg 1997). In addition, Pocket gopher disturbances may be a factor in the rapid invasion by some pest plants, since the small piles of bare dirt also create site conditions for the establishment of these species.

Goals and Strategies

The overarching goals for managing prairies on JBLM are covered here in a broad sense, placing the ever-changing specifics into our GIS database and area specific plans that are revised constantly as science and monitoring informs JBLM as to the most effective recovery methods. Here are broad strategies employed:

- Protect and maintain ecological processes and disturbances that maintain prairie function, such as fossorial excavation and fire;
- Maintain viable populations of prairie associated species appropriate for each prairie;
- Allow fire to function in its natural role within the prairie landscape, using prescribed burning as necessary to maintain prairie function and species management;
- Provide a diversity of habitat composition and structure within prairie;
- Maintain an active native prairie restoration program, including seed and prairie plant nurseries, and ongoing restoration effectiveness research;
- Provide the best adaptive management strategy to encompass both the listed Endangered Species present on individual prairie sites, while still trying to promote as many suitable and compatible non-listed species;
- Control invasive species and non-native species, which interfere with enhancing native prairie vegetation and structure; and
- Monitor population trends of prairie species to better inform management.

Prairies on JBLM have experienced significant conversion from open prairie to some extent of Douglas-fir colonization. Although JBLM has the largest remaining prairies left in the region, they are slowly being converted to Douglas-fir forest. Through fire management and mechanical means, invading trees are converted into snags, making them useful for some target species such as purple Martins and Western bluebirds. Further efforts are being made to push the edge of Douglas-fir invasion back, restore Oregon white oak that remain at the fringes of the prairie, and create a more gradual, feathered edge back into the forest.

Specific information on the management of prairie specific to prairie-dependent or prairie associated species, particularly those listed under the Endangered Species Act, can be found in their associated ESMCs and in the Biological Opinion.

4.8. Forest Management

A separate Forest Management Plan document has been developed and included in the INRMP appendices (Appendix F).

4.9. Wildland Fire Management

Wildfire and Prescribed Fire management are contained in a single document, the Wildland Fire Management Plan as an appendix to the INRMP (Appendix H).

4.10. Wetlands

Wetlands and other aquatic habitats are widely distributed over JBLM, with over 200 wetlands covering roughly 4,600 acres of the Installation. Wetland types include open water, emergent, scrub-shrub, and forested (based on the Cowardin et al. [1979] classification system).

Freshwater wetlands consist of both small kettle and large wetland systems. Aquatic beds dominated by aquatic vascular plants such as Duckweed, Pondweed, and Eurasian water-milfoil. Emergent wetlands are open marshy habitats supporting numerous species of Sedge, Cattail, and other herbaceous species. Scrub-shrub habitats support low-growing woody species such as Spirea and Willows. Forested wetlands, characterized by red alder, Oregon ash in the overstory, and salmonberry, vine maple, and stinging nettle in the understory.

Most large wetlands on JBLM have a hydrological connection to creek and river drainages, such as Chambers/ Clover Creek, Muck Creek and the Nisqually River. However, many wetlands are surface expressions of groundwater (closed systems) and have no inlet or outlet streams. These may act as groundwater discharge or recharge areas, depending on seasonal changes in the water table and the direction of groundwater flow (CH2M HILL 1994).

Management History

Prior to government acquisition in the early 1900’ s, many of the wetlands in the JBLM area were ditched and drained for agricultural purposes. Water has been restored to these drained wetlands through various restoration projects. Restoration projects included water level manipulation through dike construction, installing overflow channels, and fish ladders. Habitat enhancement projects have included non-native vegetation removal, creation of open water habitat, construction of a dam bypass, and placement of nesting structures. Projects were designed to improve habitat for species such as bald eagles, waterfowl, cavity nesting birds, and resident and anadromous fish.

Several habitat enhancement projects have been implemented on Muck creek and feeder springs on JBLM. Older round culverts have been replaced with three sided box culverts eliminating several fish barriers. Invasive non-native plant species removal and spawning bed development have improved spawning habitat in several streams. Established infestations of non-native species, such as reed canarygrass (*Phalaris arundinacea*), that pose a threat to native species, and new invasive species are the primary targets for control measures.

Halverson Marsh
Fish habitat restoration work was conducted in 1984 within the channel flowing from the marsh. The project included clearing vegetation and silt from the channel and adding clean spawning gravel. In 1998, a project was initiated to clear vegetation from the channel within the marsh that transports water from springs at the upper end of the marsh to its outlet. The channel had become choked with vegetation and was restricting fish migration to potential spawning habitat within the springs.

Johnson Marsh
In 1977, an earthen dike was constructed with a concrete structure that included a head gate allowing for water level control, and a fish ladder to allow for migration of anadromous fish. Increased water retention resulted in approximately 125 acres of wetland habitat. In 1984, a dike was constructed using approximately 1,100 cubic yards of native fill and 55 cubic yards of riprap in upper Johnson Marsh, increasing the depth of this marsh by two feet. An overflow channel was incorporated into the project to accommodate fish migration, and a head gate was installed for water level manipulation. Several projects were implemented from 1985 to 1994 to remove aquatic vegetation with bulldozers and vegetation harvesters (cookie-cutter) to create more open water habitat. The noxious weed Purple Loosestrife (*Lythrum salicaria*) was sprayed with aquatic herbicide in both 2000 and 2001. Approximately 1500 biological control agents, comprised of the Golden Loosestrife Beetle (*Galerucella pusilla*) and the Loosestrife Root Weevil (*Hylobius transversovittatus*), were released to help control Purple Loosestrife in July 2004.

Watkins Marsh
In 1982, a culvert was replaced and a headgate installed, raising the water level by two feet, and restoring about five acres of wetland habitat. The higher water levels restricted reed canarygrass infestations to the edges of the marsh and the islands within the marsh, and resulted in more open water habitat.

Hardhack Marsh
Diked and re-flooded in 1979, Hardhack Marsh presently encompasses 150 acres. This marsh reaches depths of two to three feet at its deepest points. Three acres were opened through mechanical treatment during the summer of 1994. In 2004, a hardened concrete ford crossing was built on an existing dirt road that runs through the overflow channel between Hardhack and Spanaway marshes to prevent further degradation and siltation of the marshes.

Spanaway Marsh
In 1983, a dike was constructed with a headgate and spillway. The dike construction raised the marsh three feet and re-flooded approximately 360 acres of wetland habitat. The culvert and head gate were replaced in 2000 due to the culvert leaking through rusted portions.

Chambers Lake
Muck Creek was diked in the mid-1960' s to create Chambers Lake. A concrete dike was re-built in the late 1980' s alongside a fish ladder and iron spillway allowing for the water level manipulation on the base. Approximately 100 acres were flooded reaching a maximum depth of ten feet. A determination was made to remove the current dam and water control structures based on a litigated action, and the determination that fish migration would be improved by the removal. The structure is scheduled to be removed by the year 2020.

Lacamus Creek
Lacamus Creek flows through a small portion of JBLM within Training Area 13 and into Muck Creek near Roy. In the late 1970' s, spawning gravel was added to a section of the creek within JBLM to increase salmon spawning habitat.

Muck Creek
Muck Creek is a primary tributary of the Nisqually River used extensively by late returning native chum salmon (*Oncorhynchus keta*). Muck Creek habitat enhancement has included: controlling the continued encroachment of reed canarygrass through mechanical removal and herbicide treatments; cleaning silted and sediment-laden spawning gravel; replacing all round culverts with three-sided box culverts; and building a spawning channel for returning chum salmon. The spawning channel was created from a side channel dug in the 1940' s to divert water from Muck Creek to Nisqually Lake. The water was diverted to Nisqually Lake in an attempt to maintain higher water levels in the lake throughout the year. The water was re-diverted back into Muck Creek in the 1980' s by removing water control boards that shunted water to Nisqually Lake. A 940-foot section of the diversion became a side channel, which flowed directly back into Muck Creek.

Muck Creek Spawning Channel
This channel was the site of a spawning habitat enhancement project in 2001. In a cooperative effort, the JBLM Army engineers teamed up with the Nisqually Indian Tribe to convert the 940-foot side channel into spawning habitat for chum salmon. The engineer battalion leveled out the bottom of the side channel with bulldozers, loaders, and scrappers. Filter fabric was then laid down in the channel to prevent sediment infiltration into the spawning gravel. Finally, pre-washed and un-fractured gravel, composed of appropriate size composition for salmon spawning substrate, was placed in the channel to a depth of three feet. Trees and shrubs were planted to supplement existing riparian vegetation. JBLM received a grant in 2004 funded under its Native

American Lands Environmental Mitigation Program by the DoD. The program focused on mitigating environmental impacts on lands and resources important to Native Americans. JBLM partnered up with the Nisqually Tribe for stream restoration on Muck Creek and over 12,000 native riparian plants were planted along several sections of the creek.

Murray Creek

Murray Creek is the only stream flowing into American Lake. Previous habitat improvement projects focused on enhancing cutthroat trout (*Oncorhynchus clarki*) spawning habitat. In 1985, 300 feet of spawning habitat was created by adding un-fractured gravel of appropriate size, to accommodate cutthroat trout within a stream segment that had received site preparation, including sediment removal and placement of filter fabric. Reed canarygrass was removed from 600 feet of stream below Madigan Army Medical Center during the summer of 1994. During the fall of 1994, 200 to 250 Douglas-firs and willows were planted along this stretch of stream. Murray Creek has received several other plantings of native riparian vegetation, including Black Cottonwood (*Populus balsamifera*), Western Red Cedar (*Thuja plicata*), Sitka Spruce (*Picea sitchensis*), and Grand Fir (*Abies grandis*). In 2004, Camp Murray received money to enhance Murray Creek for kokanee spawning habitat enhancement on JBLM. The enhancement work consisted of reed canarygrass removal, beaver trapping and the removal of a concrete fish screen pad that was restricting flow downstream. Over 1,200 feet of the creek banks were planted with native riparian trees, shrubs, and emergent plants.

Exeter Spring

Exeter Springs are a primary spawning site for chum salmon in Muck Creek. In 1974, a 600-foot long by 12-foot wide spawning channel was built at Exeter Springs. This project consisted of creating a channel, lining it with polyethylene, and then placing 500 cubic yards of graded gravel within the channel. By 1983, water current and spawning activity had shifted some of the gravel downstream. The WDFW, in conjunction with the Nisqually Tribe, added about 20 cubic yards of gravel to the upper portion of the channel and cleaned debris from the lower section. Most recent work at Exeter Springs (1994 to 1996) included planting of native flora and removal of Reed canarygrass from the spawning channel, old beaver dam, and sand. The aquatic herbicide Rodeo was used adjacent to the stream channel to reduce reed canarygrass competing with recently planted native plants (Nisqually Indian Tribe 2001).

Halverson Springs

Halverson Springs have received vegetative control using herbicide treatments and mechanical removal, focusing on the control of reed canarygrass. The springs have been maintained to allow access for chum salmon to spawn and migrate to the headwaters springs.

Nixon Spring
Spawning habitat at Nixon Springs was enhanced and increased by the addition of spawning gravel in and adjacent to upwelling springs. This project was implemented in 1985. In the spring of 2001, areas infested with reed canarygrass were sprayed followed by mechanical removal of dead grass and root masses in the summer of 2001.

Morey Creek/Clover Creek
Morey Creek flows onto McChord Field from the Eastern boundary for a short distance before joining Clover Creek, which flows through McChord Field from East to West. These creeks are part of the Chambers/Clover Creek watershed and part of Washington Department of Ecology's Water Resource Inventory Area 12. Stormwater runoff primarily flows into Clover Creek. This is permitted under an NPDES permit.

Wetland Management
Wetlands are managed to maintain wetland-training opportunities, enhance anadromous fish habitat, provide recreational opportunities, and control invasive species. Management of wetlands on JBLM involves protecting wetlands to ensure no net loss, protecting surface water quality in aquatic habitats, and protecting populations and habitats of listed wetland and aquatic species. In general, wetland plant communities are managed by protecting them from vehicle disturbances, monitoring and controlling populations of invasive species, and planting native riparian vegetation. DPW Fish and Wildlife staff biologists maintain and extend hardened crossings, as necessary, further preventing impacts to wetlands. In addition, management for fish and wildlife benefits many native wetland plant communities.

Wetlands are managed using various vegetative control measures to improve habitat conditions for fish and wildlife and protect rare and endangered plant species. Most management of forested wetlands consists of protecting these areas during timber harvest of adjacent forest areas. Where wetlands are adjacent to mature forest components and intact woodlands, the forest types and their Eco tones around wetlands are protected and maintained. The largest wetland/floodplain forests occur in the Nisqually Riparian Zone CUA, where direct management of forests does not occur.

This section and the Murray/Sequalitchew Watershed Management Plan, Appendix I, address wetland habitats. The primary means of management will continue to be enforcement of regulations that protect wetland habitats.

Regulation: Wetland habitats will be protected by: (1) enforcement of the 50-meter buffer around all wetlands including reservoirs, lakes, marshes, ponds, and riparian zones that restrict vehicle traffic to established roads (FL Reg. 200-1); (2) continuation of the current practice restricting water crossings involving wheeled/tracked vehicles to authorized fords (FL Reg. 200-1); and (3) continuation of past reclamation efforts designed to maintain, monitor, and control new populations of invasive non-native species on marshes and lakes.

Objective 1: Protect and maintain wetland and riparian ecosystems and their functions, including water quality and habitat for aquatic and terrestrial life.

Strategies:

- Ensure enforcement of the protective measures listed in FL Reg. 200-1;
- Control populations of invasive species in wetland and aquatic habitats;
- Avoid activities (including resource management activities) that would adversely affect wetland or other aquatic habitats; and
- Ensure no loss of wetland habitat, especially for threatened/endangered species.

Objective 2: Develop and maintain structural elements of wetland and riverine ecosystems to support viable self-sustaining populations of species fully dependent on these ecosystems while maintaining conditions that support the part of the military training mission requiring a water environment.

Strategies:

- Control reed canarygrass infesting wetlands and adversely affecting threatened/endangered species habitats, salmon habitat, and popular fishing and hunting locations.
- Enhance riparian and wetland areas by controlling invasive species and replacing them with appropriate native vegetation to meet wetland/riparian restoration objectives (i.e. woody shrubs and trees to enhance shade for salmon species. or aggressive native sedges and rushes to compete with re-invasion by reed canarygrass.
- Maintain and/or create snags near wetlands.
- Maintain mast producing trees and shrubs.
- Retain patches of mature and old growth forest habitat within 100 meters of aquatic systems.
- Leave woody debris within streams and add woody debris where absent to provide substrate for invertebrates and refuge for fish.
- Where appropriate, manage for open water habitat in large wetlands to promote edge effect and waterfowl habitat.

- Enhance anadromous fish habitat, as needed. Focus these efforts in historic salmon spawning areas on the Installation, such as the Muck Creek/Exeter Springs and Halverson Springs spawning complex. Enhancements will include stream channel improvements to maintain access to critical spawning habitat, spring restoration, and improvements to salmon spawning beds.

- Wetlands will be surveyed for populations of invasive species, and established populations will be monitored to determine whether they are increasing in size and reducing the suitability of wetland habitats for fish and wildlife. Sites where habitat has been enhanced will be monitored, as necessary, to assess the effectiveness of management actions.

Water Control Structures

Wetland water levels are a key element to water quality enhancement, vegetative control, and wildlife habitat. Many of the wetlands were ditched and drained in the early 1800s. Since then, wetland reclamation projects have been implemented to restore water levels to historic or near historic levels.

Dikes have been installed for water level management on Johnson, Watkins, Hardhack, and Spanaway marshes, as well as Chambers Lake. Water is impounded during the wet season, and released slowly in the dry season, to augment in stream baseline flows. A water control structure or headgate controls the rate of outflow of water into stream channels. Headgates are raised and lowered manually over the opening with valve wheels, controlling outflows and water levels within wetlands. To accommodate anadromous fish migration, fish ladders were built into the dikes at Johnson Marsh and Chambers Lake. Manipulations to the water control structures are used to control and balance the flow of water over the fish ladders. It is important to maintain adequate flow over the fish ladders during fish migration periods.

4.11. Soil Conservation

Moist conifer forests grow on moderately well drained soils formed on glacial moraine and till. Dry forests grow primarily on extremely well drained soils formed on glacial tills and outwash. Within dry forests, areas that generally have been forested for thousands of years primarily are underlain by Everett soils on glacial till. Areas that were prairies at the time of European settlement, but have since been colonized by forests, primarily are underlain by Spanaway soils on glacial outwash.

DPW Forestry staff manages forest soils to maintain or enhance the health, resilience, and productivity of the forest. To maintain soil organic matter and nutrients, inputs of litter and woody debris are sustained and a component of soil-building trees and shrubs is maintained in the forest. To prevent or limit soil compaction during forest operations, special equipment and designated skid trails or yarding corridors may be used. In

addition, areas of concentrated equipment operation are located on old roads and landings where soils have already been compacted. Where possible, areas heavily impacted during forest operations, including skid trails and temporary logging roads, are rehabilitated.

Very little natural erosion occurs at JBLM because of the permeable, coarse-textured soils and relatively level topography. Consequently, estimates of erosion rates have not been conducted at the Installation. The potential for erosion is confined to steep slopes where maneuver training is rarely, if at all, conducted. These steep slopes occur along the bluffs bordering Puget Sound and the Nisqually River.

Soils are more at risk from damage by compaction or by mixing soil layers during digging and use of heavy vehicles. Visible compaction of soils has been noted in study plots where heavy vehicles have been driven (Wolford 2002), and in assembly areas where vehicles regularly congregate and park (Foster 2001). The greatest degree of soil compaction occurs when soils are at approximately 80 percent of saturation (Hillel 1982).

Objective 1: Maintain or enhance the health, resilience, and productivity of forest soils.

Strategies:

- To maintain soil organic matter and soil nutrients, sustain inputs of litter and woody debris and maintain a component of soil-building trees and shrubs (i.e., alder, maple, and cedar).

- Carefully design and schedule forest operations to prevent excessive soil compaction. Use special equipment and designate skid trail locations or yarding corridors.

- Locate concentrated equipment operation in areas that have already been compacted, such as old roads and landings.

- Rehabilitate areas where soil is heavily impacted.

- Minimize soil disturbance during silvicultural treatments, particularly at woodland-forest Eco tones.

- DPW Forestry staff will monitor treatment sites for compaction and other soil disturbances and assess the effectiveness of preventative measures. Areas that have been heavily impacted during forest operations will be rehabilitated, if practicable.

- In prairies, the most important aspects of soil conservation are preventing damage to soil, particularly in areas not previously disturbed, and repairing damage to soil where it does occur.

Objective 2: Maintain soil conditions and processes that are suitable to sustain or enhance prairie habitat.

Strategies:

- Avoid soil compaction and mixing of soil layers to maintain the integrity of soil conditions;
- Actively repair damaged areas to maintain their capability for training and to minimize expansion of training impacts into other areas;
- Review dig permits for any digging/soil disturbance activities in prairies;
- Continue to use RTLA and other appropriate land condition maps when planning locations for soil disturbing activities to avoid soil impacts in high quality prairies;
- Continue the dig permit process that requires review of projects and training exercises involving digging;
- Maintain and improve roads traversing prairie habitat to encourage military use of existing roads and help prevent widening of roads and deeply rutted sites; and
- Determine which roads to decommission through the Land Use Deconfliction process.

4.12. Invasive Species

Economic and natural resource losses from the spread of non-native invasive species are growing exponentially. Without proper control and restoration efforts, invasive species threaten native plant and animal species, including several recently listed threatened and endangered species. Invasive species also can adversely affect military readiness and create fire and safety hazards. Only through broad regional and national cooperative efforts can the threat of invasive species and exotic pests be controlled.

Pest Management staff is responsible for control of pest species and undesirable vegetation throughout the cantonment area with the exception of the housing areas, where a contractor is responsible. Pest Management staff follows an integrated pest management approach, which incorporates multiple methods of pest control, including physical, mechanical, educational, biological, genetic, regulatory, and chemical tactics. Pests that have the greatest adverse effect on the military mission (in terms of damage, time, money, and regulatory requirements; such

as noxious/invasive plants and other undesirable vegetation) are given precedence for control. Other types of pests, including invasive animal species, are controlled almost exclusively in the cantonment area where they are at risk of damaging real property, spreading disease, and annoying residents. These pests are at risk of competing with native animal species as well. For more information on noxious weeds and other pests, refer to the Integrated Pest Management Plan (Appendix J).

Invasive species control efforts on training lands is focused on Scot's broom, an aggressive shrub that displaces native vegetation and alters habitat structure, reducing its suitability for many wildlife species. Scot's broom infestations reduce the suitability of training lands to support vehicle maneuvers and other training exercises. In addition, Scot's broom infestation reduces the quality of habitat for wildlife species that require prairie and Oak habitats. Invasive plant species control measures include hand pulling, mowing, burning, and herbicide treatment. Often, more than one treatment method is used to increase effectiveness and limit the likelihood that a treated population will return quickly.

In addition to Scot's broom, native trees and shrubs invading the prairie from the surrounding forest, such as Douglas-fir, are controlled to prevent loss of open maneuver space. Other invasive plant species that have invaded JBLM prairies have a less noticeable effect on prairie openness and structure, but displace native species and reduce prairie quality. Examples of invasive prairie plant species include non-native "pasture" grasses (which invade undisturbed sites), knapweed, sulphur cinquefoil, and leafy spurge.

Encroachment by native conifers is the predominant reason for the reduction in Oak habitat on JBLM. Invasive understory species can be a problem as well, particularly on the edges of prairies infested with these species.

Most major wetlands on JBLM contain one to several species of introduced plants, such as Eurasian water milfoil, yellow-flag iris, pondweeds, reed canarygrass, and purple loosestrife. These invasive species, if untreated, can dominate wetland and stream habitats, reducing their suitability for training and for native plant and animal species. Reed canarygrass is one of the most problematic invasive plant species because it has little wildlife value and it blocks stream channels, reduces flows, and binds spawning gravels.

The IPMP (Appendix J) details the objectives for pest control on the Installation, by pest type and site, and management strategies to be used and the methods and frequency of pest surveillance. The IPMP objectives for managing undesirable vegetation, which has the highest priority for control, are as follows:

Control invasive and noxious weeds to minimize damage to property, protect native habitats, and comply applicable laws.

Control undesirable broadleaf weeds to minimize damage to improved grass areas on the Installation.

Control undesirable grasses to minimize damage to property and to improve aesthetics. Control undesirable vegetation, including brush on roadsides, to minimize damage to property, and to limit risk of fire or security breaches.

Objective 1: Protect native habitats from invasive and exotic plant species.

Strategies:

- Control Scot's broom in forest openings using the following methods: repeat burning of Scot's broom patches; biological controls (including reestablishment of native communities resistant to invasion); chemical controls; and mechanical controls (including pulling, mowing, and brush cutting).

- Maintain survey of habitats for invasive species. Map populations using GPS and incorporate data into GIS. Established populations will be monitored to determine whether they are increasing in size, and to develop a priority ranking for control.

- DPW Fish and Wildlife Staff biologists will continue to survey for new populations of invasive plants and monitor established populations. This information will be used to identify and prioritize areas for future treatments, and to assess the success of current control efforts. The effectiveness of different control methods (including combinations of multiple methods) will be monitored to determine which methods are most effective at reducing infestations.

- Control of Scot's broom and other invasive plants is the primary focus of prairie management. Populations of invasive plant species reduce the availability of open landscapes for military training and the quality of prairie ecosystems. Therefore, control of invasive plants is incorporated into most aspects of prairie management, as discussed in previous sections.

Since control of Scot's broom is such an integral component of prairie management, the following objective has been developed:

Objective 2: Reduce Scot's broom cover on all major prairies to less than 20 percent.

Strategies:

- Use prescribed fire as the primary control method for Scot's broom. Prescribed fire is the most cost effective long-term control method.

- Continue to utilize mowing as a pretreatment, prior to prescribe fire in areas with high densities of Scot's broom.

- Utilize mowing as a control method for scotch broom in areas that cannot be treated with fire.

- Consider use of herbicides in place of (or in combination with) prescribed fire, especially in areas where the use of fire may pose an unacceptable risk to listed species.

Although JBLM has not released any biological control agents to reduce populations of Scot's broom or other prairie invaders on JBLM, the Army will continue to explore options to maximize the effectiveness of existing biological controls released by other regional entities that have spread throughout JBLM. DPW Fish and Wildlife and ITAM Program staff will continue to monitor prairie habitats for invasive species, recording information on new populations, and changes in existing populations. This information will be used to prioritize areas for future treatment.

4.13. Public Access and Outdoor Recreation

The goal of the Outdoor Recreation Program is to give people the opportunity to enjoy the natural areas on JBLM and to help ensure that recreationists treat the natural resources responsibly. JBLM currently does not have a current Outdoor Recreation Plan under which it operates. DFMWR is the owner of the Outdoor Recreation Plan and due to lack of resources has not been able to update the last plan since it was originally written in 1993. Currently DFMWR operate an outdoor recreation program, to include coordination of hunting and fishing, to the best their resources allow on an as needed basis. The Installation and implementation of the iSportsman program would provide a fee collection mechanism for special installation permits and the funds would be used to implement requirements identified in the INRMP. Over 20 outdoor recreation areas exist on JBLM, including parks, picnic areas, rental facilities, and other facilities (Table 4-4). Common activities occurring on the Installation are hunting, fishing, camping, biking, hiking/jogging, swimming/scuba diving, boating, and wildlife viewing. In addition to the designated recreational areas, certain portions of the JBLM are available to military personnel and the public for outdoor recreation, provided it does not interfere with military training.

The DFMWR operates recreational programs on the Installation, including hunting and fishing. DFMWR coordinates with DPW Fish and Wildlife management; fish stocking; habitat improvement; game species enhancement; and the protection of special status species and sensitive natural areas, which are discussed in this INRMP. Hunting and fishing at JBLM are privileges and not rights. All personnel engaged in hunting and fishing on JBLM will comply with all applicable regulations including: the Federal

Migratory Bird Treaty Act, Revised Code of Washington, and JBLM regulations. The Conservation Law Enforcement Program enforces the Installation, Federal and State regulations, and policies.

The Training Division/Range Control, issues Installation down range Access Permits for non-training access to the range complex. It is imperative that Range Operations is contacted for area access permits since this ensures the safety of recreational users and prevents conflicts with military training needs.

Most training areas are open to the public for recreational purposes, provided restrictive military training is not taking place or the activities pose a risk to listed species. The more commonly used recreation areas are those that support relatively low levels of military training, such as the Rainier Training Area. Areas that are not open to the public include the Artillery and South impact areas. Public access is restricted in areas with listed species and/or sensitive resources.

Security issues associated with unauthorized access or use of the Installation is a common occurrence at JBLM. The Conservation Law Enforcement Police Operations makes a substantial effort to deter trespassers and other unauthorized users of the Installations training lands.

Table 4-4. Classification of Outdoor Recreation Areas on Joint Base Lewis-McChord

Facility/Area	Activities Supported
Adventures Unlimited	Boating, camping and other outdoor equipment rental
Holiday Park	Camping with hookups and tent camping, and group picnicking
Skeet Range	Archery and skeet ranges
Morey Pond	Fishing, wildlife watching, walking path, and picnicking
Carter Lake	Fishing, wildlife watching, picnicking, and playground
Porter Hills Watchable Wildlife Area	Hiking trails, and nature and wildlife watching
Gasking Park Watchable Wildlife Area	Wildlife watching
Mountain View Watchable Wildlife Area	Wildlife watching
Morey Pond Watchable Wildlife Area	Wildlife and nature watching

Facility/Area	Activities Supported
Equipment Rental Center	Boating and camping equipment, skiing equipment, fishing, picnicking, educational classes, boating safety instruction, and equipment resale store
Travel Camp	Camping with hookups and tent camping
Shoreline Park	Boating, fishing, boat launch, mini-golf, group picnicking, swimming, hiking trail, food services, and equipment resale store
Tall Firs Picnic Area	Picnicking
Solo Point Recreation Area	Saltwater boat launch, fishing, and picnicking
Sequalitchew Lake Recreation Area	Fishing and picnicking
Miller Hill Recreation Area	Group picnicking, hiking trails, and nature activities
Wright Lake Recreation Area	Fishing and picnicking
Lewis Lake Recreation Area	Primitive camping, picnicking, and fishing
Ecology Park	Picnicking, hiking
Chambers Lake Recreation Area	Primitive camping, picnicking, and fishing
Johnson Marsh Recreation Area	Fishing
Cat Lake Recreation Area	Fishing
Skeet & Trap Range	Shooting activities and equipment resale store
Rifle/Pistol Range	Shooting activities and equipment resale store
ATV Park	ATV trails
Sears Lake Recreation Area	Picnicking and hiking, fishing (children only)
Shannon Marsh Recreation Area	Fishing (children only)
Nisqually River Recreation Area	Fishing
Fiander Lake Recreation Area	Fishing
Vietnam Village Marsh Recreation Area	Fishing
Spanaway Marsh Recreation Area	Fishing

4.13.1. Fishing Program

Certain waters on JBLM are open to fishing and boating by DoD personnel [2], civilians, and tribal members exercising treaty-fishing rights. People who fish on JBLM waters must have valid Washington State fishing licenses and follow all applicable Federal, State, and Army regulations, including Washington State's Game and Fisheries Code (Chapter 77.15 REW), FL Reg. 215-1, and FL Reg. 350-30, the current WDFW Fishing Regulation Pamphlet, and the JBLM Fishing Rules.

[2] The category DoD personnel include active duty military, retired military, appropriated, and non-appropriated fund employees, and their immediate family members or accompanied guests.

With the exception of Nisqually Lake and Muck Creek, where it flows through the impact areas, people may fish on all the lakes and streams on Lewis Main and Lewis North, except in the event of closures. Sears Lake is only open to juveniles under age 15. Individuals wishing to access or cross any portion of these waters located on or adjacent to JBLM, Lewis Main and Lewis North must obtain a recreational use permit from the Range Area Access Section.

No boating is permitted on McChord Field and fishing is limited to Clover Creek, Morey Creek, Morey Pond, and Carter Lake. The Carter Lake fishery is managed as a "put and take" fishery for rainbow trout. Clover Creek and Morey Creek have selective fishery regulations in effect for native cutthroat trout.

Morey Pond is not stocked. Morey Pond contains Peamouth chub, Yellow perch, Rock bass, Pumpkinseed, Large-scale sucker, Western brook lamprey, and Brown bullhead.

Each year, the State provides JBLM with 50,000 Rainbow trout fingerlings, which are raised in pens on American Lake by Outdoor Recreation staff. Occasional stocking of fish by DPW Fish and Wildlife staff also occurs in Sequalitchew Lake, Lewis Lake, and Vietnam Village Marsh, which are stocked by fish provided by various sources.

The Outdoor Recreation Program has no biologists, so DPW Fish and Wildlife manages game fish species on JBLM. The management approach is to improve and increase open water habitats on the Installation by controlling reed canarygrass, purple loosestrife, and other species that contribute to the loss of game fish habitat. No data on populations of game fish species are collected. Such monitoring may be necessary to ensure the sustainability of these populations. Further management specifically for game fish species could improve fishing activities on the Installation. For example, Lewis Lake contains populations of small sized fish, which reduces its suitability as a fishing site. Additional management specifically for improving fishing quality would increase the desirability of fishing at Lewis Lake.

4.13.2. Hunting Program

JBLM is open to hunting (in season) whenever it does not interfere with training, public safety, or impact listed species. Hunters must register, obtain a hunting permit, and register firearms at the Northwest Adventure Center on JBLM. All persons engaged in hunting at the Installation must have a valid Washington State hunting license and transport tags (except for tribal hunters exercising treaty rights), and must cooperate fully with the Military Police, Federal game wardens, and WDFW Enforcement.

Hunters must follow all applicable Federal, State, and Installation regulations, including FL Reg. 215-1; FL Reg. 350-30; the Migratory Bird Treaty Act; the Migratory Bird Hunting and Conservation Stamp Act; the Game and Fisheries Code of the State of Washington (Chapter 77.15 REW); and WDFW Hunting Seasons and Regulations.

For the most part, all training areas on JBLM, except for the entire McChord Field area, are open to hunting (subject to their availability depending on military training and public safety), with the exception of Close-in Training Area F, the AIA, the South Small Arms Impact Area, and several lakes and wetlands on the Installation. The Northwest Adventure Center follows training area designations to delineate hunting areas. The number of authorized hunters allowed in each training area is determined on the basis of one rifle hunter per 100 acres, and one shotgun or bow hunter per 50 acres.

Hunting is categorized into four main types: big game (deer, bear), migratory birds (waterfowl), upland game birds (pheasant, grouse, partridge), and small game. Game bird hunting is seasonally restricted in areas used by Streaked horned larks and Mazama pocket gophers. Limited pheasant releases will be allowed in Training Areas 21 and 22, but only trained field dogs may be off-leash for these hunts.

Forests, prairies, Oak woodlands, and wetlands are managed to increase native habitats and habitat diversity, but populations of game species are not monitored. Game species management is discussed within the Fish and Wildlife Management Plan (Appendix D). There is no monitoring in place to track population trends of game species on JBLM. All hunters are required to submit their hunting reports/species transport tags to WDFW at the end of the season. WDFW utilizes this information to ensure sustainability of game species and to track population trends, which can be found in their Game Harvest Reports and Game Status and Trend Reports.

4.13.3. Off-road Vehicle Use

Under FL Reg. 350-30, all recreational vehicular traffic is restricted to established roads. Therefore, off- road vehicle use is not an authorized form of recreation on JBLM, outside of the designated Off Road Vehicle Park on Lewis Main. In part, this regulation is intended to help protect prairie habitats, which are sensitive to this type of disturbance. The Down-Range Law Enforcement Section and McChord Field Security Forces enforce this regulation.

4.13.4. Non-consumptive Recreational Activities

Training areas on JBLM are used for a variety of non-consumptive recreational activities, such as hiking, biking, horseback riding, birding and other nature watching, and dog training. Primitive camping is allowed at Lewis Lake and Chambers Lake, provided campers pre-register through the Northwest Adventure Center. Recreational users must obtain an Area Access Permit and are subject to the access restrictions and regulations. Similar to hunting and fishing, the goal for non-consumptive recreational

activities are to provide for these uses on JBLM lands while ensuring resources are sustained and the military mission is met. Ecosystem-level management provides objectives, strategies, and monitoring for protecting and sustaining natural resources on the Installation. Management strategies may require the Army to impose some restrictions on certain uses of sensitive areas for non-consumptive forms of recreation (e.g., horseback riding and dog training) that adversely affect sensitive habitats and/or listed species. Nonetheless, JBLM remains committed to continue to provide access to portions of JBLM for these types of recreation, as military training and resource condition allow.

4.14. Tribal Access

Tribal access to JBLM is sanctioned by the Medicine Creek Treaty of 1854, which guarantees access to usual and accustomed places that are vital to the continuation of tribal members' culture. Tribal members access is governed by DoD policy (American Indian and Native American Policy, October 1998) and FL Reg. 200-1 (Appendix R.4.b). The Nisqually, Puyallup, Squaxin Island, and Steilacoom tribes have an interest in traditional cultural properties of religious or other cultural importance, and in lands for hunting, fishing, and gathering. Continued access and healthy, sustainable resources are especially important for Nisqually tribal members who occasionally conduct hunting and fishing activities on JBLM.

JBLM's stated policy is to recognize the reserved rights that tribal members have on lands administered by the Installation and its sub-installations, and to seek to accommodate these rights within mission requirements. The ICRMP provides for planning and execution of cultural resources management on JBLM. The ICRMP provides for access for the exercise of treaty rights unless: a) the area requested is in use for live- fire maneuvers, and/or b) other safety hazards exist.

As separate government entities, tribes are not required and generally do not divulge the complete extent or location of traditional cultural properties, or the extent or type of natural resources accessed. However, some resource uses are well known, such as firewood collection and activities associated with the Clear Creek Fish Hatchery, which is operated by the Nisqually Tribe under a long-term, renewable lease. In addition, a general understanding exists that tribal members occasionally collect salal, bracken fern, cedar bark and wood, and hunt, gather, and fish on JBLM property. The Army does not keep records of access granted and there is no monitoring of resources used. A permit issued by the Forestry staff is required to collect firewood. Permits are offered free of charge to tribal elders and handicapped tribal members, and tribal members acting on their behalf.

Tribal access to most portions of the Installation is generally allowed without formal permission by showing a tribal membership card at the gate. However, tribal members wishing to access impact areas are required to contact the Cultural Resources Program Manager or Training Division/Range Control to request access. For training areas

frequently in use, scheduling access is sometimes difficult. Indian tribes issue and enforce their own hunting regulations, as they are not required to possess a Washington State license to exercise their treaty rights to hunt or fish on JBLM. Current policy for access is:

1. Tribal members are authorized to hunt on JBLM, provided they carry a tribal hunting permit and tag, along with their treaty enrollment and/or fishing card.

2. Prior coordination with Training Division/Range Control is encouraged for access to downrange training areas.

3. Prior coordination and scheduling with Training Division/Range Control is required before entering any impact area.

4. Coordination with Training Division/Range Control is arranged through the Cultural Resource manager. Individuals must call by phone before entering and upon leaving any impact area.

5. When tribal hunting permits and tags are issued, tribal members will be advised to avoid troops in the field when exercising their treaty hunting rights on JBLM.

6. Military Police will direct tribal members to leave the area if there is a potential safety conflict between troops and tribal hunters; tribal hunters will comply or face trespass charges.

7. Tribal members hunting with modern firearms must abide by the same restrictions as non-tribal members concerning safety issues (no hunting in training areas occupied by trainers and limitations on the number of rifle hunters allowed in each training area). Military Police will contact Tribal Police to enforce tribal fish and game regulations (such as suspected poaching).

8. Natural resource management activities on JBLM help sustain native ecosystems and traditional cultural properties. Continued natural resources management, ensures the availability and quality of sustainable resources sufficient to meet tribal members' needs. JBLM will continue to provide tribal access to usual and accustomed places, as guaranteed by treaty rights. As training increases on JBLM, the potential for conflict between training and tribal member access could also increase (safety requirements and military mission).

4.15. Integrated Training Area Management Program

The ITAM Program is the Army's comprehensive approach to land utilization for training. ITAM provides for the monitoring and maintenance of Army training land to ensure quality training and realism, reduce environmental damage, and enhance public image of the Army as a conscientious land steward.

The ITAM Program is composed of four major elements:

1. RTLA, previously Land Condition Trend Analysis, inventories, and monitors habitats to document resource condition to withstand training impacts.

2. LRAM uses vegetation removal, re-vegetation, and preventive and corrective measures to rehabilitate the training land.

3. Sustainable Range Awareness (SRA) educates officers, enlisted soldiers, and community members to foster the wise use of land.

4. TRI improves coordination and facilitates cooperation by providing information on land resource requirements.

According to the SRP Web page and AR 350-19, the objectives of the Army ITAM Program are to:

1. Achieve optimal sustained use of lands for the execution of realistic training and testing, by providing a sustainable core capability, which balances usage, condition, and level of maintenance.

2. Implement a management and decision-making process, which integrates Army training and other mission requirements for land use with sound natural and cultural resource management.

3. Advocate proactive conservation and land management practices. Align Army training land management priorities with the Army training, testing, and readiness priorities.

On JBLM, ITAM staff is under the responsibility of DPTMS, and comprise the Land Management Branch of Training Division/Range Control.

The overall mission for the ITAM Program and individual missions for TRI, SRA, RTLA, and LRAM are as follows:

1. The ITAM Program is the U.S. Army's formal strategy for integrating mission requirements to achieve optimum, sustainable use of training lands. The ITAM Program bridges the gap between the training community and natural resource managers.

2. TRI is a management and decision-making process that integrates ITAM into the training mission and regional conservation efforts.

3. RTLA collects ecological data and delivers the results in a suitable format intended to assist Training Division/Range Control and Army trainers with environmental

compliance issues and wise land use decisions. The RTLA Program strives to prevent training impacts that have ecological and economic consequences on the JBLM training mission.

4. LRAM supports the U.S. Army's military mission by reducing the long-term impacts of training on JBLM through preventive and corrective land rehabilitation and maintenance practices.

5. SRA educates soldiers about natural and cultural resources and the training mission so they can keep training lands healthy by minimizing the impacts of their activities.

ITAM staff must repair training lands. However, due to funding criteria, their natural resource management efforts are focused on areas that are most intensively used for training, or areas formerly used for training.

Over the next five years, the ITAM Program will continue to take an active role in repair and rehabilitation of training lands, as discussed throughout the preceding sections. Staff responsibilities will include repairing damaged training lands, monitoring the condition of prairies and oak communities, and working to increase the training community's awareness of environmental issues. Objectives for three elements of the ITAM Program have been identified.

Range and Training Land Assessment

Objective 1: Monitor natural resources to detect and/or determine trends and land use training impacts and identify sources of changes and trends. Data must be technically valid and be able to withstand scientific scrutiny.

Strategies:

- Collaborate with installation and regional land managers to measure and monitor sensitive natural resources.

- Collaborate with TRI and SRA to provide current information about the status of natural resources within a training area or range to assist trainers and land managers with wise land use decisions. Have data ready to respond to training events as they emerge so recommendations can be made about land use.

- Provide methods to assess the effects and impacts of training on natural resources. These methods will include collecting ecological data on prairie and Oak habitats in training areas, mortar points, or ranges to monitor conditions, trends, and changes.

- Collect ecological data on species going through a regional decline. Monitor species known to exist on JBLM for trends in population and density and take a proactive role in management.

- Ensure that all methodologies entail the use of scientifically sound principles with objectives designed to support the training mission. Consult with subject matter experts on the scientific validity of all projects and adjust monitoring protocols that do not meet high standards.

- Provide data, analytical capabilities, and recommendations associated with sustained usage of training lands. Document all monitoring methodologies and protocols, as well as, field season activities, observations and findings in an annual field report, to include yearly accomplishments, management recommendations, and data analysis.

Objective 2: Provide recommendations to LRAM to assist in the development and prioritization of projects.

Strategies:

- Assist in the development of LRAM monitoring methodologies to evaluate the effectiveness of LRAM efforts, including different re-vegetation approaches and Scot's broom removal methodologies. Monitor LRAM efforts to determine if land management and training support goals are met.

- Use current data to inform LRAM of rehabilitation areas, areas in need of vegetation control and native seed sources.

- Land Rehabilitation and Maintenance

Objective 1: Sustain quality training and realism through improvement and repair of Joint Base Lewis- McChord training lands.

Strategies:

- Work with other ITAM Program staff, Training Division/Range Control, and military trainers to identify project sites that require restoration, rehabilitation, or reconfiguration to improve access to training areas and training potential.

- Remove noxious vegetation from JBLM training lands to open up new areas for training, reclaim unusable training areas, and create a safer environment for training.

- Use hydro- or broadcast seeding, drill seeding, and hand planting of native plants to repair maneuver damaged training lands for safety and continued availability of land for training.

Objective 2: Sustain the overall condition and natural environment of JBLM training lands to ensure long-term military viability.

Strategies:

- Use native species in rehabilitation projects to increase the chance of successful rehabilitation and to provide the best assurance of maintaining training resources.

- Produce native plant plugs in the ITAM Program greenhouse from seed collected on JBLM, to ensure a steady supply of native plants for repairing training land damage, at less cost than purchasing them from a local vendor.

- Conduct annual maintenance and review of Seibert-staked areas to ensure their effectiveness.

- In coordination with DPW Fish and Wildlife staff biologists, review road infrastructure in training areas and decommission roads not essential to the military training mission. Deter traffic from new trails and recently established roads to help prevent prairie fragmentation and the spread of noxious weeds.

Objective 3: Minimize long-term costs associated with land rehabilitation and maintenance.

Strategies:

- Evaluate the effectiveness of the completed projects. Incorporate ecological concepts and information from other efforts and an experimental approach to assess the success of various re-vegetation approaches relative to program objectives.

- Apply reasonable accommodations for design and execution of LRAM Program projects to ensure that the results of rehabilitation, repair, and maintenance are commensurate with the applied resources.

- Coordinate long-term land maintenance plans with other land management programs on JBLM to ensure that completed projects receive adequate preventative maintenance (i.e. burning regimes and herbicide treatments) and that project efforts do not cause conflict or duplicate the efforts of other programs.

Sustainable Range Awareness

Objective 1: Educate training land users of their conservation responsibilities.

Strategies:

- Develop educational materials, including multi-media materials that capture general mission requirements and installation/group specific activities.

- Distribute educational materials to solders, unit leaders, and non-military land users, and participate in educational outreach events.

Objective 2: Educate conservation professionals on operation and mission requirements.

Strategies:

- Conduct briefings of JBLM training conservation measures and projects, to demonstrate how JBLM is proactively working towards sustaining its training lands and natural resources.

- Provide opportunities with hands-on orientation of weapon systems and observation of training events.

5.0. IMPLEMENTATION

The management programs and activities presented in the previous chapter detail the integrated approach that the Army will follow to manage and sustain natural resources on JBLM. The success of the INRMP depends upon the successful implementation of the management strategies outlined to meet the natural resources goals and objectives. Success will also be dependent upon the identification of issues and/or new management strategies to ensure management practices are adapted to meet the current needs of the Installation and its natural resources.

5.1. Achieving No Net Loss to the Military Mission

The INRMP strives for no net loss in the capability of JBLM lands to support the military mission. Management activities detail the integrated approach that JBLM will use to sustain training lands, and to reduce future restrictions on training associated with species listings and other compliance issues.

5.1.1. Defining Impact to the Military Mission

The Garrison Commander, the Army, and the Air Force may define an impact to the military mission as a lessened ability to support training to the standard set. On JBLM, the most likely impacts to the military mission associated with natural resources and natural resource management include the following:

- A reduction in the quantity and quality of training lands;
- A reduction in the capability of existing training lands to support military training (e.g., loss of open habitats through Scot's broom infestation);
- Restricted access to training lands, either spatially or temporally; and
- A reduction in the amount of training allowed.

5.1.2. Integrating Land Use and Natural Resource Decisions

JBLM training lands and natural resource management are mutually dependent, and decisions concerning land use and natural resources must be integrated to be effective. The Natural Resource Management approach JBLM has taken, and proposes to take, will consider military land use and natural resources simultaneously.

One mechanism for integrating land use and natural resource decisions is the Land Use Deconfliction process. The Land Use Deconfliction process allows consideration of land use and natural resource issues when planning projects on the Installation.

5.1.3. Supporting Sustainability of Training Lands and the Military Mission

The primary goal of the INRMP is to support the sustainability of training lands and the military mission through management of natural resources. It addresses the sustainability goal of obtaining healthy, resilient JBLM and regional lands that support

training, ecosystem and cultural values. For JBLM lands to continue to support the military mission, use of training lands must be sustainable. Forests are managed in accordance with the sustainable principles of the Forest Stewardship Council. Wetlands are protected from potentially damaging land uses. Prairie and Oak ecosystems, which support much of the training that takes place on JBLM, are not currently sustainable with current levels of management.

Invasive species are not adequately controlled and dominating most Oak stands, and some invasive non-native species are starting to dominate portions of the prairie ecosystem. Additional investments in integrated natural resource management will improve sustainability within these habitats.

The Army has developed a Sustainable Range Program to maximize the capability, availability, and accessibility of ranges and training lands to support the military mission. In accordance with Army Reg. 350-19, JBLM will support the sustainability of the military mission by doing the following:

- Modernizing training range facilities to sustain live training execution;
- Sustaining range and training facilities;
- Maximizing the accessibility of ranges and training land by minimizing restrictions brought about by encroachment factors;
- Focusing the capability of the environmental program to fully support force readiness by sustaining the accessibility of ranges and training land;
- Developing and implementing the Sustainable Range Outreach Program to improve public and stakeholder understanding of the Army's live training requirements and clearly articulate and underscore activities supporting national security;
- Establishing an interdisciplinary approach for sustaining ranges that integrates range safety, operations, facilities, and environmental management functions; and
- Establishing a multidisciplinary career program for range operations personnel that supports sustainable range management.

Another aspect of sustaining the military mission is ensuring that resource management maximizes training opportunities and access, and that restrictions associated with natural resources are minimized. JBLM will implement or expand on a variety of management approaches designed to prevent future training restrictions and maintain training flexibility.

Although placing restrictions on training is one possible response to degradation of resource condition, other management actions are available. In addition, any training restrictions put in place would be temporary, and could be lifted as soon as resource conditions improved.

The ACUB Program will allow the Army to aid in conservation of prairie and Oak habitats and increase federally listed species populations off JBLM so that training on base would not be further impacted.

Within JBLM, restoration and extensive habitat enhancement will occur in “areas of opportunity,” or areas already protected as CUAs. This management approach is intended to eliminate the need for additional training restrictions to help sustain the military mission.

Because resource management activities can affect training, the Joint Base Garrison Command staff must consider effects to the military mission when developing resource management projects. Training Division/Range Control has developed an interim training impact statement to be completed by DPW for their new projects, which is reviewed before these projects commence in the training or impact areas. This describes what benefit the project will have on training, and restrictions that could be involved. An activity hazard analysis needs to be completed for each project, so that all personnel working on the project know all potential hazards.

5.2. Pending and Unresolved Issues

5.2.1. Key Issues

Major issues pertaining to natural resource management on JBLM identified in this document include the following:

The need to hire additional biologists and additional funding to adequately manage the natural resources has been a critical issue at JBLM. Growth in the Installation (due to Grow the Army) and the recently listed species has intensified the need for additional personnel and funding at JBLM.

Natural resource management is not fully coordinated or deconflicted among the different programs. Managers suggested expanding the Land Use Deconfliction process to include a defined process for project proposal, review, assessment, and approval; and working the Land Use Deconfliction process into a regulation to make it a required process.

The inability to effectively control invasive plant species is a major issue affecting natural resources. The Department of the Army is committed to reducing the amount of pesticides applied on installations annually. Fish and Wildlife has identified opportunities for more effective control of certain invasive species by using highly selective herbicides as part of an integrated approach to management. Some of these

herbicides were developed recently, and are known to be more biologically safe. The DoD-mandated reduction in pesticide use allows natural resource managers to consider new herbicide options, although they may increase pesticide usage in the short term. The Down-Range Police Enforcement Program does not have sufficient resources to enforce natural resources laws and regulations at JBLM adequately, including trespassing, illegal dumping, prairie damage, and timber theft. Permanent enforcement staff is essential for ensuring compliance with the INRMP.

A disconnect exists between the Outdoor Recreation Program, which manages Hunting and Fishing programs but does not include any biologists, and DPW Fish and Wildlife, which is tasked with Fish and Game species management.

Additional funding for the ITAM Program will enable JBLM to fully implement the efforts to meet Senior Mission Commander needs and requirements.

Additional Range Control staff, resources, and equipment to implement requirements in accordance with FL Reg. 350-19.

5.2.2. Pending Issues

A pending issue that could affect natural resource management on JBLM, McChord Field is tree removal for compliance with airfield criteria. This project proposal calls for the removal of trees in the vicinity of the McChord Field airfield/runway, in order to create a violation- and waiver-free airfield environment in accordance with Unified Facilities Criteria 3-260-01, Airfield and Heliport Planning and Design.

Tree growth is penetrating approach/departure (50:1), transitional (seven to one) and inner horizontal surfaces. The proposal requires that trees be removed within ten feet of violating stipulated tree-height criteria.

Initially, the trees that violate criteria were identified in a 2003 aerial Light Detection and Ranging (LIDAR), (a remote sensing system) survey of the McChord Field airfield and surrounding area. Many of the trees were removed based on this survey. Another LIDAR survey was conducted in 2010. The results, received in January 2011, showed airfield obstructions, including trees that were out of compliance both on McChord Field and in the surrounding area. Environmental concerns include impacts to Morey Pond and Clover Creek riparian/wetland area; Oregon white oaks; mature fir forests; and impacts to privately owned properties and on municipal parkland.

Another pending issue concerns the Nisqually River near its intersection with Mounts Road on the West side of the base. This area of the Nisqually River is part of the Nisqually Tribe’s usual and accustomed fishing area. Fishing conflicts with sport fishermen, appropriate access to the area and assuring land alterations are properly permitted are issues being pursued. JBLM is currently working with the Nisqually Tribe to resolve these conflicts and alterations.

Several species were recently listed under the ESA, including four subspecies of the Mazama pocket gopher, the Taylor's checkerspot butterfly, Oregon spotted frog, Yellow billed cuckoo, and the Streaked horned lark. The base was exempted from critical habitat designation based on the conservation measures being implemented to minimize impacts and commitments made in the ESMC. Effects of training activities and resource management actions are addressed in the recently completed Biological Opinion, which provides the base with an exemption of incidental take for listed species associated with adverse effects from a wide range of training activities and resource management actions on JBLM. Intensified management action, coordination, and collaboration with the USFWS will be required for ongoing operations on JBLM.

5.2.3. Climate Change Vulnerability Assessment

The potential effects of climate change are increasingly significant and could impact military readiness, local ecosystems, biodiversity, and threatened and endangered species. To address the DoD Instruction 4715.03, JBLM will incorporate management considerations to address the impacts of climate change on the habitats and species of JBLM and Washington State. JBLM will work to build a framework for responding to climate change that creates and gathers the best available scientific information. JBLM will establish interagency and local partnerships that foster close collaboration between scientists and land managers. Collectively, these partnerships will build useful tools that support diverse management goals and develop climate change adaption strategies and management approaches. Climate change must be considered in the context of all potential changes, such as habitat loss, forest composition, native and non- native plant density and distribution, soil composition and moisture levels, and wildfire regimes.

A high importance will be placed on monitoring and adaptive management actions to lessen the impacts of climate change. Information on climate change impacts and needed management actions for the Washington Species of Greatest Conservation Need can be found in the WDFW State Wildlife Action Plan, 2015.

Background

The majority of current climate change models predict warmer, drier summers with more periods of extreme hot weather compared to present in Western Washington (Bachelet et al. 2011). Air temperatures are projected to continue increasing in all seasons at rates of 0.2 to 1.0°F per decade (WDFW, 2015).

July 1st soil moisture is largely projected to decline across Washington State -15 to -18 percent by 2080. These conditions will decrease growing-season soil moisture and promote a more frequent wildfire regime. Regionally, snowpack, streamflow patterns, ocean pH, and sea level all are factors that will result in changes to JBLM habitat and species.

Carbon, Greenhouse Gases and Biofuels
Changes in atmospheric concentrations of Greenhouse Gases (GHG) and aerosols, land cover and solar radiation alter the energy balance of the climate system. (IPCC, 2007). They affect the absorption, scattering, and emission of radiation within the atmosphere and at the Earth's surface. The largest growth in GHG emissions between 1970 and 2004 has come from energy supply, transport, and industry, while residential and commercial buildings, forestry (including deforestation) and agriculture sectors have been growing at a lower rate.

Unmitigated climate change in the long term, would be likely to exceed the capacity of natural, managed, and human systems to adapt. The storage of carbon in forest biomass, litter, and soils is a significant mitigation factor for climate change resulting from GHG emissions (IPCC, 2007; National Research Council, 2000; Wayburn et al., 2007). Regional land use activities interact with climate change in dynamic ways, and their influence upon the carbon cycle provides for feedbacks through the storage of carbon in forests, and the emissions of carbon via deforestation. Understanding the carbon cycle with context to carbon dioxide emissions is important to JBLM's utilization of prescribed fire to manage prairies and forests versus catastrophic wildfires. In carbon accounting, also understanding the carbon costs and efficiencies of harvesting forest biomass can inform environmental policies, and influence the use of sustainable forest biomass for energy. JBLM and other regional land managers will need to work to understand how best to maximize the restoration and ecological value of biomass removal while minimizing the potential (both in the near and distant future) of negative and unintended ecological impacts.

Natural Resources Affected
Climate change will impact Puget Sound trough species and habitats by potentially impacting (negatively and positively) the following ecological conditions:

- Suitable habitat availability;
- Species distribution and genetic make-u;
- Growth rates and mortality of native tree and plant species;
- Regeneration and restoration of Oak and Pine communities;
- Invasive species spread;
- Pollutant sensitivities;
- Forest and plant susceptibilities to new diseases due to moisture and drought stress;

- Aquatic system health;
- Ecological processes; and
- Erosional processes.

Hydrologic regime, water temperature, water chemistry, sediment, and rare aquatic species in the wetlands and water bodies on and adjacent to JBLM.

As for individual species and ecological systems, WDFW developed a vulnerability rankings for each species of greatest conservation need in Washington State (WDFW, 2015). To determine the vulnerability to climate change, sensitivity and exposure were evaluated for each species or ecological system. Confidence levels where then applied to each sensitivity and exposure, thus giving an overall vulnerability assessment for each species.

The Streaked horned lark was identified as moderately vulnerable to climate change stressors. This is likely due to the dependency upon availability of nesting and/or foraging habitat. Increases in invasive vegetation and altered fire regimes will increase the vulnerability of this species. The Taylor's checkerspot butterfly and well as other rare invertebrates have little to no information to develop an accurate vulnerability assessment. Taylor's checkerspot exhibit both direct (activity and emergence are influenced by temperature) and indirect sensitivity to climate (due to habitat specialization) (WDFW, 2015). The Mazama pocket gopher and Western gray squirrel were identified as having a moderately low vulnerability due to a lack of sensitivity information and for having a generalist dependency for their respective habitat). For a more detailed list of JBLM species and ecosystem see WDFW's Wildlife Action Plan, 2015.

Ongoing data collection and analysis for all rare plants and species on JBLM will help determine the extent fluctuations in climate and weather patterns impact these species and JBLM will continue to build consistent data sets that can be analyzed and modeled to combat negative changes in species distributions as a result of climate change.

Adaptation Strategies and Approaches
There are several broad adaptation strategies JBLM land managers can use to build a framework to address climate change and sea level rise:

- Sustaining ecological functions;
- Reducing the impact of existing biological stressors;
- Protecting forest and prairie ecosystems from severe wildfire;

- Maintaining refugia and promoting landscape connectivity;
- Maintaining and enhancing species and structural diversity;
- Increasing ecosystem redundancy across the landscape;
- Enhancing genetic diversity; and
- Planning and responding to disturbance.

Each of these strategies will require varying levels of management intensity and will require an adaptive management approach to the evaluation and implementation of management responses. Below is a list of possible general adaptation responses for natural resource management at JBLM:

1. Reduce the impacts of current stressors to enhance ecosystem resilience to climate change in the near term. Current stressors include altered fire regimes (unnaturally high fuel loads), increase in the number of non-native invasive species, and altered hydrology.

2. Maximize un-fragmented patches of ecological systems, including within ecosystem topographic and hydrologic variability, functional ecological processes, and landscape patterns of ecological systems.

3. To ensure there are migration corridors for rare plants and wildlife, encourage the land management of natural vegetation in areas of potential in land migration by the use of prescribed fire and invasive species control. Dense vegetation and invasive species may interfere with the inland migration.

4. Monitor trends in ecological systems to assess changes in reference conditions, especially native prairie ground cover responses. Use the dynamic reference condition approach to assess changes over time.

5. Identifying and adapting to the likely effects of climate change calls for a proactive rather than reactive approach to maintain cost effective programs and meet legal requirements to manage natural resources. Collaboration with other natural resources agencies will lead to a successful result for all stakeholders. These management strategies will help foster an ecosystem approach that considers and addresses the impacts of climate change

5.3. Beneficial Partnerships and Collaborative Research Planning

Multiple programs with the potential for overlap manage natural resources on JBLM in efforts. Therefore, management of natural resources requires collaborative

planning. Since the natural areas on JBLM are significant from a regional perspective, partnering and collaborating with outside stakeholders is necessary to ensure the Army's management goals are compatible with and complementary to those of other resource management entities.

5.4. Training of Natural Resources Personnel

JBLM hires qualified natural resource personnel with suitable education and training for fulfilling job responsibilities. Any additional training required is supplied or sponsored by the Army. Natural resource personnel go through an orientation to familiarize them with Army terminology, issues, policies, and regulations, and any necessary safety training.

Some natural resource personnel are members of national organizations, such as The Wildlife Society, Society of American Foresters, American Fisheries Society, Native Plant Society, and Society of Ecological Restoration, and keep current within their professions by reviewing technical journals and attending local and national meetings of interest. Resource personnel attend workshops and conferences sponsored by the Army, and local meetings and conferences sponsored by public and private natural resource-related groups in the Puget Sound region. Personnel are active participants in local organizations involved in natural resource management.

JBLM works closely with State and Federal agencies, universities, non-profit organizations, tribal members, contractors, and other resource specialists to ensure that the best people are used to manage and protect the resources on JBLM. These outside specialists can bring skills to JBLM that are unavailable on the Installation due to budget constraints, allowing JBLM to manage its resources more effectively.

5.5. Organizational Roles and Responsibilities

Table 5-1 lists the type and number of natural resources personnel currently involved in implementing the INRMP, as compared to the number needed to adequately implement the INRMP.

5.5.1. Management Responsibilities

The majority of forest management is the responsibility of DPW Fish and Wildlife and Forestry, with minor assistance from the Pest Management and ITAM Programs (Table 5-2).

Prairie management activities are primarily the responsibility of the DPW Fish and Wildlife and ITAM Programs. Support for control of invasive species and encroaching forest species is provided by the DPW Fish and Wildlife and Forestry. Although not included in Table 5-3, the Maintenance and Repair Division may assist with mowing of Scot's broom in the cantonment area.

Oak community management responsibilities are shared by the DPW Fish and Wildlife, Forestry, and ITAM Programs (Table 5-4).

Management of wetland habitats and species is predominantly the responsibility of DPW Fish and Wildlife (Table 5-5). DPW Forestry assists in forested wetlands areas. The Pest Management and ITAM Programs make minor contributions.

Table 5-1. Current Staffing and Personnel Needs

Position	Type	Existing Number	Total Number Needed
DPW, Forestry Branch			
Forester (supervisory)	Government	0	1
Forester (timber sales)	Government	1	1
Forester (fire management)	Government	1	1
Forester (stand development)	Government	1	1
Ecologist	Government	1	1
Forestry Technician	Government	3 permanent, 2 term	3 permanent, 2 term
Forestry Technician	Seasonal	14[1]	14
Dispatcher	Seasonal	2	2
Equipment Operator	Seasonal	1	1
DPW, Natural Resources Branch (Fish and Wildlife Program)			
Fish and Wildlife Program Manager/Pest Management Coordinator	Government	1	1
Fish and Wildlife Biologist	Government	4 filled, 2 terms	12
Fish and Wildlife Biologist	Contract	5	5
Biological Technicians	Permanent	0	2
Seasonal Biological Technicians	Seasonal	0	6
DPW, Compliance Branch (NEPA, Noise, Water, and Air Programs)			
NEPA and Noise Program Manager	Government	1	1
NEPA and Noise Support	Government	1	2
Water Program Manager	Government	0	1
Water Program Technician	Contract	1	1
Water Program Technician	Seasonal	1	1
Environmental Engineer (Air)	Government	1	1
Toxic Substances Control Act Specialist (asbestos, lead, radon)	Contract	1	1
Air Quality Chemist	Contract	1	1

Position	Type	Existing Number	Total Number Needed
Administrative and Database Management Support	Contract	1.5	1.5
DPTMS, ITAM Program			
ITAM Program Coordinator	Government	1	1
RTLA Coordinator	Contract	1	1
LRAM Coordinator	Contract	1	1
SRP GIS Analyst	Contract	1	1
Heavy Equipment Operators	Contract	0	4
LRAM Laborers	Contract	4	3
RTLA Technicians	Contract	3	3
[1] – Not all seasonal positions are currently filled.			

Table 5-2. Forest Management Responsibilities

Activity	Responsible Program
Silvicultural treatments (fuels reduction, timber harvest, stand development, reforestation, habitat enhancement)	DPTMS (LRAM); DPW (Forestry, FW)
Prescribed burns	DPW (Forestry, FW)
Herbicide application	DPW (Forestry, FW)
Invasive species surveys	DPW (Forestry, FW)
Wildlife surveys (including special status species)	DPW (FW)
ISI plots	DPW (Forestry)
FIP plots	DPW (Forestry)
Environmental awareness training	DPTMS (ITAM); DPW (FW)

Table 5-3. Prairie Management Responsibilities

Activity	Responsible Program
Prairie enhancement treatments (fuels reduction, seeding, planting)	DPTMS (ITAM, LRAM); DPW (FW)
Prescribed burns	DPW (Forestry, FW)
Herbicide application	DPW (FW)
Conifer removal	DPW (Forestry, FW)
Repair of training damage	DPTMS (ITAM); DPW (FW)
Land Condition Mapping plots	DPTMS (ITAM)
ITAM plots	DPTMS (ITAM)
Species surveys (plants, mammals, insects)	DPW (FW)

Activity	Responsible Program
Habitat quality monitoring	DPTMS (ITAM); DPW (FW)
Invasive species surveys	DPTMS (ITAM); DPW (FW)
Environmental awareness training	DPTMS (ITAM); DPW (FW)

Table 5-4. Oak Woodland Management Responsibilities

Activity	Responsible Program
Silvicultural treatments (fuels reductions, timber harvest, stand development, planting, habitat enhancement)	DPW (Forestry, FW)
Prescribed burns	DPW (Forestry, FW)
Herbicide applications	DPW (FW)
Invasive species surveys	DPW (FW)
Repair of damaged training lands	DPTMS (ITAM); DPW (FW)
Invasive species surveys	DPTMS (ITAM); DPW (FW)
ITAM plots	DPTMS (ITAM)
ISI plots	DPW (Forestry)
Wildlife surveys (including listed and special status species)	DPW (FW)
Special status plant species surveys	DPW (FW)
Environmental awareness training	DPTMS (ITAM); DPW (FW)

Table 5-5. Endangered Species Act

Activity	Responsible Program
Implement ESMC	DPW (FW)
Implement requirements of biological opinions	DPW (FW)
Monitor listed species	DPW (FW)

5.6. Annual Review and Management Performance Evaluation

5.6.1. Annual Review Process

The INRMP will be reviewed annually to determine whether major updates to the document are necessary. The annual review process is a mechanism whereby natural resource managers can reprioritize projects, reallocate funding, and staff to meet new priorities. Other relevant changes to the document can be made at this time.

Annual reviews serve to verify the following:

- Information is current;
- All required trained natural resources positions are filled or are in the process of being filled;

- Projects and activities for the upcoming year have been identified and included in the INRMP. An updated project list does not necessitate revising the INRMP;

- All required coordination has occurred;

- All significant changes in the Installation's mission requirements or its natural resources have been identified; and

- Current versions of management plans may be replaced with updated versions as they become available.

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