SIGNATURE PAGES

This Integrated Natural Resources Management Plan (INRMP) is an updated INRMP Little Rock Air Force Base (LRAFB) and has been developed due to the presence of natural resources. These resources include the presence of a variety of habitats for numerous game and non-game fish and wildlife, a federally listed species, and several species of concern. It meets the requirements for INRMPs per United States Air Force (USAF) policy, meets the intent of the Sikes Act of 1960, as amended by the Sikes Act Improvement Act of 1997 (16 U.S.C. §§ 670a), and contributes to the management of natural resources on military installations.

To the extent that resources permit, the United States Fish and Wildlife Service (USFWS), Arkansas Game and Fish Commission (AGFC), and the 19th Airlift Wing (19th AW) by signature of their agency representative, do hereby enter into a cooperative agreement for the conservation, protection, and management of natural resources present on LRAFB. The intention of this agreement is to maintain sustainable ecological communities on these facilities that integrate the interests and mission of the agencies charged with conservation, protection, and management of natural resources in the public interest. This agreement may be modified and amended by mutual agreement of the authorized representatives of the three agencies. This agreement will become effective upon the date of the last signatory and shall continue in full force for a period of 5 years or until terminated by written notice to the other parties, in whole or in part, by any of the parties signing this agreement.

By their signatures below, or an enclosed letter of concurrence, all parties grant their concurrence with and acceptance of the following document.

7 Mar 19

Gerald A. Donohue, Colonel, USAF
Commander
19th Airlift Wing

Date

MELVIN TOBIN

Digitally signed by MELVIN TOBIN
Date: 2019.02.06 08:29:09 -06'00'

Melvin L. Tobin
US Fish and Wildlife Service
Field Supervisor
Ecological Services Field Office, Arkansas

Date

X 35423

Jason Honey
Arkansas Game & Fish Commission
Private Lands Biologist

X 2-4-19

Date

Little Rock

Air Force Base

Integrated Natural Resources Management Plan (INRMP)

1255 Vandenberg Blvd
Jacksonville, AR 72099

February 2019
Final

U. S. AIR FORCE INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Little Rock Air Force Base

(See INRMP signature pages for plan approval date)

ABOUT THIS PLAN

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

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

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

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DOCUMENT CONTROL

Record of Review – The INRMP is updated not less than annually, or as changes to natural resource management and conservation practices occur, including those driven by changes in applicable regulations. In accordance with (IAW) the Sikes Act and AFI 32-7064, *Natural Resources Management*, the INRMP is required to be reviewed for operation and effect not less than every five years. Annual reviews and updates are accomplished by the base Natural Resources Manager (NRM), and/or an Installation Support Team Natural Resources Media Manager. The installation shall establish and maintain regular communications with the appropriate federal and state agencies. At a minimum, the installation NRM (with assistance as appropriate from the NR Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of the United States Fish and Wildlife Service (USFWS), state fish and wildlife agency, and National Oceanic and Atmospheric Administration (NOAA) Fisheries, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INRMP Review Summary. By signature to the Annual INRMP Review Summary, the collaborating agency representative asserts concurrence with the findings. Any agreed updates are then made to the document, at a minimum updating the work plans.

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Gerald A. Donohue, Colonel, USAF **Commander** 19th Airlift Wing	Date
Melvin L. Tobin US Fish and Wildlife Service Field Supervisor Ecological Services Field Office, Arkansas	Date
Jason Honey Arkansas Game & Fish Commission Private Lands Biologist	Date

ANNUAL REVIEW AND COORDINATING DOCUMENTATION

These pages are used to certify the annual review and coordination of the Integrated Natural Resources Management Plan (INRMP) for Little Rock Air Force Base (LRAFB) in Pulaski County, Arkansas.

With the signatures below, the certifying officials acknowledges that the annual review and coordination of the INRMP has occurred for the specified year.

Approving Official:

Year: 2019

Gerald A. Donohue, Colonel, USAF Commander 19th Airlift Wing Commander	Date
Melvin L. Tobin US Fish and Wildlife Service	Date
Jason Honey Arkansas Game and Fish Commission	Date

Year: 2020

Gerald A. Donohue, Colonel, USAF Commander 19th Airlift Wing Commander	Date
Melvin L. Tobin US Fish and Wildlife Service	Date
Jason Honey Arkansas Game and Fish Commission	Date

Year: 2021

Gerald A. Donohue, Colonel, USAF Commander 19th Airlift Wing Commander	Date
Melvin L. Tobin US Fish and Wildlife Service	Date
Jason Honey Arkansas Game and Fish Commission	Date

Year: 2022

Gerald A. Donohue, Colonel, USAF Commander 19th Airlift Wing Commander	Date
Melvin L. Tobin US Fish and Wildlife Service	Date
Jason Honey Arkansas Game and Fish Commission	Date

Year: 2023

Gerald A. Donohue, Colonel, USAF Commander 19th Airlift Wing Commander	Date
Melvin L. Tobin US Fish and Wildlife Service	Date
Jason Honey Arkansas Game and Fish Commission	Date

1.0 EXECUTIVE SUMMARY

The 2018 Integrated Natural Resources Management Plan (INRMP) updates the INRMP prepared in 2013, in compliance with the Air Force Installation (AFI) 32-7064, *Integrated Natural Resources Management* (18 November 2014) and Department of Defense (DoDI) 4715.3, *Environmental Conservation Program* (3 May 1996). Little Rock Air Force Base (LRAFB) has been designated as a Category I Natural Resources Installation, and the INRMP is designed to achieve an ecosystems-based management program to protect natural resources while supporting present and future mission requirements.

The fundamental objective of the INRMP, as mandated by the Sikes Act as amended by the Sikes Act Improvement Act of 1997 (SAIA; 16 U.S.C. §§ 670a), is to provide an interdisciplinary approach to management and stewardship of installation natural resources within the framework of ecosystem management. This approach to resource management attempts to balance human-centered multiple uses with ecosystem values to ultimately sustain the installation's socio-economic values and future mission requirements. INRMPs are updated every 5 years and reviewed annually by installation officials to identify minor updates and track implementation as well as providing long-term guidance for base staff in order to maintain and improve sustainability and biological diversity at LRAFB.

LRAFB encompasses approximately 6,128 acres along the eastern edge of the Ouachita Mountains above the Mississippi Alluvial Plain and an ancient coastal embayment, in an area known as the Arkansas Valley and Ridges Land Resources area. Approximately half of the installation acreage is classified as "Improved" or "Semi- Improved" to include the main cantonment area, golf course, and airfield. The remaining acreage is classified as "Unimproved," consisting mainly of deciduous woodlands, pine woodlands, and oak savannahs, but also includes the main base lake and various smaller surface water features. There are 76 individual wetland areas on base with a combined total of 70.4 wetland acres. The largest wetlands occur in the eastern portion of the base. Twelve of the individual wetlands are over 1 acre in size. There are 16 areas on the installation classified as floodplains that cover a total of 730 acres. Numerous riparian areas are scattered throughout LRAFB along the margins of water bodies.

The SAIA of 1997, as amended, requires federal military installations with significant natural resources to develop a long-range INRMP and implement cooperative agreements with other agencies. LRAFB also maintains an active forest management program to maintain ecological integrity and biological diversity, protect watersheds and wildlife habitat, provide quality forest products, and plan and coordinate the multiple uses of forest land. The Natural Resources Management Goals presented in this INRMP are listed below:

Goal 1: Provide a natural resource management program within 19 CES/CEIE that supports the 19th AW mission while protecting ecosystem diversity to the maximum extent possible while complying with applicable federal and state laws and USAF regulations and policies.

Goal 2: Remain in compliance with federal, state and local laws and regulations governing natural resources.

Goal 3: Manage soil to minimize sediment loss and erosion, while protecting water quality.

Goal 4: Manage water resources so they remain resilient and with no net loss of acreage or functions and values.

Goal 5: Manage vegetation to promote a diversity of native species using cost effective and sustainable methods.

Goal 6: Manage fish and wildlife to maintain populations of game and non-game species consistent with 19AW mission and ecosystem management.

Goal 7: Manage endangered, threatened, and rare species habitat using an ecosystem approach, while maintaining the military mission at LRAFB.

Goal 8: Minimize impacts of invasive plant and pest species with mechanical treatment and minimal chemical applications, utilizing an integrated pest management approach.

Goal 9: Enhance Natural Resources Programs with continual training opportunities.

These goals are supported in the INRMP by objectives and projects, as well as management strategies and specific actions to achieve these goals. Goals and objectives are listed in Section 8.0 of the INRMP, and projects and activities are summarized in Tables 10 and 11 of Section 10.0. This INRMP provides a description of the installations and the military missions, the environment on each installation, and specific natural resource management designed for sustainable military training. The implementation of this INRMP will ensure the successful accomplishment of the military mission while promoting adaptive management that sustains ecosystem and biological integrity and provides for multiple uses of natural resources.

2.0 GENERAL INFORMATION

2.1 Purpose and Scope

The purpose of this INRMP (or "Plan") is to serve as a framework for natural resources management at LRAFB to include the Blackjack Drop Zone. This plan presents an interdisciplinary approach to management and stewardship of natural resources and is based on the concept of multiple use within the framework of ecosystem management as defined in AFI 32-7064. This approach to resource management attempts to balance human-centered multiple uses such as mission support, commodity production, and recreation with ecosystem values related to general life support services of soil and water conservation, oxygen recharge, and nutrient recycling. Additionally, the preservation and enhancement of biological diversity on LRAFB lands will be an overarching goal of the INRMP.

This plan is a dynamic document that integrates all aspects of natural resources management with each other and the rest of the installation's mission. Management strategies should be monitored and adjusted as needed. Goals and objectives of this plan must be given consideration early in the planning process for projects and mission changes on the installation. To achieve this end, the INRMP will be incorporated by reference into the LRAFB Installation Development Plan (IDP), and INRMP digital maps will form the basis of the IDP's A-1 maps (Areas of Critical Concern) and A-2 maps (Management Areas). The interface of the INRMP with the IDP will be such that whenever the INRMP maps and associated databases are updated, the IDP A maps will also be updated.

The INRMP provides sufficient and adequate protection and conservation of federally listed threatened and endangered species and their habitats. Therefore, an approved INRMP precludes the need for USFWS and National Oceanic and Atmospheric Administration, National Marine and Fisheries Service (NOAA Fisheries) to formally designate critical habitat on military lands and the National Defense Authorization Act of FY2004 changed the Endangered Species Act, Sec 4(a)(3) to prevent these agencies from doing so.

The 2018 INRMP replaces the 2013 INRMP.

2.2 Management Philosophy

This plan presents both broad philosophical guidance as well as specific goals. INRMP planning and decision making is integrated with base comprehensive planning, proposed project planning, pest management planning, Bird/Wildlife Aircraft Strike Hazard (BASH) reduction, airfield management planning, golf course environmental management planning and grounds maintenance planning. Interdisciplinary input from a wide variety of operational organizations on LRAFB as well as from various Local, State, and Federal agencies was incorporated into this plan. This same cross-agency, cross-discipline approach will be used in preparing all major revisions of the INRMP. In recognition of the existing Cooperative Agreement between the DoD, DOI, and the State of Arkansas represented by the19th Airlift Wing (AW), USFWS, and Arkansas Game and Fish Commission (AGFC) respectively, the Installation Natural Resources Manager will work with respective agency personnel for the purposes of protecting, developing, and managing the fish and wildlife resources on LRAFB and thereby achieving the goals and objectives of the INRMP.

This INRMP has been revised and updated by the LRAFB natural resources manager and approved by the wing commander. The overall INRMP is effective for 5 years from the date of approval; however, the plan will be reviewed annually by the natural resources manager, USFWS, AGFC, and certified by the wing commander.

The fundamental philosophy behind the development of this INRMP is ecosystem management. The principles of Air Force ecosystem management (USAF 2004a) include the following:

- Maintenance or restoration of native ecosystem types across their natural range where practical and consistent with the military mission;
- Maintenance or restoration of ecological processes such as fire and other disturbance regimes where practical and consistent with the military mission;
- Maintenance or restoration of the hydrological processes in streams, floodplains, and wetlands when feasible;
- Use of regional approaches to implement ecosystem management on an installation by collaboration with other DOD components as well as other Federal, State and Local agencies, and adjoining property owners; and
- Use of natural resources to provide for outdoor recreation, agricultural production, harvesting of forest products, and other practical utilization of the land and its resources, provided that such use does not inflict long-term ecosystem damage or negatively impact the Air Force mission.

The INRMP is focused on supporting the base mission requirements while complying with the Sikes Act (SA), Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), Clean Water Act (CWA), federal natural resource conservation laws and regulation, and various Executive Orders including Executive Order (EO) 11988 *Floodplains Management*, EO 11990 *Protection of Wetlands*, EO 13186 *Responsibilities of Federal Agencies to Protect Migratory Birds*, EO 12962 *Recreational Fisheries*, EO 11989 *Off-Road Vehicles on Public Lands*, and EO 13112 *Invasive Species*.

2.3 Authority

2.3.1 Natural Resources Laws, Regulations & Policy

The Sikes Act of 1960 (16 United States Code [USC] 670a-670o), as amended, provides for cooperation between the Department of Interior (DOI), DoD, and State agencies in planning, developing, and maintaining natural resources on military reservations. The Sikes Act Improvement Amendment as contained in the Fiscal Year (FY) 1998 National Defense Authorization Act specifically calls for the cooperative preparation and implementation of INRMPs on military installations. DoD Instruction 4715.3, *Environmental Conservation Program*, implements policy, assigns responsibilities, and prescribes procedures for the integrated management of natural and cultural resources on property under DoD control. Air Force Policy Directive (AFPD) 32-70, *Environmental Quality*, requires Air Force installations to conserve natural and cultural resources through effective environmental planning. AFI 32-7064, *Integrated Natural Resources Management*, implements the Sikes Act, DoD Instruction 4715.3, *Environmental Conservation Program*, and AFPD 32-70, *Environmental Quality*, and provides guidance in managing natural resources on Air Force installations in accordance with applicable Federal, State, and Local laws and regulations. AFI 32-7064 establishes the INRMP as the principal tool for managing natural resources on Air Force installations.

Other applicable guidance includes AFI 32-7065, *Cultural Resources Management*, and DoD Instruction 7000.14, *DoD Financial Management Policy and Procedures.* A complete list of applicable regulatory guidance is found in Appendix K.

2.3.2 National Environmental Policy Act Compliance

The National Environmental Policy Act (NEPA) is a Federal statute requiring the identification and analysis of potential environmental impacts of proposed Federal actions before those actions are taken. NEPA established the Council on Environmental Quality (CEQ) that is charged with the development of implementing regulations and ensuring Federal agency compliance with NEPA. CEQ regulations mandate that all Federal agencies use a systematic interdisciplinary approach to environmental planning and the evaluation of actions that might affect the environment. This process evaluates potential environmental consequences associated with a proposed action and considers alternative courses of action. The intent of NEPA is to protect, restore, or enhance the environment through well-informed Federal decisions.

The process for implementing NEPA is codified in 40 CFR 1500–1508, *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*. The CEQ was established under NEPA to implement and oversee Federal policy in this process. To this end, the CEQ regulations specify that an Environmental Assessment (EA) be prepared to

- Briefly provide evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI)
- Aid in an agency's compliance with NEPA when an EIS is unnecessary
- Facilitate preparation of an EIS when one is necessary.

AFPD 32-70, *Environmental Quality*, states that the USAF will comply with applicable federal, state and local environmental laws and regulations, including NEPA. The USAF's implementing regulation for NEPA is 32 CFR 989, *USAF EIAP*.

2.3.3 Responsibilities

The commander of the 19th AW at LRAFB is responsible for compliance with Federal, State, and Local environmental laws and regulations. The 19th AW Environment, Safety, and Occupational Health Council (ESOHC), chaired by the Wing Commander, provides oversight for environmental compliance. The ESOHC is comprised of members from both host and associate unit organizations. The chief of wing safety serves as the executive secretary of the ESOHC. Planning conflicts that arise from the INRMP that cannot be resolved through the natural resources manager will be elevated to the Little Rock AFB ESOHC. General responsibilities by department are shown in Table 1.

Table 1. Primary Natural Resource Management Responsibilities at LRAFB			
Group	**Squadron**	**Flight/Staff**	**Responsibilities**
Wing Staff		Wing Commander	- Chair, Environment, Safety, and Occupational Health Council
		Judge Advocate	- Regulatory Interpretation - Off-Base Dispute/Complaint Resolution - Legal Representation
		Safety	- Executive Secretary, Environment, Safety, and Occupational Health Committee - BASH Monitoring and Minimization (on and off base)
Medical Group	AMDS	Bioenvironmental Public Health	- Environmental Health Risk Assessments - Zoonosis Monitoring
Operations Group	Operations Support	Airfield Management	- Airfield Grounds Management - Clear Zone Management - BASH Monitoring & Minimization - Depredation Team - Design Procedures/Ensure Compliance for Noise Sensitive Wildlife Areas and Settlement Under Low-Level Routes
Mission Support Group	Civil Engineering	Environmental	- Natural Resources Program Management - NPDES Storm Water Quality Monitoring
		Engineering	- Storm Water/Erosion Control and Landscaping - Specifications for New Construction - Community Planning
		Fire Department	- Wildland Fire Management Plan
		Housing Communities (Privatized)	- Grounds Maintenance in Housing Areas
		Operations	- General Grounds Maintenance - Pest Management - Deer Removal from Airfield
	Security Forces	Operations	- Base hunting and fishing law enforcement in cooperation with AGFC law enforcement personnel

AGFC – Arkansas Game and Fish Commission
BASH - Bird/Wildlife Aircraft Strike Hazard
NPDES - National Pollutant Discharge Elimination System

2.4 Integration with Other Plans

By its nature, an INRMP is multidisciplinary and provides the summary for natural resources at a specific installation. As a result, information from an INRMP is incorporated into other plans and these plans help identify management priorities and potential impacts to natural resources. The INRMP is integrated with the following LRAFB plans:

- BASH Hazard Reduction Plan – provides summary of the BASH program on LRAFB, including techniques, processes, responsibilities and management recommendations (LRAFB 2015a; Section 12).
- Integrated Pest Management Plan (IPMP) for LRAFB – plan for management of pest species, including nuisance wildlife and invasive species, to minimize impact to mission, natural resources and the environment (LRAFB 2016; Section 12).
- One Plan: Spill Prevention, Control, and Countermeasures Plan (Red Plan) for LRAFB – plan for prevention and management of spills (LRAFB 2012; Section 12).
- Integrated Cultural Resources Management Plan (ICRMP) for LRAFB – plan for management of cultural resources at LRAFB, including archeological resources and historic structures (LRAFB 2018b; Section 12).
- Invasive Species Survey and Management Plan – to survey areas of the base for designated invasive species, treat the areas with pesticides, monitor the results of the treatment, and modify the approach for further treatment (HDR Engineering, Inc. 2016; Section 12).
- Landscape Tree Inventory Management Plan – plan for management of landscape trees at LRAFB by exploring future management options while reviewing current conditions (Davey Resource Group 2012; Section 12)
- Wildland Fire Management Plan – plan to establish strategies for reducing wildfire potential and the implementation of prescribed burns as an ecological management tool. (LRAFB 2014; Section 12).
- Airfield Vegetation Management Plan – plan for management of tree intrusion into the controlled airspace at LRAFB to reduce the potential for future airfield safety problems originating from forest areas surrounding the airfield (LRAFB 2003; Section 12)
- Base Lakes and Ponds Watershed Management Plan – plan for management of the lakes and ponds on LRAFB by identifying problems and concerns with the current watersheds; developing and prioritizing solutions and long-term strategies; ensuring these lakes and ponds provide the best possible habitat for fish and other aquatic species (LRAFB 2010; Section 12).

3.0 INSTALLATION OVERVIEW

3.1 Location and Area

3.1.1 Little Rock Air Force Base – Main Base

LRAFB is located within the political boundary of Pulaski County in central Arkansas (Figure 1). The base lies in the northeast corner of the county, adjacent to and north of the City of Jacksonville, a city of approximately 30,000 people (U.S. Census Bureau [USCB] 2018). The base is situated roughly 15 miles north of the twin cities of Little Rock and North Little Rock. Little Rock is located near the junction of Interstates I-30 and I-40, and United States (U.S.) Highway 65, U.S. 67, and U.S. 167. Memphis, Tennessee, is located approximately 150 miles east of Little Rock along I-40; Texarkana, Texas is located roughly 135 miles southwest of Little Rock along I-30. U.S. 67/U.S. 167 extends northeast of Little Rock and passes immediately southeast of the base.

LRAFB has a resident population of approximately 3,332 and a working population of approximately 7,200. It encompasses 6,128 acres. A total of 2,347 buildings, facilities, and housing units are located on the base. The airfield, with its approximately 13,500-foot east-west runway, and associated aircraft operations and maintenance areas, comprises roughly the northern third of the base. The 39-acre Pat Wilson Lake, located in the southwestern quadrant of the base, is the central feature of the privatized family housing area. An 18-hole golf course is situated in the south-central portion of the base. In 2000, LRAFB was the sixth largest employer in the Greater Little Rock area.

3.1.2 Blackjack Drop Zone

As part of its mission, LRAFB's 19th Airlift Wing owns and utilizes a 300-acre site near Romance, Arkansas, as a drop zone (Figure 1). Known as the Blackjack Drop Zone, the site is located approximately 23 miles north of the main base in White County.

3.1.3 All-American Drop/Landing Zone

LRAFB also utilizes a 471-acre site known as the All-American Drop/Landing Zone located at Camp Robinson. Camp Robinson is situated approximately 5 miles west of the main base (Figure 1). LRAFB utilizes this drop/landing zone as a tenant and does not maintain real property accountability at this site.

Figure 1. Regional location of LRAFB within Arkansas.

3.2 Installation History

The Little Rock area was first considered as an ideal location for an Air Force base in late 1951 because of its location near the geographical center of the U.S. Local leaders supported the idea, however, Congress refused to allocate money for the purchase of the needed property. In an unprecedented move, local citizens raised the money to purchase the land and then donated it to the Air Force. As a result of these efforts, on 9 September 1952 the Air Force announced its decision to build a $31-million medium jet bomber base near Jacksonville, Arkansas, about 15 miles northeast of Little Rock.

In 1953, construction began on Little Rock AFB. By the summer of 1954, the Strategic Air Command (SAC) had assigned the 384th Bombardment Wing and the 70th Strategic Reconnaissance Wing to the base. The base was opened to air traffic and was officially dedicated in 1955.

In 1961, the 308th Strategic Missile Wing (SMW) replaced the 384th Bombardment Wing as LRAFB became the support base for 18 Titan II intercontinental ballistic missile (ICBM) sites located around north and central Arkansas. The Air Force transferred LRAFB from SAC to the Tactical Airlift Command (TAC) in April 1970. The first C-130s subsequently arrived as part of the 64th Tactical Airlift Wing (TAW) with the 64 TAW becoming the new host unit. With the arrival of the 64 TAW, tactical airlift operations and training began.

The 64 TAW was replaced in 1971 by the 314 TAW. Another major change occurred on the base in December 1974, when the Air Force reassigned the 314 TAW from TAC to the Military Airlift Command (MAC). In 1986, LRAFB was chosen as the temporary headquarters of the Army's Joint Readiness Training Center (JRTC).

The base and its mission remained primarily unchanged until August 1987, when the 308 SMW was inactivated and all the launch facilities were decommissioned. The 314 TAW remained the host unit, supporting global airlift and providing primary C-130 training for U.S. aircrews as well as crews from allied nations. The 314 TAW has participated in numerous operations since the 308 SMW became inactive, including Desert Shield/Storm in 1990.

In 1991, the 314 TAW was redesignated the 314 AW. In June 1992, the 314 AW was aligned under the newly formed Air Mobility Command (AMC), the successor to Military Airlift Command (MAC). In October 1993, the 314 AW transferred to Air Combat Command (ACC) where it remained until 1 April 1997, when the wing's training function was realigned under Air Education and Training Command (AETC) and the airlift function transferred to AMC.

In October 2008, 19th AW was declared as the host unit at LRAFB.

3.3 Military Missions

LRAFB is the home of C-130 Combat Airlift – the largest fleet of C-130's and the main C-130 training base for the DoD. Pilots, navigators, flight engineers, and loadmasters from all branches of the military service, as well as 28 allied nations, are trained in tactical airlift and aerial delivery at the base. As the installation's host unit, the 19th AW works in conjunction with the 314 AW and the 189 AW. The 19th AW is assigned to the 18th Air Force (18 AF) of AMC, which is headquartered out of Scott AFB, Illinois. The mission of AMC is to provide global air mobility…right effects, right place, right time‖ through airlift and aerial refueling for all of

America's armed forces. The 18 AF is responsible for tasking and executing all air mobility missions.

The 19th AW flies the world's largest fleet of C-130 aircraft and is responsible for providing worldwide deployable C-130 aircraft, aircrews, support personnel, and equipment for AMC and Air Expeditionary Force taskings. As part of AMC's Global Reach airlift capability, the wing's tasking requirements range from supplying humanitarian airlift relief to victims of disasters, to airdropping supplies and troops into the heart of contingency operations in hostile areas.

The 314 AW, a tenant unit at LRAFB, trains C-130 crews for all services in the DoD, the U.S. Coast Guard, as well as C-21 aircrews through the 45th Airlift Squadron at Kessler AFB, Mississippi. The 314 AW is aligned under the 19th Air Force (19 AF) of AETC, headquartered at Joint Base San Antonio (JBSA) - Randolph , Texas. The 314 AW's mission is to train the world's best C- 130 and C-21 combat airlifters to fly, fight, and win.

The 189 AW, another tenant unit at LRAFB, is part of the Arkansas Air National Guard (ANG). The mission of the 189 AW is to train C-130 aircrew instructor candidates to become instructors in their respective crew positions so that they can return to their units and keep their unit members combat-ready. In addition, the wing operates the ANG Enlisted Aircrew Academic School, which trains all the USAF's C-130 entry-level loadmasters before they are sent across the installation to the 314 AW for initial and mission qualification training. In times of emergency, as declared by the Governor of Arkansas, the 189 AW performs the State mission as directed by the State adjutant general.

Other tenant units at LRAFB include the 29th Weapons Squadron (WS) of ACC; the 34th Combat Training Squadron (CTS); the 41st Airlift Squadron (AS) of AMC; the 61st Airlift Squadron (AS) of AMC; the 62d Airlift Squadron the 96th Aerial Port Squadron of Air Force Reserve Command; the 373rd Training Squadron, Detachment 4 AMC; and AMC Air Operations Squadron, Detachment 3.

3.4 Surrounding Communities

LRAFB is located in the Little Rock-North Little Rock Metropolitan Statistical Area (MSA), which is comprised of six Arkansas counties including Pulaski, Faulkner, Saline, Lonoke, Perry, and Grant. Pulaski County accounts for 53.5% of the MSA population, while Faulkner, Saline, Lonoke, Perry, and Grant Counties account for 16.6%, 16.2%, 9.8%, 1.4%, and 2.5%, respectively (U.S. Census Bureau [USCB] 2018).

LRAFB is in Pulaski County adjacent to the city of Jacksonville, Arkansas. Pulaski County also includes the twin cities of Little Rock and North Little Rock. Table 2 shows demographic information for Pulaski County and Jacksonville, AR as of 2016 (USCB 2018). The immediate vicinity of LRAFB is largely rural, and most economic activity is commercial service. There is a significant amount of low-density residential development near the base, as well as some agricultural and industrial activity. Forests and agricultural areas are the primary land uses in Pulaski County, comprising 15.9% and 76.8% of the total land area respectively. Urban, water, and transportation comprise the remaining major land uses at 7.3% (U.S. Department of Agriculture [USDA] 2012). Land uses in the immediate vicinity of LRAFB are generally agricultural, forests, and low-density residential.

Table 2. Local area demographics			
Geographic Unit	**Population**	**Median Household Income**	**Percent of Individuals Below Poverty Level**
Jacksonville, AR	28,518	$42,991	17.4
Pulaski County, AR	393,250	$47,101	17.2

3.5 Local and Regional Natural Areas

Located near the eastern edge of the Ouachita Mountains above the Mississippi Alluvial Plain (Braun, 1950) and within the Arkansas Valley and Ridges Land Resources area, LRAFB possesses a diversity of habitats. The area is dominated by pines and upland hardwoods and supports a wide array of plant and wildlife species. Habitats found on the base include upland pine forest, broad-leaved deciduous swamp, and freshwater ponds.

Arkansas is a predominantly rural state and is known as "the Natural State." The northwestern portion of the state is comprised of the hills of the Ozarks and the Ouachita Mountains. Nearly a dozen sizable man-made lakes make these hills a haven for fish and wildlife, as well as sportsmen. The Mississippi Flyway is located east of the base. The state provides valuable wintering habitat for many migrating birds, estimated at 5% of all ducks and 1% of all geese surveyed in the country. Arkansas also harvests more mallards than any other state in the nation. Commercial forests dominate the southern portion of the state, to the east, soybeans, cotton, and rice are grown on large farms.

Wildlife Management Areas (WMAs) in closest proximity to the base include the Camp Robinson WMA owned by the Army National Guard, and Holland Bottoms WMA, owned by the AGFC. Other regional areas of interest include the town of Stuttgart, located 65 miles southeast of the base, known as the duck hunting capital of the world. The Arkansas River-Lake Dardanelle area, between Russellville and Clarksville, situated approximately 70 miles northwest of the base, is known for its resident Canada geese (*Branta canadensis*) population. The Buffalo River, approximately 90 miles north of the base, lies within a National Park Service Reserve, which borders the Ozark National Forest. This area also contains the Buffalo River WMA.

4.0 PHYSICAL ENVIRONMENT

A brief summary of the natural environment at LRAFB is provided in the following sub-sections. A complete, detailed summary is provided in Appendix F and a summary of special status, threatened and endangered species is provided in Appendix G.

4.1 Climate

The climate of Pulaski County is affected by all North American air mass types. Summers are typically hot, with long periods of high humidity. Based upon the base climatic data for 1981 through 2011, the warmest month occurred in August with an average maximum temperature of 92.6 degrees Fahrenheit (°F). Winters are generally mild. The coldest month between 1981 and 2010 occurred in January with an average minimum temperature of 31.2 °F.

The annual average rainfall varied from 2.59 inches in July to 5.28 inches in November with an average annual rainfall amount of 49.75 inches; however, the wettest season is typically spring. Historically, annual snowfall ranged greatly with most of the annual snowfall occurring in January and February (National Oceanic Oceanic and Atmospheric Administration [NOAA] 2018). Due to the lack of readily available regionally-specific model outputs, the Nature Conservancy's ClimateWizard was used to determine likely future climate regimes under different emissions scenarios. ClimateWizard enables technical and non-technical audiences alike to access leading climate change information and visualize the regional impacts to both temperature and precipitation that are likely to occur in areas within the US. Historically, it appears Arkansas's climate has been growing wetter and cooler (Figures 2 and 3). In the future, Arkansas's climate will generally grow warmer and wetter during this century (Figure 4) as summarized on The Nature Conservancy's Climate Wizard site (http://www.climatewizard.org).

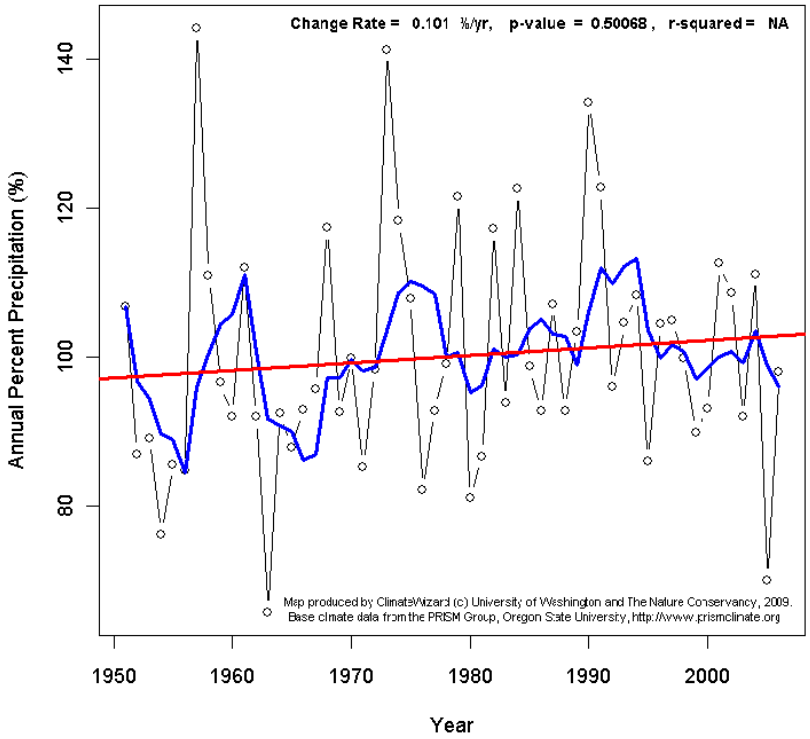

Figure 2. Historic annual precipitation for Arkansas based on data from Climate Wizard.

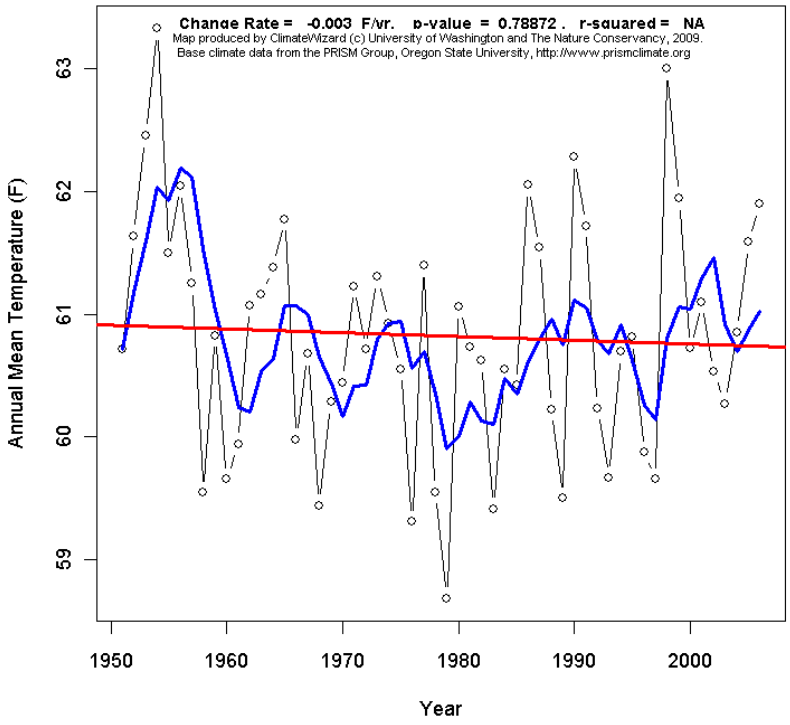

Figure 3. Historic annual temperature for Arkansas based on data from Climate Wizard.

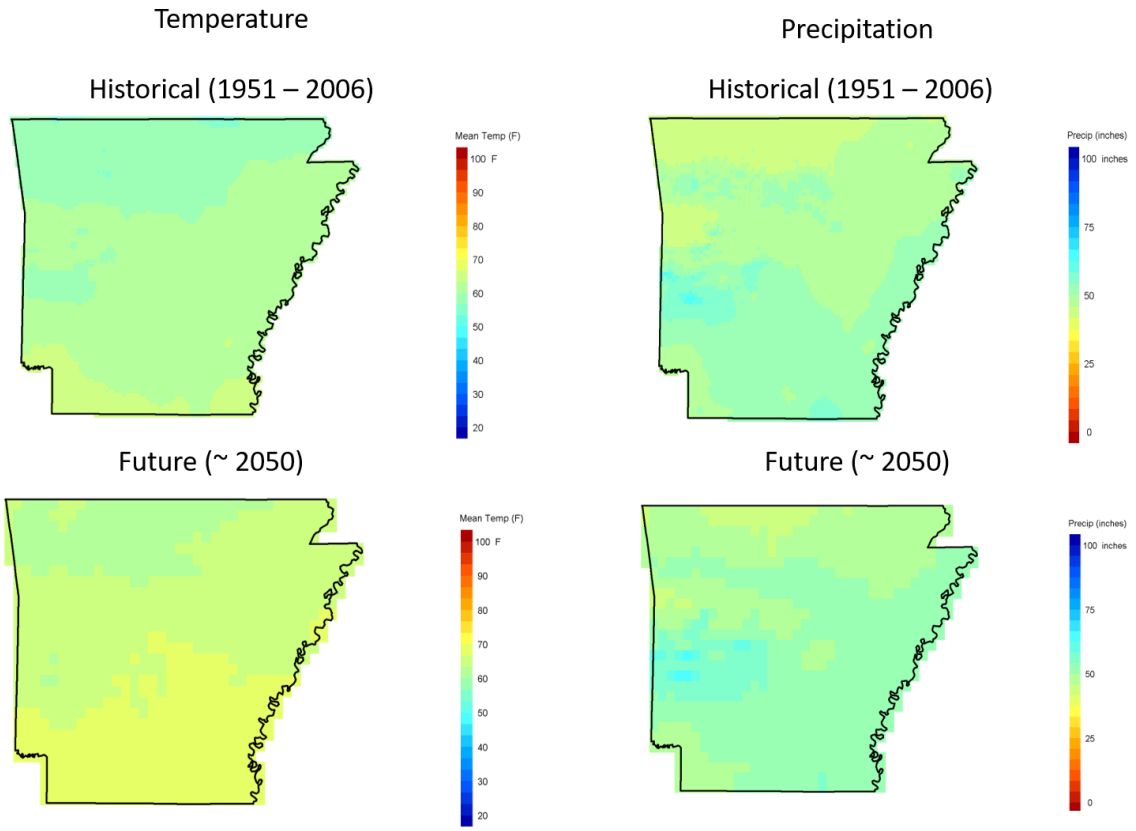

Figure 4. Historical and projected annual precipitation and temperature for Arkansas based on an ensemble average for medium emissions scenarios (http://climatewizard.org).

4.2 Landforms

Most of the base currently has a rolling topography with gentle slopes. Steeper slopes are primarily limited to stream valleys in the northwestern and southwestern corners of the base, and along the ridge north of the airfield. The highest point on the base is northwest of the commissary at 421 feet above mean sea level (msl). The lowest point on the base occurs along the eastern perimeter at 258 feet above msl. Elevations along drainage ways at the perimeter of the base range from between 260 to 320 feet above msl.

4.3 Geology and Soils

The prevalent bedrock in the vicinity of LRAFB is generally level-bedded sandstones, shales, quartzites, and cherts of the early Paleozoic era. The series of steep sided ridges that occur north of the base are indicative of localized faulting and folding which tilted the bedrock. Variable erosion of the interbedded layers of bedrock formed the narrow ridges.

The Soil Survey of Pulaski County, Arkansas (Haley et. al., 1975) generally describes the soils of the base and much of the northern third of Pulaski County as soils formed in material weathered from predominantly acid sandstone and shale, and in valley fill washed mainly from local highlands. Two soil associations are identified on the base. The northern half of the base is the Leadvale-Guthrie-Linker association. These soils range from poorly drained to well drained, level to gently sloping, deep and moderately deep, loamy soils in valleys and on tops of low mountains. The Linker-Mountainburg association occupies the southern half of the base. It is described as typically well-drained, gently sloping to steep, moderately deep and shallow, loamy, and stony soils on hills, mountains, and ridges. Soils throughout the base are low in organic

matter and medium to very strongly acidic, owing to the sandstone and shale parent material from which most of them were derived (Haley et al. 1975; Map E-6). Detailed characteristics of the soil series are provided in Appendix F.1.3.

4.4 Hydrology

Jacksonville and LRAFB are a part of the Bayou Meto watershed of Arkansas. This watershed is part of the larger Lower Mississippi River Basin which extends from southern Missouri and Kentucky to the Gulf Coast of Louisiana. Water leaves the base at a number of locations, mostly by way of small streams. The base can be divided into 14 complete drainage basins based upon topography, existing surface water features, and the storm water collection system (Map E-7). More details of the groundwater and watersheds can be found in Appendix F.

5.0 ECOSYSTEMS AND THE BIOTIC ENVIRONMENT

A brief summary of the ecosystems and the biotic environment at LRAFB is provided in the following sub-sections. A complete, detailed summary is provided in Appendix F.2. Table 3 provides an inventory of potential habitats and their acreages on LRAFB.

Table 3. Ecosystems and descriptions of ecosystems and size at LRAFB.

Habitat	Acres	Description
Deciduous woodland	2282	Areas dominated by deciduous trees, including bottomland hardwoods and oak woods, and/or dense shrubby growth with an open tree canopy.
Pine woodlands	615	Areas dominated by loblolly or shortleaf pine, mostly plantations.
Oak savanna	305	Areas with a predominance of oak trees but with an open canopy allowing the development of native grass-dominated understory.
Open field	480	Less frequently mowed areas or deforested, unmaintained areas that are dominated by grasses and/or herbaceous plants. May contain open shrubby growth.
Urban land	2300	Areas that are largely pavement and frequently mowed lawns with selective landscaping, including main cantonment, administrative, housing, industrial, recreational fields, and golf course.
Wetlands	70	Areas that are inundated or saturated with ground or surface water.
Impoundments	48	Open water bodies such as lakes or ponds.
Riparian areas	728	Areas are located along the margins of water bodies and support vegetation that typically prefers moist soil, higher humidity, periodic inundation, and sloping soils.

5.1 Ecosystem Classification

The biotic environment can be divided and classified based on climate, geologic structures, and undisturbed vegetative communities. For LRAFB, the National Hierarchical Framework of Ecological Units, also known as Bailey's Ecoregions, was used to classify ecoregions (Bailey et al. 1995). This system allows for the mapping of regions based on the soils, physiography, and habitat types.

LRAFB lies within the Humid Temperate Domain. The climate of the Humid Temperate Domain and within the subtropical division. Forest provides the typical vegetation throughout

most of this division. Jacksonville, including LRAFB, lies on the boundary of the Lower Mississippi Riverine Forest Province and the Southeastern Mixed Forest Province. Seven sections have been delineated in the Southeastern Mixed Forest Province. LRAFB lies within the Arkansas Valley Section. About 80% of this land consists of plains with hills, and 20% includes open low mountains. Elevation ranges from 258 to 3,000 feet above msl.

5.2 Vegetation

5.2.1 Historic Vegetative Cover

The historic vegetation of the base is similar to what is described by the Bailey's ecoregion provinces. Similarly, Braun (1950) described the Little Rock area in the unglaciated, Southern Division of the Oak-Hickory Region, specifically the Ouachita Mountains portion of the Interior Highlands. She noted the Interior Highlands as having the greatest diversity and best development within the Oak-Hickory region. In Braun's description, the pine-oak forest type is the most widespread in the uplands. On the drier, sandy ridges, the vegetation was typified by pine-oak and oak communities.

Prior to establishment of the base, much of the forest had been cleared for agriculture, with limited areas of woodland remaining. The remnant woodlands had likely undergone some form of logging.

5.2.2 Current Vegetative Cover

5.2.2.1 Little Rock Air Force Base

Historic logging, vegetation management, and development have altered the vegetation at the base. Currently, approximately 2,820 acres of woodland remain, with the rest being semi-improved and improved lawns, open fields, and impervious surfaces. The forested areas are very fragmented. The existing vegetative cover types at the base and their acreages are shown in Table 3 and Map E-3.

According to the Arkansas Natural Heritage Commission (ANHC; Logan 1996), the dominant plant community in the undeveloped area is the post oak (*Quercus stellata*) and blackjack oak (*Q. marilandica*) community. This community comprises approximately 1,700 acres of the base. Other species associated with this series are cedar elm (*Ulmus crassifolia*), red oak (*Q. falcata*), yaupon (*Ilex comitoria*), and deciduous holly (*I. decidua*). A common invader of this series is the Eastern red cedar (*Juniperus virginiana*). The next most common plant on the undisturbed portions of the base is a bottomland hardwood series containing pin oak (*Q. palustris*), sweet gum (*Liquidambar styraciflua*), and willow oak (*Q. phellos*). The plant series containing loblolly (*Pinus taeda*) and shortleaf (*P. echinata*) pine is found on approximately 615 acres of the base. Approximately 509 acres of loblolly pine stands and 106 acres of shortleaf pine stands are present. Other plant species associated with this series include a variety of oak species including post oak, blackjack oak, white oak (*Q. alba*), and water oak (*Q. nigra*). Common understory species include flowering dogwood (*Cornus florida*), yaupon, and American beautyberry (*Callicarpa Americana*) (ANHC 1996). A complete list of plant species detected during the 1996 survey can be found in Table H-1 in Appendix H.

The pine series present on the base is mostly a result of the area being cleared for timber between 1960 to the 1980s, and subsequently replanted with primarily loblolly pines. In addition, some portion of the sweet gum dominated bottomland stands was also planted. The remainder of the

forest has become established naturally.

Logan (1996) also performed a survey of rare plant communities. A somewhat rare oak savanna community type has been identified at two locations south of privatized family housing (Map E-3). This habitat was once widespread in Arkansas in areas of poor, shallow soils, but has since been largely obliterated. The presence of this community at the base represents an example of a pre-settlement vegetation type.

Vegetation Mapping Specialists with Colorado State University Center for Environmental Management of Military Lands began collecting ground vegetation field data at LRAFB in fall 2018 in order to develop National Vegetation Classification System (NVCS) version 2 alliance level special data for the base. Field-data collection is expected conclude in spring 2019.

There is currently an ongoing program to survey and treat invasive species occurring at LRAFB (HDR Engineering, Inc. 2016; Section 12). The priority species targeted are listed in Table 4. In 2010, survey areas focused on linear features (i.e., roads, ditches, mowed rights-of-way) and expanded to a commercial timber in 2012 (HDR Engineering, Inc 2016; Section 12). Not all target species were located on LRAFB but are known to occur in Pulaski County (Table 4).

Table 4. Potential and Documented Non-native Species in Pulaski County and LRAFB			
Scientific Name	**Common Name**	**Documented in**	
		Pulaski Co.	**LRAFB**
Flora			
*Pyrus calleryana**	Bradford pear*	X	
*Triadica sebifera**	Chinese tallow tree*	X	
*Lespedeza cuneata**	Chinese bushclover*	X	X
*Imperata cylindrical**	cogan grass*	X	
Ligustrum sinense	Chinese privet	X	X
*Ligustrum vulgare**	common privet*	X	X
*Lamium amplexicaule**	henbit*	X	X
Coronilla varia	crown vetch	X	X
*Lonicera japonica**	Japanese honeysuckle*	X	X
*Sorghum halepense**	Johnson grass*	X	X
Paspalum dilatatum	dallasgrass	X	X
Polygonum persicaria	lady's thumb	X	X
*Pueraria montana var. lobata**	kudzu*	X	X
*Albizia julibrissin**	mimosa*	X	X
*Nandina domestica**	nandina*	X	X
*Ampelopsis brevipedunculata**	pepper vine*	X	X
*Schedonorus phoenix**	tall fescue*	X	X
*Vinca major/minor**	vinca*	X	X
*Wisteria sinensis**	wisteria*	X	X
Alternanthera philoxeroides	alligator weed	X	X
Egeria densa	Brazilian waterweed	X	
Fauna			
*Solenopsis invicta**	red imported fire ant*	X	X
Passer domesticus	house sparrow	X	X
Columba livia	rock pigeon	X	X
Myocastor coypus	nutria	X	
Ratus norvegicus	Norway rat	X	
Streptopelia decaocto	Eurasian Collared Dove	X	X
Sturnus vulgaris	European Starling	X	X
Popillia japonica	Japanese beetle	X	
*** = LRAFB target invasive species (*source*: HDR Engineering, Inc. 2016)**			

5.2.2.2 Blackjack Drop Zone

In 1996, ANHC also conducted a survey for the Blackjack Drop Zone (Logan 1996). This property is primarily mowed grassland with hedgerows and woods at the edges. A complete list of plant species detected during the 1996 survey can be found in Table H-2 in Appendix H.

5.2.3 Turf and Landscaped Areas

Most turf and landscaped areas (2300 acres; Table 3) occur in the improved and semi-improved sections of the base, including the airfield, around structures in the cantonment area, around privatized family housing, along major roadways, and the Deer Run Golf Course. Lawns around the cantonment area are primarily composed of Bermuda grass (*Cynodun dactylon*).

On the golf course, fairways are primarily composed of common Bermuda grass, with a limited amount of other species (e.g., *Zoysia*). Greens are primarily bentgrass (*Agrostis* spp.). Common turfgrass pest species on the golf course include pythium (*Pythium* spp), dollar spot *(Sclerotinia homoeocarpa*), brown patch (*Thanatephorus* spp), cutworms (*Agrotis ipsilon*), armyworms (*Spodoptera frugiperda*), wild onion (*Allium* spp.), goosegrass (*Elusine indica*), bluegrass (*Poa* spp.), and crabgrass (*Digitaria* sp).

In 2010, an urban forestry survey was conducted on the base (Davey Resource Group 2012; Section 12) in order to inventory currently landscaped trees, evaluate their current condition, and establish an effective planning and management program. During the survey, 12,031 point locations were inventoried and trees were recorded at 10,686 of these points. The tree population included 76 species, representing 38 genera. *Quercus* (oak) comprises 34.66 percent of the inventoried tree population, with *Pinus* (pine) contributing 15.76 percent, *Lagerstroemia* (crape myrtle) 10.30 percent, *Ulmus* (elm) 5.94 percent, *Acer* (maple) 5.17 percent, *Juniperus* (juniper) 4.61 percent, *Ilex* (holly) 3.42 percent, *Fraxinus* (ash) 3.25 percent, *Pyrus* (pear) 3.06 percent, and *Carya* (hickory) contributing 1.89 percent. This report noted that the urban population has 31.41% young or small trees (less than 6 inches in diameter), 16.88% mature trees (between 6 and 24 inches in diameter), and 8.23% were large trees (greater than 24 inches in diameter). There were 131 (1.23 percent) trees in good condition, 9,326 (87.26 percent) are in Fair condition, 939 (8.79 percent) are in Poor condition, and 161 (1.51 percent) are in Critical condition. There are 129 (1.21 percent) trees rated as Dead.

5.3 Fish and Wildlife

Figure 5. Three-toed Box Turtle (*Terrapene triunguis*) located in forest on LRAFB.

The base provides a variety of terrestrial habitats as well as limited aquatic habitats. Wildlife surveys, both formal and informal, have been conducted over the years including a small mammal trapping survey (Phelps 1997), bat surveys at the main LRAFB and Blackjack Drop Zone (Saugey 1997) an acoustic survey for the northern long-eared bat (Hauer and Schwab 2017), several bird surveys (Peacock and Zollner 1997, Fischer 2001, Guilfoyle 2017), an inventory of amphibians and reptiles (Robinson 1997a), an inventory of crayfish (Robinson 1997b), and an insect survey (Weaver Boos Consultants Inc. 1997). Additionally, a fish survey is being conducted at Pat Wilson Lake in 2018. In summary, these surveys conclude the following fish and wildlife occur at LRAFB: 23 species of terrestrial mammals, 5 bat species, >120 avian species, 38 herpetofaunal species, 7 species of crayfish, 213 families of insects, and 14 species of fish. For additional details regarding historical surveys as well as species of fish and wildlife occurring at LRAFB and species that have the potential to occur at LRAFB refer to Appendix H. Fish and Wildlife management information at LRAFB can be found in Section 7.2.

5.4 Threatened and Endangered Species and Species of Concern

Federal status, as a threatened or endangered species, is derived from the Endangered Species Act (ESA) of 1973 (16 US Code [USC] §1531 *et seq*.) and is administered by the US Fish and Wildlife Service (USFWS). Federally listed wildlife species with known occurrence in Pulaski County include the endangered Interior Least Tern (*Sterna antillarum athalossos*), the threatened Piping

Plover (*Charadrius melodus0*), the threatened Northern Long-eared Bat (*Myotis septentrionalis*), and the Rattlesnake Master Borer-Moth (*Papaipema eryngi*), a Federal candidate species. Both the Interior Least Tern and the Rattlesnake Master Borer-Moth have been documented on LRAFB but there is no critical habitat designated.

Federally listed wildlife species with known occurrence in White County include the threatened Piping Plover, the threatened Northern Long-eared Bat, the endangered Gray Bat (*Myotis grisescens*), and 5 federally protected mussel species (Appendix G). No protected species have been documented at the Blackjack Drop Zone in White County to date. The Rattlesnake Master Borer-moth, a candidate species is not documented at the Blackjack Drop Zone and is not listed as a species present in White County; however, the moth's host plant, *Eryngium yuccifolium*, has been documented on the property.

Bald eagles (*Haliaeetus leucocephalus*), which were delisted under the ESA but remain protected under the Bald and Golden Eagle Protection Act (BGEPA), have also been historically (1998) documented on LRAFB. However, this species is likely only a transient visitor to LRAFB as there are no documented nesting locations at the base.

Priority species were identified based on their regulatory status, known occurrence on or near LRAFB, or their likelihood of occurring on LRAFB. This section presents information about the management of sensitive species that are located within, or may be located at, LRAFB, along with requirements and strategies for management. For more details on special status species at LRAFB, see Appendix G. Two priority special status wildlife species have been identified at LRAFB: the interior least tern (*Sterna antillarum athalassos*) is listed as federally endangered, as designated by USFWS, is found to nest and forage on LRAFB (Section 5.4.1). Additionally, a candidate species, the rattlesnake-master borer moth (*Papaipema eryngii*) and its host plan occur in several locations on LRAFB (Section 5.4.2).

In 2018, AFCEC ordered a Programatic Biological Assessment (PBA) regarding threatened and endangered species and flight operations for 32 installations in order to provide a model so that the AF and the USFWS may have a quantifiable and defenseible means for tracking, amending, and/or renewing incidental take statements in the future at both a national- and base-scale as missions change over time (LRAFB 2018c). As of 2018, two species of bat, *Myotis lucifugus* and *Perimyotis subflavus*, known to occur at LRAFB (Saugey 1997, Hauer and Scwhab 2017) are not listed but under review by the USFWS to become candidate species under the ESA (Appendix G, Table G-1; LRAFB 2018c). USFWS suggested that, though not listed, the Little Brown Bat and the Tricolored Bat should be included in the PBA (LRAFB 2018b).

Federal Special Status Species

- Federally and state-endangered species interior least tern (*Sterna antillarum athalassos*)
- Federal candidate species rattlesnake-master borer moth (*Papaipema eryngii)*

Figure 6. Interior Least Tern (*Sterna antillarum athalassos*)

The interior least tern (*Sterna antillarum athalassos*: ILT) was designated as endangered by the USFWS in 1985 due to loss of habitat associated with alterations of naturally flowing river systems in North America. Least terns, pictured in Figure 6, are the smallest North American terns. Adults average 8 to 10 inches in length, with a 20-inch wingspan. Their narrow, pointed wings make them streamlined flyers. Males and females are similar in appearance. Breeding adults are gray above and white below, with a black cap, black nape, and eye stripe, white forehead, yellow bill with a black or brown tip, and yellow to orange legs. Hatchlings are about the size of ping pong balls and are yellow and buff with brown mottling. Fledglings (young birds that have left the nest) are grayish brown and buff colored, with white heads, dark bills, and eye stripes, and stubby tails. Young terns acquire adult plumage after their first molt at about 1 year, but do not breed until they are 2 to 3 years old.

ILTs arrive at breeding areas from mid-May to August and spend 3 to 5 months on the breeding grounds. Upon arrival, adult terns usually spend 2 to 3 weeks in noisy courtship. Courtship behaviors include nest preparation and a variety of postures and vocalizations. Interior least terns nest in colonies, where nests can be as close as 10 feet, but are often 30 feet or more apart. The nest is a shallow depression in an open, sandy area, gravelly patch, or exposed flat. Small twigs, pieces of wood, small stones, or other debris usually occur near the nest. Egg- laying begins in June, with the female laying 2 to 3 eggs over a period of 3 to 5 days. The eggs are pale to olive buff and speckled or streaked with dark purplish brown, chocolate, or blue-gray markings. Both parents incubate the eggs, with incubation lasting about 20 to 22 days. The chicks hatch within 1 day of each other and remain in the nest for about a week. The breeding season is usually complete by late August. ILTs often return to the same breeding site, or one nearby, year after year.

Nesting habitat of the ILT include bare or sparsely vegetated sand, shell, and gravel beaches, sandbars, islands, and salt flats associated with rivers and reservoirs. The birds prefer open habitat and tend to avoid thick vegetation and narrow beaches. Sand and gravel bars within a wide unobstructed river channel, or open flats along shorelines of lakes and reservoirs, provide favorable nesting habitat. As natural nesting sites have become scarce, the birds have used sand and gravel pits, ash disposal areas of power plants, reservoir shorelines, and other manmade sites. For feeding, interior least terns need shallow water with an abundance of small fish. Shallow water areas of lakes, ponds, and rivers located close to nesting areas are preferred (USFWS 2006). The tops of all flat gravel-roofed buildings are managed to protect the ILTs, should they decide to nest on them also.

On 19 June 2006, the USFWS confirmed sightings of ILTs on LRAFB (see Map E-4). On 6 June 2007, a large nesting colony of interior least terns was found on top of Building 450 (see Map E-4). The birds successfully nested there through 2008 (Popham pers. comm). In 2009, the colony was the largest in the state, but presumably due to extreme weather conditions, the colony failed (Popham pers. comm). Although the birds had not been observed nesting on the base since 2009, some individuals were seen feeding at the base lakes and flying over Building 450 each summer. In 2012, the birds returned to nest on Building 450, and continued nesting on Building 450 in 2013, 2014, and 2015. In 2016, one nest was identified on Building 450 though no eggs were present. That same year the terns were observed nesting on the rooftop of Building 787, the Base Exchange (BX), another building with a large gravel rooftop (see Map E-4, Figure 7). They continued nesting on the BX in 2017 and 2018, though no nesting activity was observed on Building 450.

From 2012 to 2017, there was a study of nesting ILTs in the Arkansas River Valley which included ILTs nesting at LRAFB (Nupp and Nefas 2018). In 2017, Nupp and Nefas (2018) found 42 nests on top of Building 450 at LRAFB (*note: it is believed that the nests were on Building B-787 which was listed as B-450 by mistake in the report*). Despite the large number of nests, few fledglings were produced in 2017. In total, the nests produced 18 nestlings and 4 total fledglings or 0.05 young per breeding pair. The average of young per breeding pair for all monitored sites in 2017 was 0.18 (Nupp et al. 2018). The fledging rate, defined as the highest fledgling count for the colony divided by the breeding pair estimate, at LRAFB in 2017 was 0.10 while the fledging rate for all sites pooled together was 0.34 (Nupp and Nefas 2018). The main cause of egg and nestling mortality in 2017 appears to be high temperatures, strong storms, and high wind.

In 2017, LRAFB replaced the gravel on the top of Building 450 with permission from USFWS. Observations of the ILT indicate they did not use Building 450 for nesting purposes during 2017 or 2018 nesting seasons. Total number of observed ILT nests on top of Building 787 as of 14 June was 28 (Nupp and Nefas 2018).

The installation has developed an awareness program and implemented roof access protocol approved by the USFWS to protect ILT on base (see Section 12). Additionally, any project within 0.5 mile of both Building 450 and Building 787 requires a consultation with the USFWS to proceed. ILT nests will continue to be monitored into the future. The NRM is currently applying for a 10(a)(1)(A) Research and Recovery permit for the base so that we will be able to have more flexibility in developing a multi-year baseline to help staff better understand possible changes in population trends

Figure 7. Roof-top of the Base Exchange (Building 450) and nesting location of Interior Least Tern (*Sterna antillarum athalssos*) at LRAFB.

5.4.2 Rattlesnake-master Borer Moth

On August 14, 2013, the USFWS published a 12-month finding in the Federal Register on a petition to list the rattlesnake-master borer moth (*Papaipema eryngii*; RMBM) as endangered or threatened under the Endangered Species Act. The Service has determined the moth, a species associated with prairie habitats, warrants listing under the Endangered Species Act. However, the Service will not immediately propose the species as endangered or threatened due to species with higher priority for listing. Therefore, RMBM is considered a candidate species and when practical, allowed the protections similar to endangered species by the Air Force (AFI 32-7064).

RMBM are obligate residents in undisturbed tallgrass prairies, a highly threatened habitat, or woodland edges which contain their host plant, rattlesnake-master (*Eryngium yuccifolium*). RMBMs are not thought to disperse over large distances, typically no more than 2 miles and only do so when host plants are limited (Panzer 2003, LaGesse et al. 2009). Threats to RMBM include habitat loss, fragmentation, degradation, and modifications from agriculture, development, invasive species, and secondary succession of prairie habitat. Altered fire and grazing regimes as well as herbicides have further impacted the species across their range.

On LRAFB, RMBM was originally known from one location on the northwest part of the airfield. Several populations of the host plant were found at various locations on base in 1996. New

surveys were conducted in 2014 and 2016 to locate current populations of the host plant and RMBM. As of 2016, the RMBM's host plant currently occupies a total of 18 acres, in three locations on LRAFB (Map E-4; TNC 2016). The largest population occurred near the airfield in two subpopulations totaling approximately 1,715 plants (Figure 8). A maintained shooting lane west of the airfield had approximately 70 plants, down from 100 plants in 2014 (TNC 2014) and another population located south of base housing had approximately 150 plants (Map E-4; TNC 2016). A survey at the Blackjack Drop Zone was conducted in 2016 but no plants were detected (TNC 2016).

Figure 8. Rattlesnake-master borer moth (*Papaipema eryngii*) habitat at LRAFB.

The current conservation plan for the RMBM outlines the programmatic mechanisms by which LRAFB will implement conservation measures that maintain and improve habitat values within the base property for the recovery of the moth, when practical (LRAFB 2018a). Conservation actions included in the plan are described in Table 5 and the full RMBM conservation plan can be found in Section 12.

Table 5. RMBM Conservation Plan Conservation Actions	
Conservation Action	**Details**
Prescribed Burns	Conducted late January to early March with a cool, low intensity burn. No more than 35% of occupied RMBM habitat burned in any given year.
Mechanical Treatment	Delay mowing until late August or early September and, if mowing is necessary, should not occur before late June. Mowing should occur approximately 3 ft from (no more than 6 ft) from the fence.
Chemical Treatment	In order to control invasive species. Mechanical treatment preferred over chemical.
Mitigation	Voluntary. Expansion of habitat available. Seeding or Transplanting rattlesnake master plants.
Source: LRAFB 2018a	

5.5 Wetland and Floodplains

5.5.1 Wetlands

The U.S. Army Corp of Engineers (USACE) defines wetlands as "those areas that are inundated or saturated with ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR 328). Wetlands are an important natural system because of the diverse biological and hydrologic functions they perform. These functions include water quality improvement, groundwater recharge, pollution treatment, nutrient cycling, provision of wildlife habitat and niches for unique flora and fauna, storm water storage, and erosion protection. As a result, wetlands are protected as a subset of the "waters of the United States" under Section 404 of the CWA. The term "waters of the United States" has broad meaning under the CWA and incorporates deep water aquatic habitats and special aquatic habitats (including wetlands). "Jurisdictional" waters of the United States are areas regulated under the CWA and also include coastal and inland waters, lakes, rivers, ponds, streams, intermittent streams, vernal pools, and "other" waters that if degraded or destroyed could affect interstate commerce.

Section 404 of the CWA authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits for the discharge of dredged or fill materials into the waters of the United States, including wetlands. Therefore, even an inadvertent encroachment into wetlands or other waters of the United States resulting in displacement or movement of soil or fill materials has the potential to be viewed as a violation of the CWA if an appropriate permit has not been issued by the USACE. In addition, wetlands are protected under EO 11990 (43 Federal Register 6030) the purpose of which is to reduce adverse impacts associated with the destruction or modification of wetlands.

Woolpert (1993) conducted an inventory of the wetlands at LRAFB. The wetlands survey was updated in 1997 by FTN Associates, and in 2004 by the USACE, and again in 2012 by the USACE. There are 76 individual wetland areas on base with a combined total of 70.4 wetland acres (Map E-4; USACE 2007). Details on the wetlands at LRAFB can be found in the Wetlands Reevaluation Survey (USACE 2007; Section 12).

5.5.2 Floodplains

Floodplains are defined by the USGS as, "the flat or nearly flat land along a river or stream or in a tidal area that is covered by water during a flood." These areas must be reserved to discharge the 100-year flood without cumulatively increasing the water surface elevation more than a designated height. When a floodplain is established, no additional obstruction (e.g., a building) should be placed in the floodplain that will increase the 100-year floodwater surface elevation. Executive Order (EO) 11988 requires all Federal agencies to provide leadership and take action to reduce the risk of flood loss; to minimize the impacts of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains, specifically the 100-year floodplain, in managing Federal lands and conducting Federal activities and programs affecting land use. Air Force installations have the responsibility to determine if proposed actions will occur in a floodplain, evaluate and document the potential effects, and consider alternatives to avoid these effects and incompatible development in the floodplain.

A 100-year floodplain survey using 1-foot contours was completed in 2012 (Map E-7). The northern areas of LRAFB, which contain the landing strip, are flatter and lower than the rest of the base and, therefore, are susceptible to flooding (Map E-7). Other areas susceptible to flooding on the base include the riparian areas on the east side of LRAFB; however, these areas are primarily wooded and undeveloped (Map E-7).

5.5.3 Impoundments

There are a number of impoundments and open-water bodies on LRAFB (Map E-7). The largest is Pat Wilson Lake (approximately 37 acres). The lake has a total drainage area of approximately 460 acres, approximately 15 acres of which is located off base. The lake and its watershed is divided into two areas by Arnold Drive, resulting in the common delineation of the collective impoundment named Pat Wilson Lake and the "small base lake." North of Arnold Drive, the small base lake extends west of Sixth Street and approximately 1500 feet north of Arnold Drive, which includes mostly unimproved area. South of Arnold Drive, Pat Wilson Lake is almost entirely occupied by portions of privatized family housing except for a narrow border of open space along the banks of the lake. The base lakes provide the only fishing and boating opportunities at the base. Boating on both base lakes is restricted to canoes and non-gas powered craft.

Figure 9. Peninsula at Pat Wilson Lake on LRAFB.

In 2007 a boat dock was built, a boat ramp was revamped, and a peninsula was built to support fishing in the Pat Wilson Lake (Figure 9). In the winter of 2011, the Pat Wilson Lake was partially drained and small base lake was completely drained. Another peninsula was built in the Pat Wilson Lake and a water fountain was placed in the small base lake to assist aeration during the summer. In addition, two coves located north and south of the Youth Center were dredged of sediment in Pat Wilson Lake. Large rocks were placed within the water along the east shore of the Pat Wilson Lake between the two coves for habitat enhancement.

There are three ponds within the golf course. Two of these ponds (hole #1, 1.4 acres; between holes #5 and #6, 2.3 acres) are adjacent and connected, with a combined watershed of approximately 260 acres. The watershed includes improved areas along the western half of Cannon Drive south and Sixth Street, the hospital, a portion of base family housing, and the western section of the golf course. Most of the channels feeding these ponds from the improved areas are concrete lined. These two ponds are used for irrigation at the course. Runoff usually maintains the water level in these ponds but as necessary the ponds can be recharged from the City water supply. The ponds support grass carp and an abundance of turtles.

The third golf course pond (near the tee of hole #12, 1.1 acres) has a watershed of approximately 300 acres, including improved areas south of Sixth Street and west of Vandenberg Boulevard and portions of the golf course. Like the other golf course ponds, the channels through the improved areas feeding this pond are concrete lined. This pond is typically not used for irrigation.

There are seven small impoundments on the eastern half of the base ranging from 0.2 to 1.2 acres. The impoundments hold varying amounts of water and support limited wetland vegetation. In addition to the impoundments, there are a number of small ponds (each less than 0.5 acre) that appear to have been created by excavation for soil borrow.

U.S. Geological Survey (USGS) conducted a survey of Pat Wilson and Little Base Lake in 2015 to examine nutrient concentrations and other lake conditions (Driver and Justus 2016). The results indicated eutrophic conditions that suggested continued exposure of the lakes to additional nutrients could cause unfavorable dissolved-oxygen conditions and increase the risk of cyanobacteria blooms and associated issues (Driver and Justus 2016). Similar results were found for the golf course ponds when they were sampled by USGS in 2016 and 2017, which indicated that harmful algal blooms are possible in waterbodies on LRAFB (Driver and Justus 2017). These studies indicated resource managers should be concerned "given the ongoing development, application of lawn fertilizers, and past and/or future water resource management practices (i.e. pond fertilization) on Base, nutrients, algal growth, and cyano-toxin concentrations."

In response to some previous reporting of trace-metal concentrations in bed-sediment and fish-tissue samples in taken in 2011 and 2012 (Justus et al. 2015), which indicated trace-metal concentrations at rates higher than expected background concentrations, USGS conducted a comprehensive study of overall sediment toxicity in 3 sampling locations on Pat Wilson (2) and Little Base (1) Lakes (Justus et al. 2015). Concentrations of arsenic, cadmium, cobalt, copper, lead, manganese, mercury, nickel, and zinc at one or more of the three sites sampled in May 2014 were higher than median concentrations for a study involving 98 urban streams in seven metropolitan areas of the United States. Concentrations for most polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and organochlorine (OC) pesticide constituents in all three bed-sediment samples were less than the laboratory reporting limit or were detected at low concentrations (Justus et al. 2015).

5.6 Other Natural Resource Information

Riparian areas are located along the margins of water bodies and support vegetation that typically prefers moist soil, higher humidity, periodic inundation, and sloping soils. They provide highly valuable habitat because of the access to water, density of cover, and diversity of plant species. It is not uncommon to find bird species in a region that only forage and nest in riparian areas. Some species require specific riparian zone widths to successfully breed. There are ongoing projects aimed at removing invasive vegetation and restoring native trees to riparian areas at several locations at LRAFB (Figure 10).

Riparian areas have been surveyed and mapped throughout LRAFB and are presented in Map E-7. The width of the riparian zone at LRAFB varies depending on several factors including stream bank slope, area of typical inundation, and interpretation of relative change in plant series. Riparian areas on the base typically mimic the floodplain boundaries as seen in Map E-4. There are 16 areas on the installation classified as floodplains that cover a total of 730 acres. The riparian areas along drainages in the bottomland hardwood habitats are broad based on the lack of topographical change in the area. Riparian areas in the southwest portion of the base are very narrow because of the steep slopes and dry uplands associated with the area of the base. Riparian areas play an important role similar to wetlands in the protection of streams and drainages from the contaminants in runoff.

Figure 10. Riparian restoration area at LRAFB.

6.0 MISSION IMPACTS ON NATURAL RESOURCES

6.1 Natural Resources Constraints to Mission and Mission Planning

The most significant constraints on LRAFB are related to wetlands and riparian areas, water quality protection, forestry management, and reducing BASH risk. Current restraints relating to threatened and endangered species relate to (1) vegetation management for the rattlesnake master borer-moth host plant near the airfield and (2) any new activities or infrastructure limited in areas where the ILT nests and forages. There are ongoing plans for replacement of the runway, which may affect nearby wetlands. For more discussion of threatened and endangered species see Section 5.4 and Appendix G. Constraints are presented graphically in Map E-4.

The primary sustainability challenge on LRAFB, as it is currently used and projected to be used in the near future, is the ability to (1) maintain forest stands on LRAFB for wild fire prevention and prevention of trees penetrating the imaginary surface surrounding the airfield (i.e., uniform facilities criteria) and (2) manage BASH risk. The following natural resources management issues have been identified as having the potential to impact the military mission:

- Lack of information about species present, particularly listed and candidate species;
- Lack of accurate information on deer population as it relates to BASH risk; and
- Commercial forestry inventory as it relates to maintain healthy forest stands across the base.

If the mission changes significantly in the future, the sustainability challenges could increase. Additional infrastructure development or a significant increase in on-the-ground training could pose challenges for the long-term sustainability of LRAFB, if the constraints of the site are not taken into account.

6.2 Land Use

Current and historic information pertaining to land uses on the installation and in the surrounding communities is necessary to properly manage natural resources and assess future management activities. This section describes land uses associated with the surrounding community, and with LRAFB. An overview of the LRAFB, its infrastructure and aerial image is provided in Map E-2. A summary of land use categories and infrastructure at LRAFB is provided in Table 6. The base contains 2138 acres of improved grounds including: 501 acres of high-intensity development, 430 medium-intensity development, 49 acres of low-intensity development, and 1158 acres of developed open areas; and 4073 acres of unimproved areas. Arkansas ANG leases 55 of these acres. Table 6 provides a further breakdown of these major land use categories

The main base cantonment area is centrally located and encompasses 720 acres. The airfield, which includes the parking ramp, maintained cleared areas, taxiways, and runways, encompasses approximately 1,110 acres in the northern section. Private family housing (380 acres; see Section 7.8.4) is located in the southwestern corner. The golf course (280 acres) is located south of the cantonment area. Bulk fuel storage, explosive ordnance disposal (EOD), small arms ranges, and the Defense Reutilization and Marketing Office (DRMO) occupy limited areas in the eastern half of the base. The remaining, unimproved areas occur in the eastern, southwestern, and northwestern sections of the base, with a small amount along the ridge north of the airfield.

Table 6. Distribution of developed base lands.	
Land Use Description	**Acreage**
Improved Areas	
High-Intensity Development	
Airfield Surface	364
Buildings	137
Medium-Intensity Development	
Paved Surfaces	430
.	
Low-Intensity Development	
Construction/Storage Sites	48
Sidewalks	2
Developed Open Areas	
Maintained Base Grounds	655
Maintained Housing Grounds	301
Outdoor Recreation	187
Utility Row	14
Unimproved Areas	
Wilderness	
Deciduous Forest	2104
Grassland/Herbaceous	790
Evergreen Forest	548
Post Oak Savanna	293
Shrubland	65
Mixed Forest	21
Wetlands	
Emergent Herbaceous Wetland	139
Woody Wetland	61
Lake	38
Ponds	14
Total	6211

Source: D. Hardage, 2018

6.3 Current Major Impacts

This discussion focuses on the installation's current major impacts on the local environment, including aircraft safety, hazardous materials, hazardous waste, water quality, noise, air quality, socioeconomics and environmental justice.

6.3.1 Aircraft Safety

The USAF has defined five mishap classifications. Class A mishaps result in a fatality or permanent total disability; total cost in excess of $2 million for injury, occupational illness, and property damage; or destruction or damage beyond repair to military aircraft. Class B mishaps result in a permanent partial disability; total cost in excess of $500,000 but less than $2 million for injury, occupational illness, and property damage; or hospitalization of five or more personnel. Class C mishaps result in total damages between $50,000 and $500,000, and Class D is any nonfatal injury or occupational illness that does not meet the definition of Lost Time. The fifth mishap category, Class E Events, comprises incidents resulting in total damages between $2,000 and $50,000. Class E Events include BASH (Wildlife Strikes) and HAP (high accident potential) reports.

Accident Potential Zones (APZs), extending immediately beyond the ends of runways and along the approach and departure flight paths have significant potential for aircraft accidents. Development restrictions within APZs are intended to preclude incompatible land use activities from being established in these areas. At LRAFB, the areas extend longitudinally 15,000 ft. from the threshold beyond either end of the east-west runway are designated APZ's. APZs are 3000 ft. laterally centered on the runway center line. Currently, incompatible land use exists in these areas. State, County and Municipal regulations are attempting to curb incompatible development through land use zoning practices (LRAFB 2018b).

BASH is defined as the threat of aircraft collision with birds during flight operations and is a safety concern at all airfields due to the frequency of aircraft operations and the possibility of encountering birds at virtually all altitudes. Most birds fly close to ground level; correspondingly, more than 95 percent of all reported bird strikes occur below 3,000 feet above ground level (AGL). At most military installations, about half of reported bird strikes occur in the immediate vicinity of the airfield and another 25 percent occur during low-altitude local training exercises. Reported strikes to 19th AW aircraft have all occurred in low-altitude training areas and transition areas. Bird strike hazards are also a potential concern within the immediate vicinity of the main airfield and enroute to other locations.

LRAFB aircraft generally use central Arkansas, including the Blackjack and All- American Drop Zones, as the primary low-level flying area. This area has many features, including the Arkansas River and the Mississippi flyway, that attract a variety of birds, both resident and migratory. The 19th AW Bird Hazard Working Group (BHWG) has reported that the low-level flight phase is generally the most susceptible to bird strike hazards. Migratory bird concentrations in the eastern third of Arkansas are greatest in the fall. Subsequently, the BHWG has recommended that routes east of Little Rock during fall months be avoided. Raptors (hawks, black vultures, turkey vultures) and blackbirds represent year-round hazards. Airfield Operations (Airspace Manager) investigates and coordinates impact assessments of the low-level flying mission (K. Hunt *pers. comm.* 2018).

Wildlife strikes with military aircraft at LRAFB averaged 261 strikes per year from 2007 to 2017. The average bird-strike rate (BSR, bird strikes per 1000 flying hours), was 12.1 per year. Bird-strike damages average $480,768 per year. Species causing major damage during this period include: Canada Goose, Red-Tailed Hawk, Black Vulture, Turkey Vulture, Snow Goose, American Coot (K. Hunt *pers. comm.* 2018).

6.3.2 Hazardous Materials and Hazardous Waste

Hazardous wastes are generated at the installation from routine activities such as maintenance and corrosion control of aircraft, vehicle and support equipment maintenance, general maintenance, munitions storage and disposal, medical services, and laboratory operations. Current procedures involving hazardous materials and wastes are conducted in accordance with the 19th AW Hazardous Waste Management Plan (LRAFB 2012). Also, a Spill Prevention Plan (i.e., One Plan, Red Plan) provides for emergency procedures in the event of a toxic materials emergency (LRAFB 2012; Section 12).

In the past, LRAFB engaged in a variety of activities that resulted in the release of hazardous materials. These activities have included fuel storage and distribution of petroleum, oils, lubricants (POL), EOD, fire training exercises, and landfill operations. The base is not listed on the National Priorities List (NPL) but has several sites where soils have become contaminated with petroleum-based fuels, oils, lubricants, metals, and solvents. Remediation through treatment or disposal of soils requires compliance with applicable State and Local regulations and requirements.

A Hazardous Material Pharmacy (HAZMART) system has been implemented to improve management of hazardous materials. The system provides a single source, pharmaceutical approach to hazardous material inventory and control to monitor and further reduce the amount of stored hazardous materials. The various users of these materials include Logistics, Civil Engineering, Operations, Maintenance, Medical, and the ANG. Typical hazardous wastes include waste paint, paint stripper, paint-contaminated rags, and degreasers. Current base recycling and/or pollution prevention efforts include the recycling of antifreeze, plastic, metal, aluminum, glass, cardboard, paper, and magazines.

The base does not have a permit for treatment, storage, or disposal of hazardous waste and must remove wastes from the base within 90 days. Hazardous wastes are initially controlled by generating activities at numerous satellite accumulation points. Hazardous wastes are collected in 55-gallon metal drums or other suitable containers. Wastes may also be taken directly to the hazardous-material (HAZMO) 90-day accumulation site for later dispersal to a contracted treatment, storage, and disposal facility off-base.

A comprehensive testing and identification survey of electrical transformers was conducted in 1989 to identify and replace transformers containing polychlorinated biphenyls (PCB). Replacement and disposal of PCB-containing transformers was completed in 1993. 19 CES/CEIEC oversees a screening program in Civil Engineering, Base Supply, HAZMO, and contracting in conjunction with Entergy Corp. to ensure only certified non-PCB equipment is permitted on base (E. Gamber *pers. comm.* 2018).

6.3.3 Installation Restoration Program

In light of historic as well as current activities involving hazardous materials, an installation restoration program (IRP) was initiated at the base. LRAFB implemented this program to comply with applicable laws and regulations and to ensure that present and future waste and resource management practices at the base will protect human health and the environment.

The USAF IRP is the primary driver for the LRAFB environmental restoration program. Currently, the base is under an Arkansas Consent Administrative Order concerning past releases of hazardous materials. The base has assumed the role of the “lead agency” and is actively pursuing cleanup at all sites, consistent with Federal and State regulations and guidance.

The IRP program currently includes preliminary assessment and remedial investigation/ feasibility studies to determine the disposition of hazardous waste sites identified at the base. The program is administered through 19 CES/CEIER and is supported by Public Affairs and the Staff Judge Advocate Office. The IRP is managed through the Air Force Civil Engineer Center (AFCEC), Joint Base San Antonio.

LRAFB currently has 55 IRP sites. Forty-six of the IRP sites have received no further action per the state regulatory Remedial Action Decision Document (RADD) (Feb 2007) and amended RADD (Mar 2010) (Nov 2014). Two sites are active: AOC- 3 (ST-25) flight line fuel leak and SWMU 27 (LF-13) solid-waste landfill which are both in Remedial Action-Operation phase. Presently, 7 IRP sites have land use control restrictions (T. Broach *pers. comm.* 2018).

6.3.4 Fuel Storage

The Fuels Management Office is responsible for the management and control of fuel and the handling and storage of the cryogenics in direct support of the C-130 aircraft. The primary receipt of Jet A is by commercial tank truck. Fuel is stored in the POL bulk storage tanks, then transferred by underground pipelines to hydrant systems or pumped into tank trucks for aircraft refueling. The bulk POL storage area includes three cone roof aboveground storage tanks (AST). The containment dikes surrounding all of the ASTs at the bulk storage area are covered with a High Density Polyethylene (HDPE) Liner over earthen material.

Fuel is also stored in 14 underground storage tanks (UST), at two hydrant pumphouses. Each pumphouse has two fillstands which enables two refueling trucks to be filled simultaneously. Gasoline and diesel fuel for military vehicles are stored and dispensed from the USTs at the motor pool.

Defense Logistics Agency (DLA) is responsible for preforming American Petrolium Instititue (API) tank inspections. Tank inspections occur every 3 to 8 years depending upon tank construction and protection. The pipelines are pressure-checked annually and hydrostatically tested every 5 years. Permanent records of these inspections are maintained. Fuels management and Civil Engineering personnel are trained on the operation and maintenance of equipment to prevent fuel discharge as required by POL Technical Orders and Civil Engineering regulations and manuals.

LRAFB has 19 USTs and 5 ASTs that are regulated under 40 CFR (CFR) 280 (P. Waisanan *pers. comm.* 2012). All others are excluded from regulation under various exclusions found in the Resource Conservation Recovery Act Section 9001(1). All tanks are currently in compliance. Previous remedial actions include removal of 13 USTs, and 4 UST investigations that were complete as of 2005 (J. Neely *pers. comm.* 2018).

6.3.5 Asbestos

The LRAFB Asbestos-Containing Materials (ACM) and Lead-Based Paint (LBP) Program is managed by the 19 CES/CEIEC, with shared responsibilities in the 19th Medical Group Bioenvironmental Engineering. The most recent ACM survey was completed in 2000 with an Asbestos Management/Operations Plan updated in 2005. The most recent survey for facilities suspected to contain LBP was completed in 2004. In both surveys, priority facilities were surveyed first, and remaining buildings were surveyed as funding allowed. State-licensed contractors perform all ACM/LBP removal or abatement operations contractors (E. Gamber *pers. comm.* 2018).

6.3.6 Air Quality

In accordance with Federal Clean Air Act (CAA) requirements, the air quality in a given region or area is measured by the concentration of various pollutants in the atmosphere. Concentrations are normally expressed in units of parts per million (ppm), milligrams per cubic meter (mg/m3), or micrograms per cubic meter (µg/m3). Air quality is determined by the type and amount of pollutants in the atmosphere, the size and topography of the air basin, and local and regional meteorological influences. The significance of a pollutant concentration is determined by comparison with Federal or state air quality standards. These standards represent the maximum allowable concentrations of specified pollutants and are established to protect public health and welfare with a reasonable margin of safety.

The centerpiece of the CAA is the establishment of the National Ambient Air Quality Standards (NAAQS) Program. Federal NAAQS standards, as determined by USEPA, have set regulatory limits for six outdoor air pollutants, also known as "criteria pollutants." These standards include maximum concentrations for ground-level ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than 10 microns in diameter (PM_{10}), and lead (Pb) (40 CFR 50). Recent amendments have added a standard for particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) that will be implemented over a period of time. Ground-level ozone and PM2.5 levels are on the decline (State of Air in Arkansas Report, Dec 2017). The standards are defined in terms of concentrations determined over various periods of time (averaging periods). Short-term standards (1-hour, 8-hour, or 24-hour) were established for pollutants with acute health effects, while long-term standards (annual) were established for pollutants with chronic health effects. The primary NAAQS represent maximum levels of background air pollution that are considered safe, with an adequate margin of safety to protect public health. Secondary NAAQS represent the maximum pollutant concentration necessary to protect vegetation, crops, and other public resources along with maintaining visibility standard. The Arkansas Department of Environmental Quality (ADEQ) provides ambient air quality standards for the state, which are the same as the NAAQS for the criteria pollutants presented in the State of the Air in Arkansas (citation 2017; https://www.adeq.state.ar.us/air/state-of-air/pdfs/2017-state-of-air-final.pdf). Airshed designations include attainment (concentrations below primary or secondary NAAQS standards), and nonattainment (concentrations persistently exceed NAAQS standards; Gordon *pers. comm*. 2018).

Five air quality monitoring stations are currently located within Pulaski County. Primary onsite emissions sources at the 19th AW include the following:

- Vehicle operation and maintenance (including aerospace ground equipment [AGE])
- Combustion sources (jet engine tests, boilers, water heaters, aircraft arresting barrier engines, diesel-fired generators and fire pumps)
- Fuel-storage/transfer operations (fuel-storage tanks)
- Operational sources (solvents, cleaners, antifreeze, and other materials containing volatile organic compounds [VOCs] and hazardous air pollutants [HAPs]).

LRAFB is in the Central Arkansas Intrastate Air Quality Control Region established by the USEPA and administered by the ADEQ. Pulaski County is in attainment for all criteria pollutants. Based on the State of Air in Arkansas Report (https://www.adeq.state.ar.us/air/pdfs/state-of-the-air-in-arkansas-final.pdf), Pulaski County is currently in attainment for all criteria pollutants. According to the report, Pulaski County experienced brief periods of the ground-level ozone levels exceeding (<10%) NAAQS standards within the last 10 years; however, a nonattainment designation was

avoided, and ozone levels have shown an overall decline. All other contaminants remained well below NAAQS standards.

LRAFB operates under a Synthetic Minor Air Permit issued by the ADEQ. Synthetic Minor Permit allow for self-imposed limits that, when followed, will ensure the Base's Emissions will remain below Title V levels. LRAFB's permit is structured by group sources, all stationary. The bubble group source is: GS-001 - Boilers, GS-002 - Emergency Generators and Engines, GS-003 - Engine Test Cells, GS-004 A, B, & C - Storage Tanks, GS-005 - Fuel Dispensing, GS-006 A, B, & C - Surface Coating, and GS-007 - Solvent Degreasing. LRAFB has the freedom to adjust, modify or move equipment as long as total capacity remains below max capacity set forth in ADEQ Permit No. 865-AR-8 for each bubble source category.

6.3.7 Water

LRAFB is supplied with potable water by the City of Jacksonville, which obtains its water from the North Little Rock municipal system. Water is drawn primarily from Lake Maumelle, treated by the Central Arkansas Water System at Little Rock, distributed by the North Little Rock municipal system, and piped to Jacksonville and LRAFB. Water is stored in one 1.3 million gallon and two 30,000-gallon elevated tanks and supplied to base users by gravity flow. Jacksonville Water Works assumed all maintenance and water quality responsibilities on base as of May 2018, pursuant to the utilities privatization program.

6.3.7.1 Wastewater

Wastewater at LRAFB is collected in the sanitary sewer system and piped to the Jacksonville Municipal Wastewater Treatment System for treatment. No pre-treatment of sanitary and other wastewater occurs on base. The City of Jacksonville regulates the permit issued to the base for the discharge of wastewater to the Jacksonville sanitary wastewater collection system. Storm water infiltration into the sanitary sewers increases the flow during and after rainfall and has been known to cause the system to exceed the specified maximum flow rates (E. Gamber *pers. comm.* 2018).

6.3.7.2 Storm water runoff

LRAFB also has permits issued by ADEQ (Permit Nos. ARR000000, ARR040000, and ARR150000) and Jacksonville Wastewater Utility (Permit No. 87-08-12) to discharge storm water runoff at four outfall locations. These four streams drain the areas containing the airfield and most of the industrial activities on the base. Two permitted discharge points are located on the east side of the base along unnamed tributaries of Jack Bayou near the base boundary. The southeastern outfall drains to Bayou Two Prairie. A fourth is located at the northwestern corner of the base along Cypress Branch, a tributary to Bayou Meto. These outfall locations are monitored on an annual basis by CE- NPDES Storm Water Quality Monitoring Environmental. Effluent characteristics monitored include total suspended solids, oil and grease, biochemical oxygen demand, and chemical oxygen demand. Civil Engineering conducts a program of routine inspection and maintenance of the grit chambers.

6.3.7.3 Wetlands

Under Public Law, Section 404 of the Clean Water Act (CWA) provides for the USACE to administer a review process whereby discharges of fill material into the waters of the United States, including streams, open water bodies, and wetlands, may be permitted after notice and opportunity for public hearings. Section 401 of the CWA directs that any action (including, but not limited to, construction or operation of facilities) which requires a Federal license or permit (such as a Section 404 permit) must also be certified by the State that the action complies with state water quality criteria. The authority to administer this Section is delegated to the ADEQ. The permit provided by

the ADEQ under this Section is generally referred to as a 401 Water Quality Certification. Therefore, actions which include discharge of fill material into a wetland or other water must be coordinated with both the USACE and the ADEQ. Details pertaining to CWA permits issued to LRAFB by USACE and ADEQ may be found in Section 7.6.2

6.3.8 Noise

Aircraft operations are the primary source of noise on LRAFB. Environmental noise is managed by the 19 CES Engineering Flight through the Air Installation Compatible Use Zone (AICUZ) program, which monitors noise impacts and accident potential for land near the airfield. The most recent AICUZ study for the base was completed in 2011 (USAF 2011).

LRAFB has an established and publicized noise complaint process. This process serves to educate local communities regarding LRAFB operations and promote openness between the base and the communities. It also visibly demonstrates the Air Force's commitment to be a good neighbor. Noise complaints are handled by the Public Affairs Office (PAO), and formal correspondence and investigations are managed by the Operations Group Commander. Complaints are registered by the PAO in a noise complaint form, which includes a description of the nature of the complaint and the action taken. To minimize the effects of noise generated by its airfield operations, LRAFB has self-imposed aircraft overflight restrictions, including traffic patterns and altitudes that limit the use of airspace over surrounding communities. The number of acres impacted by more than 65db has decreased by 8% since 2003, from 4297 acres to 3934 acres in 2011 (USAF 2011). In addition to shaping on-base development, the AICUZ program is used by local off-base planning agencies to ensure compatible land uses around LRAFB (USAF 2003).

6.3.9 Installation Security/ATFP Standards

In 2002, the DoD issued its Unified Facilities Criteria (UFC) system, including DoD Minimum Antiterrorism Standards for Buildings in order to minimize the possibility of mass casualties in buildings or portions of buildings owned, leased, privatized, or otherwise occupied, managed, or controlled by or for DoD. The standards provide appropriate, implementable, and enforceable measures to establish a level of protection against terrorist attacks. The intent of these standards can be achieved through prudent master planning, real estate acquisition, and design and construction practices. Though established in 2002, these standards will apply to existing facilities starting with the FY 2004 program and will be mandated when any facility is proposed to undergo: major investments, conversion of use, building additions, and glazing replacement. Proposed facility construction and circulation enhancements are intended to bring installation facilities into compliance with these standards.

6.4 Potential Future Impacts

Known future mission impacts at LRAFB would include continuation of current impacts as previously described, and additional impacts due to new missions or mission components. Construction- related activities that might be planned would undergo a separate NEPA process, and fall into three categories:

- Short-term facilities construction intended to streamline operations and comply with minimum antiterrorism standards set forth by the DoD
- Airfield-related maintenance and infrastructure alterations to enable compliance with airfield safety requirements (UFC 3-260-01, Airfield and Heliport Planning and Design)

- Demolition projects required to enable the execution of short-term construction and infrastructure alterations.

6.5 Natural Resources Needed to Support the Military Mission

Natural resources needed to support the military mission include healthy vegetation for soil stabilization and adequate undeveloped open space. Undeveloped areas on the base are used for airfield buffering and ground-based contingency training and exercises. The abundance and health of natural resources on LRAFB also provide outdoor recreation opportunities and general quality-of-life enhancements that contribute to the overall mission. A healthy natural environment and proactive natural resources management program will continue to enhance the viability of the LRAFB to support the Air Force mission.

7.0 NATURAL RESOURCES PROGRAM MANAGEMENT

7.1 Natural Resources Program Management

The guiding philosophy of this INRMP is to take an ecosystems approach to managing the natural resources present on LRAFB (see Section 2.0). Ecosystem management provides a framework to link the military mission to local, regional, and global ecological integrity. Sustaining ecosystem integrity is the best way to protect and enhance biodiversity, ensure sustainable use, and minimize the effort and cost of management. Ecosystem management is based on clearly stated goals and objectives, and associated activities and projects. This INRMP identifies goals and objectives, and presents the means to accomplish them, as well as the methodologies to monitor results.

This section summarizes each technical area of natural resources management. In a given section, relevant management strategies, practices, guidelines, best management practices (BMPs) and priorities will be presented, as applicable to the technical topic. Goals and objectives are presented below by section. Activities (recurring, in-house tasks) and projects (discrete and/or contracted tasks) associated with those goals and objectives are presented in Tables 10 and 11 respectively in Section 8.0. Laws and regulations are not summarized in each sub-section, although primary legal drivers are identified. A complete summary of all relevant laws, regulations, EOs and policies is provided in Appendix K.

Programmatic Management
Programmatic management includes environmental awareness, public outreach, GIS data management, INRMP annual reviews, adaptive management and other objectives relating to implementing a natural resources management program.

7.2 Fish and Wildlife Management

Fish and wildlife management at LRAFB will focus on maintaining and restoring natural habitat favorable for indigenous fish and wildlife in a manner consistent with the military mission and all applicable laws and regulations. Information pertaining to fish and wildlife species known or with the potential to occur at LRAFB is summarized in Appendix F with protected species summarized in Appendix G and species lists are provided in Appendix H. In addition to general fish and wildlife management, there are additional management needs associated with minimizing BASH-related risk at LRAFB since the military mission involves flight operations.

LRAFB supports numerous native species including a federally-listed species, candidate species, and federal species of concern (see Section 5.4 and Appendix G). Currently, no mission activities appear to adversely impact wildlife populations on LRAFB.

7.2.1 Management Strategies for Wildlife

Wildlife management involves manipulating various aspects of an ecosystem to benefit chosen wildlife species. Management of habitats generally is focused to benefit native species, particularly rare species and game species. The natural resource manager will manage the wildlife and its habitat at LRAFB by implementing the strategies listed below:

- Utilize traditional silvicultural practices that have a positive effect on wildlife populations, such as prescribed burning and forest thinning. Create wildlife openings in forested areas that lack adequate cover. These openings are created by removing the most merchantable trees and felling and leaving non-merchantable trees. Large mast-producing trees are left

standing within the openings. The felled trees provide immediate cover within the branches and treetops. Subsequent growing seasons encourage thick cover excellent for wildlife.

- Implement strategies to reduce ILT chick mortality, i.e. installing shade structures on roofs.
- Maintain intact, healthy habitat and enhance or restore degraded habitat, without increasing BASH risk.
- Minimize BASH risk by deterring hazardous birds and other wildlife from the airfield and its critical zone.
- Maintain populations of wildlife away from the airfield on LRAFB by minimizing negative impacts and by providing healthy, diverse habitat and corridors for wildlife to move between those habitats
- Conduct fish surveys to determine species diversity and relative abundance and population abundance, age class structure, and size structure, in order to determine prey items available at Large and Small Base Lake to help determine proper fisheries management and stocking of the lakes in the future to benefit the Interior Least Terns nesting on the base while maintaining or improving the existing fishery.
- Implement yearly lake-fertilization program, as advised by AGFC, in order to increase lake productivity.
- Install habitat structures to attract fish and provide cover for forage species.
- Manage invasive aquatic vegetation to maintain properly balanced aquatic ecosystem.

7.2.2 Nuisance Wildlife and Wildlife Diseases

Other than those that present a BASH risk, there are few nuisance wildlife species at LRAFB. Feral hogs do occur on LRAFB but are very rare and generally are not permitted due to potential BASH risk (Section 7.13). Base hunting rules state that "feral hogs are a serious BASH and ecological issue. All feral hogs will be shot or trapped and then killed and reported to the Nat Res Mgr. No live hogs will be brought on or taken off base. Dead hogs will be disposed of immediately to avoid attracting vultures.". Future nuisance wildlife problems will be evaluated by natural resource managers in conjunction with base pest management personnel, if appropriate. Any solutions to nuisance wildlife problems will follow the IPMP and BASH plans (Section 7.0).

Diseases affecting fish and wildlife may occur on the installation. Any large-scale fish and wildlife deaths and unnatural behavior occurring on the installation will be reported, recorded and investigated by NRM in conjunction with USFWS, AGFC, and ADEQ.

Invasive species of animals living on LRAFB include feral cats, Muscovy ducks, pekin ducks, domestic geese, European starlings, house sparrows, pigeons, and imported fire ants (see Table 4 in Section 5.2 for complete list of invasive species). European starlings and pigeons are a BASH issue. In 1999 a large number of Muscovy ducks and "domesticated" mallards had to be destroyed to prevent the spread of duck viral enteritis disease, which broke out at the base lakes. Feral cats and free-roaming cats also pose a threat to native species. Other nuisance species include raccoons and opossums.

7.2.3 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MTBA) prohibits, unless permitted by regulations, the pursuit, hunting, take, capture, killing or attempting to take, capture, kill, or possess any migratory bird included in the Migratory Bird Treaty, including any part, nest, or egg of any such bird (16 USC § 703). The DoD has a Memorandum of Understanding (MOU) with the USFWS pursuant to EO 13186, which outlines a collaborative approach to promote the conservation of migratory bird

populations. This MOU specifically pertains to natural resource management activities, including, but not limited to, habitat management, erosion control, forestry activities, invasive weed management, and prescribed burning. It also pertains to installation support functions, operation of industrial activities, construction and demolition activities, and hazardous waste cleanup. In February 2007, the USFWS finalized regulations for issuing incidental taking permits to the DoD. If any of the Armed Forces determine that a proposed or an ongoing military readiness activity may result in a significant adverse effect on a population of migratory bird species, then they must confer and cooperate with the USFWS to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects (50 CFR Part 21, *see* https://www.denix.osd.mil/nr/legislationandpolicy/mousandmoas/ for MOUs).

7.3 Outdoor Recreation and Public Access to Natural Resources

The development of appealing and functional outdoor recreational facilities enhances the quality of life and supports the military mission by maintaining a high state of morale. The base offers excellent opportunities for dispersed consumptive and non-consumptive recreational activities. The base is not open to the general public for camping, hunting, and fishing due to the limited land and water areas available for these activities. A map of outdoor recreation areas is provided in Figure 11. Examples of the Outdoor Recreation Activities are provided on Figure 12.

LRAFB incorporates quality of life objectives into the management of base natural resources. Lake improvements are underway to establish and maintain a healthy fish population that will provide game fish attractive to anglers, while sustaining a baitfish population for foraging ILT. Forest management including timber and fuels thinning will improve wildlife habitat as well as hunting on base. The establishment of pollinator habitats offers multiple ecological advantages, as well as provding bird- and wildlife-watching opportunities.

As directed by Executive Order No. 11989, use of any off-road vehicles (ORV) including mountain bikes, will be allowed only after thoroughly analyzing the impact of such use on soils, archeological sites, wildlife, water quality, and other ecosystem attributes. Periodically monitor and evaluate for damage any areas designated for ORV use. The complete base policy on the use of off-road vehicles is provided in Section 12.

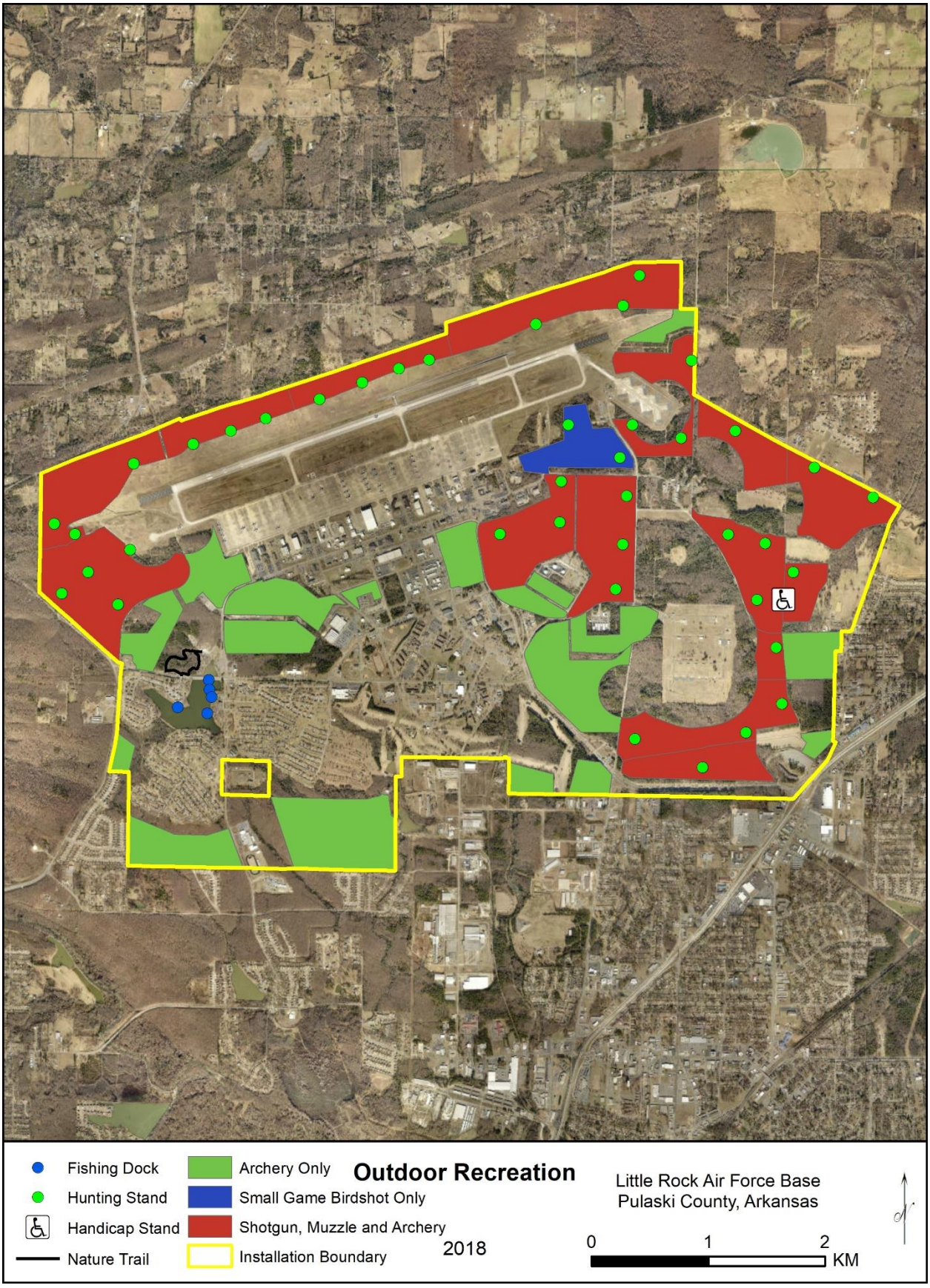

Figure 11. Outdoor recreation at LRAFB

Figure 12 Examples of outdoor recreation activities
Top left: Hunting lanes were created in areas around the airfield to allow hunters better access.
Top right: Hunting provides both recreation and control of the base deer population.
Bottom left: The nature trail is a great place for base personnel to go and enjoy nature. Bottom right: Fishing clinics promote recreational fishing.

7.3.1 Hunting and Fishing

A specific goal of LRAFB natural resources program is to promote the quality of life for personnel by providing abundant outdoor recreational opportunities. Base hunting and fishing programs managed by Natural Resources serve as an important element in supporting AF Quality of Life program goals. Quality of life objectives are incorporated into planning and management of hunting seasons on base. Consumptive recreational opportunities at LRAFB include hunting and fishing. Hunting opportunities are available to active duty personnel and their dependents, DoD employees, retirees, and guests. The base includes over 2,800 acres of forest and grassland divided into 33 separate deer hunting areas. Game species hunted on base include white-tailed deer, turkey, quail, squirrel, and rabbit. Prerequisites for hunting on base include a hunter rules/safety briefing, a current Arkansas hunting license and base hunting permit, and completion of a hunter safety course if born after 1968. Base hunting regulations allow shotgun, muzzle loader, and archery; however, pistols and rifles are strictly prohibited.

All hunting and fishing at LRAFB is in accordance with Arkansas Game and Fish Commission (AGFC) laws/regulations, and seasons. In addition, all personnel who hunt or fish on base are required to purchase a base permit, which must be attached to the State of Arkansas license. Base

hunting and fishing permits can be purchased through www.littlerock.isportsman.net or through Outdoor Recreation. The current fees for deer hunting permits are $20 for the military grade of E-6 and below and their civilian equivalents. Military grade of E-7 and above and their civilian equivalents pay $40. All guests and dependents are charged $10. Base fishing permits cost $5.00 and are valid for one year. The appropriate permit fees are determined annually by the Mission Support Group Commander, based on the recommendations of the Base Civil Engineer (BCE). All funds collected from hunting and fishing fees are deposited in a special fund to establish and maintain fish and wildlife conservation programs at LRAFB. The Security Forces desk-sergeant serves as the hunter's check station. It is the policy of the Air Force to permit public access for outdoor recreational purposes to the greatest degree possible, but due to the potential degradation or impairment of environmental qualities, recreational use is limited to active-duty and retired military and civilian personnel assigned to the installation, and their guests.

Figure 13. Black crappie *(Pomoxis nigromaculatus*) caught in Pat Wilson Lake at LRAFB.

Game species on LRAFB include white-tailed deer, bobwhite quail, wild turkey, squirrel, and rabbit. There are approximately 5,000 acres of deer habitat, consisting of woodlands, grasslands and urban/wildlife interface, and approximately 320 acres of quail habitat. The acreage for white-tailed deer habitat consists mostly of stands of mixed oaks and abandoned pastureland. The combination of available food sources and natural cover result in a habitat condition rated "good." Most of the forested areas of the base are fragmented by roads, right-of-ways, and ranges which provide plenty of openings and edge habitat. The deer population density objective is one deer per 20 acres. Quail habitat is primarily composed of cleared easements and other open, grassy areas,

and shrubland. The habitat condition on base is considered good and should improve as undesirable underbrush is cleared. The quail population objective is one quail per 6 to 10 acres. There are approximately 5,000 acres of turkey habitat, and the turkey population objective is 1 turkey per 75 acres. Associated wildlife species include eastern cottontail rabbit (*Sylvilagus floridanus*), fox (*Sciurus niger*) and gray squirrel (*Sciurus carolinensis*), and mourning dove (*Zenaida macroura*). Any proposed enhancements for fish and wildlife management must be in compliance with the approved BASH plan for LRAFB. The 2018-2019 LRAFB hunting map for deer season is shown in Figure 11. The spring turkey hunting season map is shown in Figure 11.

The 37-acre and 3-acre base lakes support a game fishery and is the main focus of base non-consumptive outdoor recreation activities. Game fish include channel catfish, bass, and bream. In 2018, AGFC reinstated the seasonal Rainbow Trout stocking program, and 1000 trout will annually be stocked in the Small Lake around Thanksgiving. The Outdoor Recreation office sponsors an annual youth fishing derby event and stocks the small base lake with channel catfish. Multiple signs are in place around the lake advising caution in the consumption of fish from the lakes due to discovery of elevated trace-metal concentrations. LRAFB Public Health Office has advised that fish larger than 13 inches should not be consumed, except for seasonal Rainbow Trout. Meals consisting of bass, catfish, or bream (13 inches or smaller) caught in the base lake should be limited to two per month. Any fish may be retained for taxidermy.

A project is underway to install dozens of artificial fish-habitat structures to attract fish and provide cover for forage species; several structures have recently been installed. Alligator weed (*Alternanthera philoxeroides*), an invasive aquatic weed has become a problem in the lakes in recent years. Efforts will be made to manage the vegetation in order to maintain a properly balanced ecosystem. A fish-survey study was conducted over the summer of 2018 to determine species diversity and relative abundance and population abundance, age class structure, and size structure, to identify prey items available at Large and Small Base Lake (Figure 14). This study was aimed to help enact proper fisheries-management practices and stocking of the lakes in the future to benefit the Interior Least Terns nesting on the base while maintaining or improving the existing fishery.

Figure 14. Young fish caught in seine during sampling during summer 2018 at LRAFB.

The base has engaged the services of the AGFC in an advisory capacity to optimize the fishery. The State has recommended a program of routine fertilization, which would increase nutrients and build the basic food supply. The prescribed increase in nutrients will result in an increase in phytoplankton, temporarily imparting a greenish cast to the water. The base is justifiably concerned that this program, while being good for the fishery, will degrade the general appearance of the water. The State's general rules for fertilizer applications are as follows: if you can see your hand clearly when it is placed in the water to elbow depth, then additional fertilizer is needed. The coloration of the water is in conflict with the general popular notion that a clear lake is an aesthetic lake. A balance needs to be struck between the base's aesthetic goals and the State's desire to achieve an optimum, self-sustaining fishery.

7.3.2 Other outdoor activities

The lakeside offers two picnic areas, a playground, and two fishing docks. The Nubbin Ridge Nature Trail is situated along the lake's northwest shoreline. A family campground was recently expanded and now has 36 improved campsites and bathing/laundry facilities and is located along the north shore of Small Base Lake. The campsites are all full recreational-vehicle sites with water, electric, and sewer hook-ups. Other amenities include a volleyball court and horseshoe pits. Off-road vehicles are prohibited except for official use by EO 11989. The complete base policy on the use of off-road vehicles is provided in Section 12.

Approximately 15 miles of equestrian trails are available to members of the on-base Saddle Club, although riders are free to roam in unrestricted areas. The stables are located along the eastern-central perimeter of the base. The private club is open to all eligible persons for boarding and equestrian activities. Facilities include 42 stalls, a lighted arena, trails, and pasture. The club maintains no horses for rent.

A private archery range, located south of the equestrian area, is available for use by members of the Archery Club. Numerous jogging trails exist on the installation. A synthetic-surface walking track and 400 meter competitive track with athletic field has recently been installed. A parcourse located in the vicinity of DRMO is no longer utilized by tenant Marine Corps, but is open to the base community. The Outdoor Recreation Center (ODR) offers a wide variety of equipment for rent by base personnel. Rental equipment includes everything from canoes and jon boats (including trailers), to camping gear and sporting goods. Mountain biking along perimeter roads and existing forest roads has become a popular outdoor recreation activity for individuals and groups. The ODR offers numerous outing activities on- and off-base throughout the year.

Approximately 100 acres of base property has been set aside for use by scouting organizations, including both Boy and Girl Scout troops. The scouting area can be utilized for primitive tent camping and features picnic tables, grills, a Scout hut built in 1999, and a pavilion. In general, this area is in need of repair and improvement.

Other recreational activities at LRAFB include canoeing, kayaking, and sailing on the base lake, bird watching, trail-hiking, and nature photography. A tremendous potential exists to develop and promote these and other non-consumptive outdoor recreational opportunities. Improvements to wildlife habitat to be undertaken as part of the INRMP will improve wildlife observation opportunities, particularly for some non-game species (Figure 15). The base also has a variety of recreational facilities normally associated with urban settings, including an 18-hole golf course, athletic ball fields, swimming pools, and playgrounds.

Figure 15. Mississippi map turtle (*Graptemys psuedogeographica kohnii*) captured during fish seining at Pat Wilson Lake on LRAFB.

7.4 Conservation Law Enforcement

Enforcement of the fish and wildlife rules and regulations is an important part of a successful natural resources program. LRAFB hunters and anglers are provided a list of Hunting and Fishing Regulations. Hunters are also required to view an instructional safety briefing before hunting on base. The 19th Security Forces Squadron (19 SFS) provides enforcement support. LRAFB does not specifically employ natural resources law enforcement personnel or game wardens. 19 SFS and the Installation Natural Resources Manager enforce Air Force and installation policies and procedures for protecting natural resources including the hunting and fishing programs. If a wildlife violation is identified, 19 SFS will contact the appropriate State or Federal agency and detain the offender(s) until an enforcement officer arrives. AGFC game wardens and USFWS agents have access to LRAFB for enforcement of State and Federal wildlife laws as per the Cooperative Agreement for

Fish and Wildlife Management at LRAFB, Arkansas found in Section 12. Citations and enforcement for the base hunting programs are written into the base hunting rules which are approved and signed by the 19th Mission Support Group Commander (D. Hardage pers. comm.).

7.5 Management of Threatened and Endangered Species and Habitats

The Endangered Species Act (Public Law 3-205) requires military installations to protect and conserve Federally-listed endangered and threatened plants and animals and their habitats. When practical, species proposed for listing, candidate-species, will be given the same protection as species which are already listed. Although installations are not obligated under the Endangered Species Act to do so, AFI 32-7064 encourages protection of State-listed species to the maximum extent practicable.

In 2018, AFCEC ordered a Programatic Biological Assessment regarding threatened and endangered species and flight operations for 32 installations in order to provide a model so that the AF and the USFWS may have a quantifiable and defenseible means for tracking, amending, and/or renewing incidental take statements in the future at both a national- and base-scale as missions change over time (LRAFB 2018c). USFWS suggested that, though not listed, the Little Brown Bat and the Tricolored Bat should be included in the PBA. Both species have been confirmed as occurring on base (Table H-6, Appendix H).

Four priority special status wildlife species and seven priority special status plant species have been identified for LRAFB, although only three species have been documented at LRAFB (Appendix H). The following is the list of priority special status species potentially occurring at LRAFB:

Federal Special Status Species

- Federal candidate species rattlesnake-master borer moth (*Papaipema eryngii)*
- Federally and state-endangered species interior least tern (*Sterna antillarum athalassos*)
- Federally threatened and state-endangered northern long-eared bat (*Myotis septentrionalis*)
- Federally protected and state species of special concern bald eagle (*Haliaeetus leucocephalus*)
- Federally-endangered running buffalo clover (*Trifolium stoloniferum*)
- Not listed but under review little brown bat (*Myotis lucifugus*)
- Not listed but under review tricolored bat (*Perimyotis subflavus*)

Priority Special Status Plant Species

- State-threatened southern rein-orchid (*Platanthera flava)*
- State-threatened purple fringeless orchid *(Platanthera peramoena)*
- State-threatened Arkansas meadow-rue *(Thalictrum arkansanum)*
- State-endangered small-head pipewort *(Eriocaulon microcephalum)*
- State-endangered white-top sedge *(Rhynchospora colorata)*
- State-endangered slender rose-gentian *(Sabatia campanulata)*

7.5.1 Federal Special Status Species

LRAFB is required to manage for federally listed and when practical, candidate species. Failure to protect Federally-listed species could lead to an ESA violation, which could negatively impact training land availability. Details regarding potentially occurring federally listed species are

provided in Appendix G. There are only two federally listed priority wildlife species known to occur at LRAFB and their management strategies are listed below.

Rattlesnake-master borer moth: On August 14, 2014, USFWS determined that the RMBM warrants listing under the ESA but designated it as a candidate species due to higher priority actions. LRAFB is implementing a voluntary conservation effort of the RMBM. These actions intend to maintain and enhance existing RMBM habitat at LRAFB by maintaining and enlarging stands of the obligate host plant rattlesnake-master. This will be accomplished by maintaining open habitats, necessary for rattlesnake-master plants with a combination of prescribed burns, mechanical treatment (i.e., mowing and bush-hogging) within LRAFB BASH guidelines, and chemical treatment of invasive species. Additionally, mitigation for unavoidable impacts to RMBM habitat will also be utilized when necessary. Presence/absence surveys will be done biennially to determine distribution and inform habitat management action planning decisions. For additional information on RMBM conservation at LRAFB, see the Conservation Plan for Rattlesnake-master Borer Moth in Section 12.

Interior least tern: In June 2006, the USFWS confirmed sightings of the Interior Least Tern (ILT) at the base. The species nested on top of Bldg. 450 in 2007, 2008, and 2009. After a disturbance in 2009 they did not return again until 2012. The ILT have also been observed nesting on the rooftop of Building 787, the Base Exchange. The installation has developed an awareness program and has implemented roof-access protocol approved by the USFWS to protect these birds. This protocol is implemented during the nesting and pre-nesting season, which is mid-April through August. The procedure for this protocol includes looking across the roof at eye level when a person first approaches a flat gravel roof. If a person sees any birds nesting, chicks, or eggs that person should then return to the ground and immediately notify the Natural Resources Manager. If birds, chicks, or eggs are discovered while on the roof, upon discovery the person should leave the roof without disturbing the birds and immediately notify the Natural Resources Manager. In the event of an emergency situation that could result in loss of human life or property, a person may proceed with their activities. USFWS is consulted regarding all construction/demolition projects occurring within a half-mile radius of buildings 450 or 787. Copies of the USFWS correspondence and the LRAFB protocol can be found in Section 12.

Northern long-eared bat: *see Appendix G.*

Bald Eagle: Bald eagles, recently delisted under the ESA, remain protected under the BGEPA. Bald eagles are known to nest near LRAFB and individuals may use the installation in a transient manner, or for foraging. The following management strategies for bald eagles are recommended:

- Encounters with bald eagles should be avoided, both within the vicinity of a nest and as part of BASH risk reduction activities.
- Any hunting activities should not cause impacts to eagles (e.g., use non-toxic ammunition).
- Modifications to aerial structures and electrical transmission lines should incorporate proven design techniques that discourage bald eagle use and eliminate or reduce bald eagle hazards.
- Limit use of pesticides as described in the IPMP, in order to limit indirect impacts to eagles.
- Limited activity near active nests.

Running buffalo clover: *see Appendix G.*

Little brown bat: *see Appendix G.*

Tricolored bat: *see Appendix G.*

7.5.2 State Special Status Plant Species

There are six state-listed priority plant species that occur in Pulaski County, in addition to those species already discussed above under federally listed species. None of these species have been documented on LRAFB. Details regarding potentially occurring federally listed species are provided in Appendix G.

7.5.3 Management Strategies for Special Status Species

The following general guidelines will be followed to facilitate the military mission and natural resources management objectives while minimizing negative impacts on special status species and their habitats and minimizing BASH risk.

- Continue supporting BASH program to minimize take of listed species.
- Update biological inventories regularly as the occurrence of listed species is subject to change over time as a result of either recruitment, responses to management activities, identification of additional protected species, or the change in status of species currently present at the LRAFB.

7.6 Water Resource Protection

For a complete summary of water resources on LRAFB see Section 4. Water resource management needs to consider land and water management actions at LRAFB in terms of impact on the quality and quantity of groundwater and surface water within the watershed. The watershed (or drainage basin) is a topographically defined area that drains to a particular point on the landscape – usually a waterbody, wetland, or point along a stream or ditch.

Management practices focus on an installation's effect on regional watersheds. The effects on the watershed are primarily from the stormwater and wastewater from the LRAFB. The storm water or wastewater can be affected by both direct impacts from discharges from operations, run-off, and from non-point source pollutions such as run-off from yards and other surfaces. Management practices for water resource protection include maintaining monitoring activities for both groundwater and surface water. When possible, monitoring programs and management activities will be part of available cooperative programs with regional government or private organizations.

Any material which enters waterways and groundwater affects the quality of the waters on and leaving LRAFB. Materials carried in storm water runoff from developed areas could include fuel, oil, grease, coolant and metals which accumulate on pavement from vehicles and aircraft; deicing chemicals applied to roadways, runways, and aircraft; and fertilizers and pesticides applied to yards and other treated surfaces. Other potentially included materials are uncontained hazardous materials, such as solvents, from normal use and contaminants migrating from IRP sites. Industrial and sanitary wastewater discharges are managed by collection and treatment prior to discharge into surface waters.

Best Management Practices (BMPs) must be implemented with all ground-disturbing activities to prevent soil erosion and to protect surface waters on LRAFB. Soil erosion control measures are

implemented during all construction projects and monitored by quality assurance and environmental personnel.

The responsibility of watershed management does not fall entirely on operational personnel. Grounds contractors, privatized family housing residents, facility managers maintaining landscaped areas, and general construction contractors, in addition to the operational personnel, must all take responsibility to prevent soil erosion, to maintain or enhance soil fertility on improved grounds, and to protect surface waters from non-point pollutants including sediments, pesticides and excess nutrients, and other surface contaminants.

7.6.1 Regulatory Requirements

The U.S. Army Corps of Engineers (USACE) regulates the discharge of dredged or fill material into waters of the United States, including wetlands, under Section 404 of the CWA. Even an inadvertent encroachment into waters of the US resulting in a displacement or movement of soil or fill material has the potential to be viewed as a violation of the CWA if an appropriate permit has not been issued by the USACE. Waters of the US are defined under 33 CFR 328.3(a) and referred to as jurisdictional waters. Jurisdictional waters may include coastal and inland waters, lakes, rivers, ponds, streams, intermittent streams, vernal pools, wetlands, and other waters, that if degraded or destroyed could affect interstate commerce.

According to U.S. Environmental Protection Agency (EPA) regulations issued under Section 404(b)(1), permitting of fill activities will not be approved unless the following conditions are met: no practicable, less environmentally damaging alternative to the action exists; the activity does not cause or contribute to violations of state water quality standards (or compliance under Section 401 of the CWA); the activity does not jeopardize listed species or sensitive cultural resources (33 CFR Part 320.3 [e] and [g]); the activity does not contribute to significant degradation of waters of the US; and all practicable and appropriate steps have been taken to minimize potential adverse impacts to the aquatic ecosystem (40 CFR Part 230.10).

The Arkansas Department of Environmental Quality (ADEQ) implements the Arkansas Waters and Pollution Control Act (Ark. Code Ann. § 8-4-101), enforcing water quality standards for all surface waters, interstate and intrastate, in the state of Arkansas. The standards of the Act are designed to not only keep the state in compliance with CWA but also enhance the quality, value, and beneficial uses of the water resources of Arkansas.

Floodplains (see Map E-4) are protected under EO 11988 Floodplain Management. The purpose of EO 11988 is to reduce the risk of flood loss, minimize the impacts of flooding, and restore and preserve the natural and beneficial values of floodplains when acquiring, managing or disposing of federal lands.

The AF shall avoid undertaking or providing assistance for new construction located in wetlands unless 1) there are no practicable alternatives to such construction, and 2) the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. In addition, the Deputy Assistant Secretary of Defense issued a memorandum to the Deputy Assistant Secretary of each branch of the Armed Forces which sets a goal of no net loss of wetlands on DoD lands. That is, adverse effects on DoD wetlands should be avoided whenever possible and reduced or mitigated when unavoidable. In cases where there is no practicable alternative to the proposed construction in a wetland, a FONPA determination is made within the supporting Finding of No

Significant Impact (FONSI) of Record of Decision (ROD) by the Secretary of the Air Force, or an official who has been dually delegated authority to act on his/her behalf.

The protection of wetlands should be a component of both operations and natural resources management programs at LRAFB. The GIS database for LRAFB and available reports should be used for preliminary planning purposes to determine if a proposed project is in or near any wetlands, riparian corridors, streams, or other waters. This information should also be used for assessing the potential impacts to wetlands resulting from the implementation of natural resources management programs, including fish and wildlife, threatened and endangered species, grounds maintenance, and wildland fire management.

7.6.2 Permitting

Department of the Army Standard Permit No. 2008-00226 authorized the placement of dredged and fill material in waters of the United States associated with upgrading the LRAFB clear zone to meet safety requirements. The permit required the implementation of both stream and riparian buffer zone restoration and enhancement methods for 1,700 linear feet of intermittent or perennial stream. The mitigation area is to be preserved in perpetuity.

Department of the Army Nationwide Permit No. 18932 authorized the placement of dredged and fill material in waters of the United States associated with the culverting of approximately 259 linear feet of intermittent steam channel. The permit required the establishment of a 100-foot-wide forested riparian buffer zone along both sides of a 259 linear-foot segment of an unnamed intermittent tributary of Bayo Meto. The mitigation area is to be preserved in perpetuity.

Department of the Army Standard Permit No. 2014-00125, authorizes the placement of dredged and fill material in the waters of the United States associated with improvements to Runway 07-25. The permit requires an on-site restoration of 1,072 linear feet of an existing stream, including establishment of 100 foot-wide riparian buffer on each side of the stream. The restoratioin was required to mitigate for the placement of approximately 2,008 cubic yards of fill into jurisdictional wetlands and waters of the U. S., and the permanent impact (fill) approximately 619 liniear feet of jurisdictional streams. The mitigation project was completed in December 2019. The mitigation area is to be preserved in perpetuity. The areas may not be converted to another use, including, but not limited to: clearing, logging, bushhogging, mowing, spraying with herbicides, filing, leveling, draining, dumping, construction of any structure, or any other activity that could adversely impact the natural mstate of the area without obtaing a revision of this Department of the Army Permit. Proposed resource management activities involving alteration of the mitigation site must have prior approval from the Corps of Engineers, Regulatory Division. LRAFB chose to purchase 6.6 weland credits from the Cadron Creek Mitigation Bank LLC, as a special condition of the permit to mitigate for the perminant imact (fill) of 0.86 acres of wetlands.

ADEQ Permit No. ARR150000, authorization to discharge stormwater under the National Pollutant Discharge Elimination System and the Arkansas Water and Air Pollution Control Act: Operator of facilities with stormwater discharges associated with construction activity.

ADEQ Permit No. ARR000000, authorization to discharge stormwater under the National Pollutant Discharge Elimination System and the Arkansas Water and Air Pollution Control Act: Facilities discharging stormwater associated with industrial activity.

ADEQ Permit No. ARR040000, authorization to discharge under the national pollutant discharge elimination system and the Arkansas water and air pollution control act: Regulated small municipal separate storm sewer systems (MS4) located within the State of Arkansas.

Jacksonville Wastewater Utility Industrial Wastewater Discharge Permit No. 87-08-12: Contribution of industrial wastewater into the Jacksonville Wastewater Utility sewer lines at LRAFB monitoring flume on South Richmond Rd.

7.6.3 Riparian Management Zones

Natural resources management will maintain Riparian Management Zones (RMZs) around all water resources, whenever possible, to reduce the influx of sedimentation and other materials into the water resources in compliance with the CWA. RMZs are sometimes also referred to as vegetation buffers, buffer strips, filter strips or streamside management areas.

One of the primary purposes of a RMZ is for water quality protection by providing vegetation to interrupt water flow and to trap and filter out suspended sediments, nutrients, chemicals, and other polluting agents before they reach the body of water. RMZs should be maintained along all perennial and intermittent streams, lakes or ponds where nearby management activities result in surface/soil disturbance, earth changes and where erosion and sediment transport occur during rain events.

Buffers can take many forms and may vary depending on the upland land use and the type of water resource being protected. Vegetation buffers can be grassland or forest. They may or may not be mowed and maintained occasionally. Currently, Arkansas has no freshwater regulatory guidance for RMZ width. However, USACE requires the establishment of 100’ riparian buffers and those specifications will be observed on base for all current and future projects, when practicable.

7.6.4 Wetland Protection

Wetlands play an important role in the ecosystem as well as improving water quality and flood control. EO 11990 requires all Federal agencies to provide leadership in the protection of wetlands in managing Federal lands and conducting Federal activities and programs affecting land use.

The wetlands on the base were surveyed in 2007. The results of the survey provided a quality ranking for the wetlands on the base, as well as a description of vegetation found in each wetland area. These results assisted in the management of information to improve and protect wetlands. As a part of the management system, the wetlands will be routinely monitored for changes in vegetation, hydrology, and size. Management practices to improve the quality of or expand wetlands focus on those wetlands connected to wetlands or watersheds extending beyond the base boundary. LRAFB maintains and remains in compliance with Stormwater and Wastewater Discharge Permits issued by the City of Jacksonville.

7.6.5 Management Strategies

In general, water resources will be managed through conservation and impact avoidance. The following guidelines will be implemented to ensure compliance and to protect and enhance water resources at LRAFB.

- Consult with the U.S. Army Corps of Engineers (USACE) prior to initiating projects with the potential to disturb water resources.
- Apply for an appropriate permit when regulated waters, including wetlands and associated buffers, will be impacted.

- Do not allow vehicles within known wetland areas.
- Restrict vehicles from within 30 feet of water resources except where established crossings and roads exist.
- Maintain RMZs around water resources, including at least 100 foot vegetated buffer along streams where practicable.
- Implement management controls to limit unavoidable erosion with the RMZs.
- Avoid disturbance of wetlands and aquatic habitats where practicable.
- Manage invasive species to promote desirable native species.
- Plan development to avoid wetland and floodplain impacts to the maximum extent possible and mitigate unavoidable impacts on wetland and floodplain functions.
- Review operations and maintenance programs that potentially affect water resources and develop procedures and guidelines to avoid the loss of function.
- Do not enhance wetlands or other water resources in the Air Operations Areas (AOA) and ensure any mitigation occurs outside the AOA.

7.7 Grounds Maintenance

Given that large parts of LRAFB are landscaped, the management and design of those areas has significant implications for water quality, BASH risk and native species. The following recommended landscaping practices should benefit the environment and generate long-term cost and maintenance time savings. The use of native plants not only protects biodiversity and provides wildlife habitat, but it can also reduce demands for fertilizer, pesticides, and irrigation and their associated costs.

General recommendations to promote environmentally beneficial landscaping include:

- Design landscaping to be suitable to the specific site and appropriate for the use and operation of the facility.
- Minimize use of water by planting drought-tolerant and low water use native plants for landscaping.
- Implement water-efficient practices, use efficient irrigation systems and recycled water, and use landscaping to conserve energy.
- Limit turf areas where practical to reduce water use and maintenance requirements.
- Use wood mulch instead of rock mulch when practical.
- Prevent expansion of nonnative plants into native plant areas by using regionally native plants for landscaping where practicable.
- Reuse landscape trimmings on site as appropriate.
- Use porous pavement when possible to support water infiltration.
- Do not use seed-bearing or fruiting plants that provide food for wildlife and wildlife habitat in areas near airfields.

Additionally, all improved and semi-improved areas of the base should be continually evaluated for possible conversion to lower levels of grounds maintenance. Semi-improved areas should be evaluated for reduced mowing, or elimination of maintenance to allow for conversion to the native habitat. This will reduce the overall grounds maintenance expenses by converting additional improved grounds to semi-improved grounds or converting semi-improved grounds to unimproved grounds.

In addition to these more general landscaping practices, the installation of rain gardens on LRAFB would be beneficial for managing stormwater on site and for improving water quality in adjacent water bodies. Rain gardens are generally placed strategically to capture stormwater from

impervious services (e.g. parking lots) and typically are bowl shaped depressions filled with organic matter and native plants. These depressions then allow for improving the water quality of the stormwater runoff, while allowing for slow infiltration into the ground water.

7.7.1 General maintenance

Most of the grounds maintenance that occurs on LRAFB is provided by services contracted by the government. Air Force employees administering these contracts should ensure that the companies providing the grounds maintenance services are qualified to do the work and are familiar with the regulations and policies outlined in various plans, including this INRMP.

Most of the turf in common or community areas of the base is maintained by a grounds contractor. Privatized Family Housing (PFH) personnel maintain their own lawn areas. Civil Engineering pest management personnel are responsible for weed, insect, and disease control in all turf areas maintained under the grounds contract. Herbicides are primarily used to control weeds associated with paved areas such as sidewalks, roadways, and airfield pavements.

The maintenance contract includes grass cutting, bush-hogging, or other mechanical vegetation control, tree pruning, shrub trimming, fertilization, tree/shrub planting, and other related activities specified in the Grounds Maintenance Contract Statement of Work (Appendix X). No chemical pest control is performed under the grounds maintenance contract. Only 4 acres of unimproved areas are included in the grounds maintenance contract (sewerline to Jacksonville Wastewater Utility).

Grounds maintenance on approximately 1356 acres of improved and semi-improved grounds on LRAFB is performed under the October 2018Grounds Maintenance Contract. Improved ground areas covered by this contract include lawns in the main cantonment, parade grounds, athletic fields, and road shoulders along major thoroughfares. Semi-improved grounds such as the airfield, rifle range, antenna farms, ammunition storage areas, secondary road shoulders, and drainage ditch banks are maintained at a somewhat lower level. For roadside maintenance throughout the installation (where feasible), it is recommended that grass height is maintained along roadways of at least 25 centimeters (cm) (10 inches) from April to August to reduce foraging opportunities for cowbirds, a nest parasitizer.

Mowing is performed as needed to maintain the grass between heights of 2.5 to 4 inches in improved areas. In semi-improved areas, except the airfield, the grass is maintained at heights between 6 to 18 inches. On the airfield, the height is maintained between 7 and 14 inches, in accordance with the Bird/Wildlife Aircraft Strike Hazard (BASH) Plan, to discourage birds from using the airfield. Turf establishment or re-establishment is primarily through the use of hydromulching or sodding. The limited amount of turf areas on unimproved grounds (such as right-of-ways) is mowed to maintain the grass heights between 8 and 24 inches.

Mowing operations at Blackjack Drop Zone should occur the first week of March and then again in late September so not to disturb the nest, eggs, and nestlings of the grasshopper sparrow and the Bachman's sparrow, two rare bird species. All maintenance activities per the contract are to be performed following the standards established by the Professional Grounds Management Society, Arkansas Agricultural Extension Service Master Gardeners, Natural Resources Conservation Service, National Arborist Association, Nurserymen's Association, Horticulture Association, and the local county extension office as references or guidance.

The Grounds Maintenance Solid Waste Management Plan does not currently incorporate any recycling, mulching, or composting program. Soil wastes are disposed of with general waste from the base.

As part of the new scope, the grounds maintenance contractor will be responsible for herbicide and invasive species management. The primary grounds maintenance management issues include invasive species, disease and insects in ornamental and turfed areas, non-point source pollution associated with landscape pesticides, solid waste associated with grounds maintenance activities, and urban forestry management.

7.7.2 Landscaping

Some form of landscaping with trees and shrubs has been performed near most of the buildings in the cantonment and housing areas. An Urban Forestry Operational Instruction has been developed for the base which stipulates location, spacing, and acceptable species of trees and shrubs on the improved portions of the base. A policy has been established whereby plans for all new structures must specify vegetative re-establishment in the construction area, including the use of sod (instead of grass seed) and either tree preservation or replacement. Specific procedures, schedules, and equipment/materials lists are provided as appendices to the Operational Component Plan for Grounds Maintenance.

In 2012, a Landscape Tree Inventory Management Plan (Davey Resource Group 2012) was developed which evaluated LRAFB landscaped tree composition and general health, made recommendations for BMPs, and provided long term strategies to improve maintenance efficiency and tree health. The report recommended expanding tree species diversity in landscaped areas, educate grounds personnel and/or contractors concerning proper tree planting and maintenance, and protecting valuable mature trees. To see detailed results and recommendations from the report, see Section 12.

The use of invasive species for landscaping is prohibited by EO 13112. There are several species of invasive plants in the natural areas of the base which must be controlled. An invasive species management plan (HDR Engineering, Inc. 2016; Section 12) was developed following regional guidelines for common invasive species. This plan is intended to reduce the numbers of invasive species currently on the base and prevent introduction of additional invasive species as a result of typical base land management activities.

7.7.3 Privatized Family Housing and other private facilities

Privatized Family Housing (PFH) is now privately operated, and no longer part of the base management plan. PFH management has a contract to mow all common areas and residential lawns. Residents are responsible for mowing and weed-eating their backyards if they have a fence. All fertilizing and pest control services are also provided by PFH management. PFH management will treat residential yards if the resident submits a work order, or if it is noted that there is a pest issue at change of occupancy during change of maintenance. Lone star ticks (*Amblyomma americanuum*) are a severe pest problem in semi-improved and unimproved areas of the base.

Units and activities have grounds maintenance responsibilities around their facilities in accordance with LRAFB Regulation 91-1, Chapter 6, Base Beautification and Anti-Litter. Responsibilities include parking lot islands and extend to the halfway point between adjacent facilities, to the natural boundary or, in the absence of both, to the point 200 feet from the facility. Housing (19 CES/CEIH) personnel maintain limited areas around the base lake. Several commercial facilities such as the

bank, commissary, and so forth perform their own grounds maintenance in the immediate vicinity of their facilities. Golf course areas are maintained by golf course staff.

7.8 Forest Management

LRAFB's forest program is managed for multiple uses and benefits including timber, wildlife, recreation, water, and the military mission. The goals and objectives section will depict many of the initiatives the base plans to implement over the next five years. Objectives of forest management are to maintain ecological integrity, maintain a biological balance in the forest community, protect watersheds and wildlife habitat, provide quality forest products, and plan and coordinate the multiple uses of forest lands. Commercial forestry occurs on LRAFB. Based on the recommendations for these forests and the various uses of LRAFB, the following forest management strategies are used:

- Avoid tree clearing April 15–September 15 due to nesting migratory birds.
- Implementation of a systematic thinning process.
- Connecting fragmented forest tracts when possible.
- Buffer drainages and wet areas.
- Apply prescriptive fire as a tool to mimic the natural forces in fire maintained ecosystems

Forest lands with the potential to produce commercial products should be managed in a way that integrates sustainable timber resources production and harvest with enhancement of the forest ecosystem. Forest resources should not be harvested for short-term profit at the expense of other long-term needs. An example of the value of the LRAFB forest ecosystem is provided in Figure 16.

Figure 16. Value of Forest Ecosystems. *Dead trees like this provide bat roosting sites under loose bark and in the split of the trunk.*

A timber stand inventory of LRAFB was conducted in 1990 as part of the Commercial Forestry Management Plan (Calvert 1990). The forest inventory was last updated in 2005 by the United Stated Forest Service (Table 7). Management strategy for each stand is determined by using forest

surveys to determine what silvicultural tools are needed. These silvicultural operations should be in accordance with Arkansas Forestry Commission Best Management Practices (BMP), an updated forestry inventory is necessary IAW (AFI 32-7064).

In 2005, there were approximately 509 acres of loblolly pine stands, and 106 acres of shortleaf pine stands at LRAFB (Table 8). Many of the pine stands are overstocked, but a systematic thinning process is being implemented. Thinning is an important part of forest management because it represents the primary means by which forest stands can be controlled or altered during the course of their development. The U.S. Forest Service (USFS) has established thinning guidelines for loblolly and shortleaf pine. Based upon USFS guidelines, the thinning goal for these sites should be approximately 90 square feet (sq ft) of basal area per acre. However, it is recommended that no stand should have its basal area reduced below 50% of the existing basal area. Therefore, the basal area for some of the denser stands should be 100 to 120 sq ft. Over-thinning the stands creates an opportunity for windthrow and/or ice damage, especially in younger stands. The thinning levels proposed should leave the stands in a free to grow condition for 10 years, at which time either another thinning or regeneration should occur.

It is desired to have the forest age class stay below 70 years of age. On this forest, dividing the pine into five equal age classes would result in a regeneration schedule of approximately 120 acres per decade (Table 7). Mature stands will be harvested and promptly reforested with bare-root seedlings. Depending upon regeneration, a precommercial thin around age 10 will likely be needed to reduce competition. Forest ecosystem management is an adaptive management process integrated with research and monitoring to allow forestry operations to become a learning opportunity from which periodic adjustments are made.

Table 7. Pine forest regeneration schedule.

		Age Class Distribution								
		10	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**Total Acres**
Decades	1	120	--	--	479	--	--	--	--	599
	2	120	120	--	--	359	--	--	--	599
	3	120	120	120	--	--	239	--	--	599
	4	120	120	120	120	--	--	119	--	599
	5	120	120	120	120	119	--	--	--	599

Source: USFS 2005

The remainder of LRAFB forests are comprised of the forest types found in Table 8.

Table 8. Other forest types at LRAFB

Forest Type	Acres
Eastern Redcedar	66
Mixed Upland Hardwoods	183
Post - Black Oak	1067
Riverbirch - Sycamore	20
Sugarberry - Elm - Green Ash	95
Sweetgum - Willow Oak	352
Sycamore - Pecan	63
Red Oak/White Oak/Hickory	436
Total	**2282**

Source: USFS 2005

Management of the existing pine forest, through controlled burnings and selective harvesting, needs to be performed in a manner to reduce potential conflicts with airfield operations and temporary aesthetic impacts. Poorly managed stands with a build-up of fuel (dry plant material) on the forest floor may be susceptible to wildfire, which would endanger property and conflict with flight operations. Additionally, periodic thinning removes the less healthy trees, which may be susceptible to disease and opens the canopy for better development of the healthier trees. Delinquency in implementing management will ultimately reduce the value of the stands for the wildlife habitat, aesthetics, and merchantable timber. Figure 17 provides an example of forest stand management around the airfield.

Figure 17. Example of forest stand management. *Logging managed forests near the airfield and other parts of the base.*

Nearly all of the pine stands have a buildup of fuels, and controlled burning is recommended. The AF Wildland Fire Center's Support Module based at Barksdale Air Force Base with be responsible for managing prescribed burning at LRAFB in the future. An Installation Burn Plan is currently being developed.

Lowland hardwood areas will not be managed on a regulatory rotation. Each individual stand and unit will be assessed to determine that particular stand's silivicultural needs. Thinning and small clearcuts will be used to promote forest health and encourage regeneration of future stands.

Hardwoods provide a diversity of plant forage for wildlife as well as a diversity of nesting and cover habitats. The most mature stands at the base are hardwoods, with the best forest structure development. The existing hardwood forest stands need to be managed as uneven-aged units. Small group selective cuttings should be performed to simulate natural disturbance from treefall, thereby maintaining overall stand integrity. The habitat features of the stand are maintained, while the gaps provide opportunity for natural regeneration and increased understory growth for forage, and also release smaller trees to improved growth.

LRAFB forest management works to promote natural forest conditions to help provide a natural balance of both native and non-game species. In forest stands where commercial timber production is not the main objective, dead or dying wood in the form of standing snags and downed logs provides forage and cover for many wildlife species, such as migratory birds and bats. Snags also provide nest and roost habitat for a variety of species including woodpeckers. Much of the base is comprised of fragmented forests. Fragmentation reduces forest health and degrades habitat. Floral and faunal movement is inhibited in isolated forests, restricting breeding and gene flow which result in long-term population decline. The base should avoid the loss or disturbance of even small forest tracts, especially those adjacent to existing wetlands and riparian zones. Habitat improvements are not expected to conflict with flying missions.

Closing or connecting fragmented forests and fields should be considered. There are some

opportunities for connecting some of the smaller habitat fragments by allowing open and cutover areas to regenerate into mature forest. If feasible, open areas should be allowed to regenerate back to forest (either naturally or by planning native trees) to connect fragmented stands. The benefits of additional forest "wildlife openings" for deer and other wildlife should be carefully assessed; these may only provide additional fragmentation, provide cowbird feeding opportunities, and increase predation on eggs and nestlings.

Maintenance of the Approach/Departure Surface along the flight line is needed for flight safety or to improve visibility of the entire field to the tower and overrides management practices for wildlife and commercial forestry. Periodic surveys of the tree height need to be performed in the Approach/Departure Surface to determine which trees are encroaching into it. As possible, a recovery of products (firewood, pulpwood) should be coordinated with removal of encroaching trees. However, special management of trees in wetlands in the Approach/Departure Surface is necessary to minimize impacts to wetlands functions and values. Natural processes should be allowed to continue to stands adjacent to the flight line unless particular needs (such as BASH) require some action. If appropriate, these stands may be managed as uneven-aged units for forest products harvesting.

Forest alterations (e.g., cutting, burning) or disturbances (e.g., mowing) during the nesting season can destroy active nests and eggs, kill nestlings, and/or cause the birds to abandon the nests. To prevent this from occurring, harvesting timber must be avoided from 15 April to 15 August. Selective-cut harvesting should be chosen over clear-cutting if timber harvests are necessary, leaving at least 70% canopy cover in harvested stands.

7.9 Wildland Fire Management

Fire is a historical and essential ecological process in Arkansas. As a result, native plant species have evolved varying degrees of fire tolerance. However, some wildfires could be too large and hot, resulting in the death of even fire tolerant species. Fire is also a cost-effective land management tool used to achieve many habitat objectives and should be incorporated into natural resources management planning whenever feasible. Installation fire management plans establish the objectives for use and desired condition of the military lands. A Wildland Fire Management Policy was developed at LRAFB via a joint effort with the Natural Resources Manager and the base fire department (19 CES/CEF). The Airforce Wildland Fire Center recently awarded a contractor a task order to compose Wildland Fire Management Plans for thirty-four installations and LRAFB's is currently in development. The plan will include fire management practices in unimproved areas of the base. Currently, 19 CES/CEF responds to all fires in unimproved areas. Wildfires occur in every month of the year in Arkansas, but are most prevalent in the spring and late summer. Wildfires do not pose a serious hazard to base ecosystems, cultural sites, infrastructure, or training lands. Limited fires have occurred in the unimproved areas of the base. Since 1990 there have been 11 fires in the non-maintained areas greater than a few square yards: three fires in a wooded area behind the housing area; one in the forest on the north side of the runway; two behind the small arms range; one in the grenade range; one in the woods beyond the west end of the runway; one in the woods behind Arnold Drive Elementary; one in the woods by the Credit Union off-base; and one in the woods south of Vandenberg Boulevard outside the front gate. The fire outside the front gate was contained by the Jacksonville Fire Department. All the others were contained by the base fire department. Erosion control measures should be immediately installed as necessary following the control of a wildfire. Three prescribed burns have been conducted in the forests behind the housing area one in 1997, 2003, and 2009. These fires were performed by The Nature Conservancy and the

USFS. In the future prescribed burns will be conducted at seven year intervals to allow for better management of the amphibians and reptile populations.

The purpose of the Wildland Fire Management Plan is to reduce wildfire potential, protect and enhance valuable natural resources, and implement ecosystem management goals and objectives. Unintentional fires ignited by lightning or mission-related activities can be fought with a defensive attack allowing the fire to play, as nearly as possible, a natural ecological role within the ecosystem. A more aggressive attack would be required if the fire may negatively impact mission activities, threaten infrastructure, equipment, public health and safety, or result in an undesirable effect to natural and cultural resources within approved plans and consistent with site specific management objectives. Use prescribed fire to achieve multiple objectives and benefit a wide variety of species.

If a fire becomes too hot, the entire humus layer can be consumed, exposing the underlying mineral soil to erosion. Prescribed fires should be conducted in late fall to late winter when small animals are dormant to protect them and the mineral soil. Small animals such as baby animals, salamanders, lizards, toads, box turtles, snakes, and mice cannot escape even a slow moving fire. Even if they could go underground they are very likely to suffocate or die from smoke inhalation. Conduct prescribed burns at 5-year intervals to prevent amphibian and reptile destruction.

Prescriptions should focus on enhancing natural communities and ecosystems. Prescribed fire should be used to support mission needs by providing quality training and operations areas, safer urban interfaces, and a natural environment. Firelines should not be plowed through Streamside Management Zones (SMZ). Firelines within a SMZ should be constructed by hand. Firelines outside the SMZ should be installed parallel to the stream. Air Force Wildland Fire Branch, Barksdale Wildland Support Module will conduct future prescribed burns for LRAFB. The Fire Support Lead and the Natural Resources Manager are in the process of developing an Installation Burn Plan, to be approved by the installation Fire Chief. Figure 18 shows a prescribed burn on LRAFB.

Figure 18. Prescribed burn south of privatized family housing. *This prescribed burn south of the privatized family housing area was used to help restore the Post Oak Savannah. Prescribed burning helps control invasive species and promote new herbaceous plant growth.*

7.10 Agricultural Outleasing

Applicability Statement

This section applies to AF installations that lease eligible AF land for agricultural purposes. This section **IS NOT** applicable to LRAFB.

7.11 Integrated Pest Management Program

Invasive and exotic species may include plants, insects, or animals. An invasive species is defined as an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. An alien or non-native species including its seeds, eggs, spores, or other biological material capable of propagating that species that is not native to that ecosystem (EO 13112). Because of the invasive capacity, many exotic species have the ability to spread rapidly through ecosystems since natural predators are often not present. Such species often retard natural succession and reforestation and generally cause a reduction of biological diversity in natural ecosystems and can usurp the position of native species in the environment.

Noxious weeds are defined as any living stage (e.g., seeds and reproductive parts) of any parasitic or other plant of a kind, or subdivision of a kind, which is of foreign origin, is new to or not widely prevalent in the United States, and can directly or indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture, including irrigation, or navigation or the fish and wildlife resources of the United States or the public health (Federal Noxious Weed Act of 1974). Most noxious weeds are introduced species (non-native) and have been introduced into an ecosystem by ignorance, mismanagement, or accident. Typically, they are plants that grow aggressively, that multiply quickly without natural controls.

7.11.1 Integrated Pest Management

LRAFB has an Integrated Pest Management Program (IPMP) implemented by the CE Operations Flight (LRAFB 2016). IPM is the use of multiple techniques in a compatible manner to avoid damage and minimize adverse environmental affects while obtaining control of target pests. The goal of IPM is to utilize non-chemical procedures to control pests, including invasive, exotic plant and animal species.

Management goals associated with pest management assess how pest species interrelate with the NRM of the installation and controlling invasive species. An IPMP was designed for the base and is provided in Section 12. Pest management records will be maintained in the Enterprise Environment, Safety, and Occupational Health Management System (EESOHMIS). The IPMP is reviewed annually by the Installation Pest Management Coordinator, Installation Environmental Coordinator, Senior Installation Engineer, Installation Medical Officer, Installation Commander, and AFCEC/COSC Pest Management Consultant .

LRAFB only uses pesticides that are approved by the EPA and AFCEC /COSC. Low-toxicity pesticides are applied to infested areas, when necessary. Herbicides are used to control weed growth, especially around the runways and taxiways. Vertebrates such as rats, opossums, and birds are controlled through the use of trapping devices and poisons for rats, as necessary. Exotic nuisance plant species are treated with herbicide.

On 5 June 18, the United States Department of Agriculture confirmed the first known presence of the exotic Longhorn tick (*Haemaphylis longicornis)* in Arkansas. Dr. Keith Loftin of the University of Arkansas at Monticello conducted tick surveys at three locations on Base 28 June 2018 in an effort to provide members of LRAFB's Public Health Office, Entomology, and Natural Resources tick surveillance training. Collected samples to be analyzed for species identification and for the presence of tick-borne disease by the University of Texas Medical Branch.

7.11.2 Invasive Species

A six-year Invasive Species Survey, Treatment and Control, and Monitoring Program took place from 2010 through 2016 (HDR Engineering, Inc. 2016; Section 12)). The priority species targeted are listed in Table 4 in Section 5.2. The 2010 program focused on land along linear features such as roads, ditches, and mowed right-of-way (ROW). The 2011 program continued survey, monitoring, and treatment of the aforementioned areas, and expanded into two commercial timber areas. As part of the 2011 program, surveys were conducted in May and July 2011, and treatment was conducted in June and July through October 2011. The 2012 program resurveyed all areas that had been previously surveyed to monitor the treatment of linear features and the commercial timber areas (the timber areas are addressed in a separate report). Unlike the previous three years of the program, 2013 and 2015 treatments did not include surveying or monitoring. Because of reduced funding, there was no survey, treatment, or monitoring in 2014 and the 2013, 2015, and 2016 programs focused only on treatment efforts. (HDR Engineering, Inc. 2016; Section 12)

Insects such as fire ants, mosquitoes, cockroaches, fleas, ticks, bees, wasps, hornets, and termites are monitored and managed around the base. In 2010, a pilot project was launched under a Department of Defense Legacy project to help manage fire ants. Dr. Kelly Loftin of the University of Arkansas Cooperative Extension Service is conducting biological control of the red imported fire ants on base using the phorid fly, (*Pseudacteon curvatus*; Loftin 2015a). If this project is

successful and additional *Pseudacteon* species are released and establish, the use of chemicals for the treatment of fire ants could be reduced. It will also save the base money and will help the local communities surrounding the base by reducing the overall number of fire ants in the region. Updates on this project will be provided in future reports.

In May 2010, seven locations were surveyed on the base, and two were found to be suitable for the introduction of the phorid fly. The two suitable locations are the Munitions Storage Area and the jogging/walking trail that goes from Vandenberg Boulevard to Marshall Road. Dr. Loftin collected fire ants to be parasitized by *P. curvatus* twice in June from colonies located near the Munitions Storage Area. Collected ants were shipped to the Florida Department of Agriculture Lab in Gainesville, FL (under contract from USDA APHIS) for parasitization by *P. curvatus*. These parasitized ants were released back into their specific mound eight days after each collection date. Dr. Loftin and his staff returned on 12 October 2010 to sample for *P. curvatus*. *P. curvatus* was recovered from phorid fly traps placed on this date. These collections indicate that this phorid fly species released at LRAFB had undergone at least two complete generations. In 2013, approximately 50,000 phorid flies (*Pseudacteon obtusus* and *Pseudacteon cultellatus*) were released but none recovered as of late 2013 and 2014; however *P. curvatus* , which was released in 2010, was abundant during sampling in October 2014 (Loftin 2015a).

The current Fire Ant Management Plan provides recommendations to manage red imported fire ants at LRAFB (Loftin 2015b). The goal of the program is to keep fire ant abundance below the level that causes damage for a particular area or circumstance. IPM options mentioned in the management plan include (1) regulatory control, (2) cultural control, (3) biological control, and (4) chemical control. For details, the Fire Ant Management Plan for LRAFB can be found in Section 12.

7.11.3 Management Strategies for Invasive Species

Invasive, non-native species and noxious weeds have the capability to significantly impact native vegetation and wildlife. A key element of INRMP implementation is to ensure no net loss of military training capability. Management of undesirable species is necessary to maintain military lands and facilities in usable condition. In addition, uncontrolled animal pests can become health hazards, which could threaten the military mission.

The task of controlling invasive and exotic species and noxious weeds is often expensive, lengthy, and risky because total eradication is required to prevent reestablishment. Prevention is the best approach. However, in accordance with laws and regulations pertaining to the management of these species, the NRM group will work to prevent the introduction of these species and take measures to control them in an economically and environmentally sound manner. General management strategies are as follows:

- Implement Best Management Practices (BMPs) to minimize land disturbances that favor invasion of non- native species and re-vegetate disturbed areas with native species.
- Native rock material should be used instead of non-indigenous rock when practical for maintenance or construction projects.
- Utilize mulches from LRAFB or certified-weed free sources to facilitate the establishment of native ground cover on impoverished soils.
- Maintain biodiversity and undisturbed habitat to maximize resilience to and competition with invasive species.

- Control invasive and exotic species and noxious weeds through early detection, isolation of infested areas, and control of individual plants with physical, chemical or mechanical means, depending on the species.
- Favor basal application and spot treatment and avoid aerial or broadcast application of pesticides to prevent adverse impacts to native plants and wildlife.
- Do not use invasive, non-native species in landscaping.
- Continue to reseed exposed soils using a certified weed-free native grass mix.
- Education of users, maintenance staff and others as relevant.

The use of chemicals to control invasive and exotic species can hinder an installation's efforts to reduce usage of pesticides. Therefore, it is important to prevent the initial spread of invasive and exotic species and address the spread of such species as early as possible to reduce the amount of required herbicide and pesticide applications, and reduce costs associated with treatment. The LRAFB NRM should evaluate the threat of invasive species as well as the environmental impacts to the environment and permitting requirements of herbicide usage (if applicable) prior to implementing any eradication and/or control program.

7.12 Bird/Wildlife Aircraft Strike Hazard (BASH)

LRAFB wing staff and operations group implements a BASH Plan (LRAFB 2015a) which has established specific procedures intended to reduce known and future hazards from birds, including the development of a Bird Hazard Working Group (BHWG). The BHWG is chaired by the Vice Wing Commander and is responsible for developing, implementing, and updating the BASH Plan and reviewing BASH incidents. The natural resources manager (NRM) also participates in the BHWG.

The potential for BASH has been reduced by an effective BASH Plan developed by the LRAFB Flight Safety office in coordination with the installation NRM. The Plan includes close management of the grass height in and around the airfield to reduce flocking of blackbirds, monitoring, and reporting of flocks by all airfield users, and a central bird hazard warning system for air crews. Monitoring of flocks throughout the normal flight zones is also performed with particular areas of high risk avoided by de-conflicting flight patterns, i.e., avoiding direct overflight, whenever feasible. It also mandates the use of the Bird Strike Threat (BST) calculator in mission planning developed to be used in conjunction with Avian Hazard Advisory System/Bird Avoidance Model (AHAS/BAM) to predict bird strike threat risk.

Despite the proximity to the Mississippi Flyway, deer are a greater potential aircraft strike hazard at LRAFB than birds. A deer sighting log is maintained and includes the number of deer, their location, direction of travel, and record of runway intrusions. Birds and deer are dispersed from the airfield utilizing horns, sirens, pyrotechnics, and/or vehicles whenever they pose a hazard to aircraft operations. Airfield management as well as the USDA representative, are the agencies responsible for the dispersal of birds/deer. Ten remotely controlled bird scare cannons have been placed around the airfield to help in bird dispersal. These cannons are controlled by airfield management. Under bird and deer watch conditions classified as "Moderate" or "Severe" pyrotechnics may be used. These practices have proven adequate in most situations. A 6-foot vertical woven wire "deer fence" was installed in September 1999. The fence has proven to be inadequate. Modifications have been made to increase the effectiveness. Plans are in place to replace the fence with an 8-foot woven fence.

As long as current threat reduction practices continue to be employed on the airfield, local duck and geese populations currently pose little conflict with airfield operations. However, the Bird Avoidance Model (BAM) graphs predict waterfowl migration hazards. Raptors and blackbirds pose year-round hazards. Migratory birds are protected by Federal law and managed by the USFWS. The base has a bird depredation permit from the USFWS and a deer and coyote depredation permit from the AGFC. A USFWS bird depredation permit, in accordance with 50 CFR part 13 and part 21.41, number MB817795-1 and an AGFC deer and coyote depredation permit are on file in the NRM office. The LRAFB BASH Plan 091-15 is included in Section 12.

7.13 Coastal Zone and Marine Resources Management

Applicability Statement

This section applies to AF installations that lease eligible AF land for agricultural purposes. This section **IS NOT** applicable to LRAFB.

7.14 Cultural Resources Protection

Important historical cultural resource items are present at LRAFB. Very little information of the cultural resources is made public to prevent any intentional destruction or collection of cultural artifacts. The resources will be managed on a case-by-case basis when development or disturbance of the specific areas of interest are proposed. The base Cultural Resources Manager (CRM) will review all plans for the possible effects on the cultural resources, and the State Historic Preservation Officer will be consulted in the event that a base project potentially could affect cultural resources.

To protect these resources and to integrate cultural resources management into the planning and implementation of construction, training, and land use, an Integrated Cultural Resource Management Plan (ICRMP) has been prepared and is reviewed annually by CES/CEIE, with any major revisions required every five years.

In support of the mission at LRAFB and to assist in compliance with the National Historic Preservation Act (NHPA), the ICRMP cites the relevant historic preservation laws, which the Air Force must comply with, presents various information useful for determining the significance of the installation's cultural resources, summarizes the base's inventory of known cultural resources and identifies the potential for discovery of additional significant resources, describes present and anticipated near-term land uses and identifies potential threats to cultural resources and activities regulated by or exempted from regulation by the ICRMP, and provides standard operating procedures and prioritized action plans and programs for cultural resources management.

Currently LRAFB has no buildings or areas that are protected under the NHPA. Building 258 is a 1963 B-58 Hustler Hut, a structure on wheels that is capable of movement. There is currently an office space and a fuel pump within the interior of the structure, preventing eligibility for listing on the Natural Register of Historic Places. The Arkansas State Historical Preservation Office has stated that B-258 will become eligible for listing if it is relocated.

The ICRMP and general protection of cultural resources were considered during preparation of the INRMP. It is the NRM's responsibility to coordinate a natural resource activity/action with the cultural resource manager (CRM).

Specific examples of necessary ICRMP coordination with INRMP implementation include:

- Fire management such as firebreak construction
- Removal of natural and manmade materials
- Restoration projects such as riparian buffer zone enhancement, installation of RCRA C landfill cap, and runway expansion project.

7.15 Public Outreach

LRAFB sponsors annual Earth Day and Arbor Day celebrations in addition to an annual children's fishing event centered on Connecting Kids with Nature. Literature on LRAFB natural resources and conservation in general are available at newcomer orientation and in CEIE. The Installation Natural Resources Manager makes frequent visits to on- and off-base schools to educate children about natural resources and wildlife biology. Key announcements pertaining to natural resources programs and events are coordinated through the Public Affairs Office for inclusion in the base newspaper.

7.16 Geographic Information Systems (GIS)

GIS is a useful management tool that facilitates creating, storing, analyzing and managing spatial data and associated attributes. GIS allows managers to examine ecosystem components where each component is represented as a layer in a spatial format. Layers may be viewed individually for continuity or uniqueness, or several layers can be viewed simultaneously to identify relationships.

LRAFB Natural Resources data are developed and maintained by AFCEC Installation Support System (ISS) Environmental GIS Support Analyst and stored both locally and on the Base network. All data are maintained and displayed using ArcGIS. This software package gives LRAFB NR the ability to create theme related shape files, digitize maps, store data and compile reports or analyses for natural resources management.

Several existing key natural resources layers include:

- Delineated Floodplain and Wetland Areas
- Waterbodies
- Timber Stands
- Land Cover
- Designated Hunting Areas
- Land Cover
- Invasive Species
- T & E Habitat Locations
- T & E Sightings
- Recreation Areas
- Wildland-Urban Interface Areas

In addition, LRAFB should not only maintain a natural resources management database in GIS, but also track progress toward goals. To accomplish this, LRAFB should continue to consult with AFCEC for information on the appropriate format and software to be used. Maps should be prepared on a scale that is practical for the size of the installation and should be reviewed annually. GIS maps should be compatible with base comprehensive planning maps. GIS and other information on species and habitat should be shared with the State Natural Heritage database and the local Nature Conservancy. Finally, LRAFB should ensure that at least three or four people are annually trained in the use of GIS receivers and field computers.

The following Table 9 provides a summary of natural resource GIS data currently available for LRAFB:

Table 9. Summary of natural resource GIS data available for LRAFB		
GIS Data	**Source**	**Year Updated**
Streams, Open Water	LRAFB GIO	2016
Riparian Areas	LRAFB GIO	2005
Wetlands	USACE Little Rock District	2007
Floodplains	USACE	2011
Land Cover	HDR, Inc & CSU-CEMML	2017
Watersheds	USACE & CSU-CEMML	2011
Soils	NRCS	2002
Nature Trails	CSU-CEMML	2016
Fire Area (natural)	LRAFB NR & CSU-CEMML	2016
Wildand/Urban Interface	Southern Group of State Foresters	2017
Bird & Bat Survey Stations	ERDC, LRAFB NR and CSU-CEMML	2017
Hunting & Fishing	LRAFB NR & CSU-CEMML	2016
Forest Stand	LRAFB NR & CSU-CEMML	2005
Noxious & Invasive Species	HDR Engineering & CSU-CEMML	2011
Forest Compartment	LRAFB NR & CSU-CEMML	2016
ILT Locations	USFWS & LRAFB NR	2015
RMBM Locations	TNC Arkansas	2017
Aerial Imagery	Multiple Sources	--
Notes: LRAFB NR=Little Rock Air Force Base Natural Resources CSU CEMML=Colorado State University Center for Environmental Management NRCS=Natural Resources Conservation Services ERDC=US Army Engineer Research and Development Center USACE=US Army Corp of Engineers TNC=The Nature Conservancy USFWS=US Fish and Wildlife Service		

7.17 Soil Conservation & Sediment Management

Land management practices affect erosion, soil integrity and sediment loss, which in turn affects stormwater runoff and, ultimately, surface water and groundwater quality. The issues and management strategies for this section overlap significantly with the next section on water quality

protection. This section will primarily focus on management to protect soil integrity and limit erosion, while the next section on water quality will include other natural resources and measures in addition to soil management.

Two main types of soil erosion exist: wind erosion and water erosion. Wind erosion is not a significant issue at LRAFB. Several factors affect water erosion. These factors include rainfall, slope steepness and length, soil texture or erodibility, cover protecting the soil, and special practices such as terracing or planting on the contour. Sediment resulting from erosion affects surface water quality and aquatic organisms. Loss of soil integrity leads to erosion and sediment loss results from erosion, primarily during stormwater runoff. Erosion can be a significant management concern at LRAFB along riparian areas and around Pat Wilson Lake and the Small Base Lake.

Stormwater runoff is produced when rainfall during a storm exceeds the infiltration capacity of the soil or encounters an impervious surface. Stormwater runoff can be a significant source of pollutants as well as sediments to surface waters, especially in areas with impervious surface cover or where groundcover has been disturbed. Sources of stormwater runoff and pollution could originate from operational, maintenance, and/or administrative areas within the LRAFB (LRAFB 2015c). Additionally, stormwater runoff from impervious surfaces has a high potential to carry pollutants into wetlands, surface waters, and groundwater. Impervious surfaces at the LRAFB include roads, parking lots, taxiways, sidewalks, and buildings. Water quality also may be negatively impacted by disturbances causing increased sedimentation to wetlands and stream channels (Section 7.6).

7.17.1 Stormwater Management

Stormwater management is important at LRAFB, given the extent of development and 14 outfalls into nearby Cypress Branch to the west, Jack's Bayou on the east, and the Rocky Branch on the south, many of which empty into the Arkansas River. General stormwater guidelines and current BMPs are presented in the Storm Water Management Plan for LRAFB (LRAFB 2015c).

Although water quality monitoring is not required, it is a good way to measure ecosystem health. Land-based environmental degradation eventually affects water quality and aquatic ecosystems. To protect water quality, the LRAFB already implements the following strategies:

- Maintain vegetation buffers around water resources (see **Section XX**);
- Adhere to BMPs for construction and industrial activities as described in applicable manuals, plans and permits;
- Minimize the amount of impervious surfaces in newly developed areas;
- Minimize the use of pesticides;
- Revegetate barren ground;
- Monitor surface water quality;
- Prevent surface water pollution by ensuring environmental plans (e.g. SWPPP) are followed.

7.18 Coordination with Host Facilities for Natural Resources

7.18.1 Coordination with City of Jacksonville and Pulaski County

Coordination with the city of Jacksonville is restricted to adhering to current waste water and stormwater permits (*see* Section 6). There is currently no natural resource coordination with Pulaski or White Counties.

7.18.2 Arkansas Game and Fish Commission (AGFC)

A Cooperative Agreement for Fish and Wildlife Management was entered into in 1992, by and between the DoD, functioning through the Support Group Commander at LRAFB; the DOI, functioning through the Regional Director of the USFWS; and the State of Arkansas, functioning through the Director of the AGFC. As outlined in the tripartite agreement, "it is the mutual desire of the Air Force, the Service, and the Commission to work in harmony for the common purpose of developing, maintaining and managing the fish and wildlife resources at LRAFB for the best interest of the people of Arkansas and the United States." Further pursuant to the agreement, the Service and Commission will act in an advisory capacity to LRAFB in these matters. Assistance to LRAFB under the agreement has included sampling, stocking, and recommendations for improvement of the base lake fishery by the AGFC. A copy of the agreement is provided in Section 12 and Arkansas's Wildlife Action Plan is available at <http://www.wildlifearkansas.com/strategy.html>.

7.19 Encroachment Management

AFI 90-2001, *Encroachment Management*, mandates installations to develop and maintain Internal Installation Complex Encroachment Management Action Plans (ICEMAPs) until funding is secured for an external ICEMAP. ICEMAPs are designed to assist the MAJCOM and the installation commander in developing a comprehensive plan to manage encroachment challenges and their impacts on the installation's operations. A successful Internal ICEMAP is built upon three major premises:

- Multiple stakeholders' interests are to be considered. The Internal ICEMAP will take into consideration the installation and local community, and regional, state, national, and international interests.
- Solutions cannot be implemented solely by the installation. Many of the encroachment challenges require the assistance of service field operating agencies and higher headquarters.
- Regulatory change is constant. The installation should monitor proposed legislation and regulations because compliance with federal, state, and local regulations is mandatory. Monitoring ensures that potential impacts are identified early and that the regulatory community is made aware of potentially adverse impacts on installation operations posed by such proposals.

The Installation Encroachment Management Team is responsible for developing the Internal ICEMAP at LRAFB, the most recent being completed in 2015 (LRAFB 2015b).

7.20 Pollinator Protection

DoD has emphasized the importance of pollinator conservation to the military services by developing partnerships to support their conservation. DoD has Memorandums of Understanding (MOUs) with Bat Conservation International (BCI) and Pollinator Partnership (P2). The U.S. Air Force (USAF) Pollinator Conservation Reference Guide was developed collaboratively by the USFWS and the Air Force Civil Engineer Center (AFCEC; March 2018). The MOU with BCI "establishes a policy of cooperation and coordination between DoD and BCI to identify, document and maintain bat populations and their habitats on DoD installations" (signed Oct 2006, renewed Dec. 2011). The MOU states that this framework is important to "ensure that pollinator management activities are incorporated where practicable, into installation Integrated Natural source Management Plans (INRMPs) and practices." The objective of the MOU with P2 "is to

establish a framework for cooperative programs that promote the conservationand management of pollinators, their habitats and associated ecosystems" (signed Feb. 2015). Conservation of pollinators by Air Force alone or in collaboration with groups such as BCI and P2 supports these DoD initiatives.

Some areas of Air Force installations are more suitable for pollinator habitat conservation due to current use and/or habitat condition. For example, conservation on unimproved (natural) areas, buffers, recreation areas, rights-of-way, golf courses, and landscaped areas may be more compatible with mission requirements than other areas. These areas should be a priority for implementing pollinator habitat improvements and using land management practices in ways beneficial to pollinators.

Installations are required to conduct "a basic reconnaissance survey to determine the presence of any federally listed Threatened, Endangered or Candidate species on an installation" with methods, scope, and species considered determined after consultation with the USFWS (AFI 32-7064, , Chapter 8.2). Additional reconnaissance surveys are required when a newly listed species may occur on the installation. Resurveys may be required in certain situations (e.g., if stipulated in a Biological Opinion, Recovery Plan or INRMP). If a federally listed species may be affected by a federally funded or authorized project, consultation with USFWS is required under Section 7(a)(2) of ESA. Furthermore, Section 7(a)(1) of ESA calls upon Federal agencies to "utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species." In support of Section 7 (a)(1) of ESA, INRMPs must provide an ecosystem management strategy that provides for protection and recovery of federally listed species (AFI 32-7064, Chapter 8).

The U.S. Air Force Pollinator Conservation Reference Guide provides specific pollinator conservation measures which can be implemented by the Air Force. The U.S. Air Force Pollinator Conservation Reference Guide was finalized March 2018, and is available on USFWS and AFCEC eDASH Natural Resources websites. The USAF Pollinator Reference Guide, developed by the U.S. Fish and Wildlife Service, establishes guidance as a National Pollinator Conservation Strategy on lands owned by the Air Force. It supplements existing policy and instructions to guide Air Force actions to contribute to pollinator conservation under Presidential Memo and Federal Pollinator Health Strategy. Further provides Technical Guides as reference materials for pollinators of conservation concern (listed species, birds of conservation concern, bees and monarch butterflies), and native plant recommendations specific to ecoregions (*see* <https://www.fws.gov/pollinators/pollinatorpages/USAF_Ref_Guide.html>).

A project to create and enhance pollinator habitat began spring 2018 (Figure 19). The habitat will contain native milkweed, the host plant of the monarch butterfly. Though the monarch butterfly has not been documented as occurring on LRAFB, it is known to migrate through central Arkansas.

Figure 19. Pollinator habitat restoration area at LRAFB.

8.0 MANAGEMENT GOALS AND OBJECTIVES

Goals and objectives provide the framework for the natural resources management programs. Goals provide a general guiding direction for each technical area and logical objectives that facilitate achieving those goals are described for any priority issues within each technical area. The objectives then drive the development of activities and projects to achieve those objectives. Activities and projects, and the objectives they support, are described in Tables 10 and 11 in Section 10.0. Below are the goals identified in Section 1.0.

GOAL 1: Provide a natural resource management program within 19 CES/CEIE that supports the 19th AW mission while protecting ecosystem diversity to the maximum extent possible while complying with applicable federal and state laws and USAF regulations and policies.

OBJECTIVE 1.1: Prepare budget necessary to implement natural resources management plan.

OBJECTIVE 1.2: Prepare INRMP in cooperation with US Fish and Wildlife Service (USFWS) and the Arkansas Game and Fish Commission (AGFC)

TASK 1.2.1: Conduct INRMP annual reviews with cooperative agencies.

OBJECTIVE 1.3: Initiate and/or continue programs and projects that enhance the training land and training opportunities and result in no net loss of training land availability.

OBJECTIVE 1.4: Use adaptive, ecosystem management as the primary natural resources management paradigm.

OBJECTIVE 1.5: Maintain BASH plan.

TASK 1.5.1: Implement BASH risk reduction measures.

OBJECTIVE 1.6: Continue internal environmental awareness activities to minimize impacts to natural resources by LRAFB personnel and visitors.

OBJECTIVE 1.7: Continue outdoor recreation program in conjunction with Outdoor Recreation Center (ORC)

OBJECTIVE 1.8: Continue public outreach in coordination with other regional entities as appropriate.

OBJECTIVE 1.9: Continue to cooperate with other agencies and local landowners on regional land and natural resources management efforts.

OBJECTIVE 1.10: Maintain and improve Geographic Information System (GIS) data and access to that data by LRAFB personnel.

GOAL2: Remain in compliance with federal, state and local laws and regulations governing natural resources.

OBJECTIVE 2.1: Cooperatively support USFWS and State of Arkansas protection goals

OBJECTIVE 2.2: Maintain correspondence with USFWs and State of Arkansas regarding updates to federal and state threatened, endangered, and species of concern lists.

OBJECTIVE 2.3: Maintain appropriate state and federal permits to enable necessary wildlife control

TASK 2.3.1: Maintain Federal Migratory Bird Depredation Permit under Migratory Bird Treaty Act

TASK 2.3.2: Maintain AGFC Depredation Permit for Deer and Coyote

TASK 2.3.3: Assess BASH related-populations annually and apply for depredation-permit renewal for appropriate species

GOAL 3: Manage soil to minimize sediment loss and erosion, while protecting water quality.

OBJECTIVE 3.1: Manage shorelines on Big Base Lake and Small Base Lake to minimize erosion and sediment loss.

TASK 3.1.1: Develop erosion and sediment control manual with site-specific BMPs.

OBJECTIVE 3.2: Manage stormwater runoff in order to reduce erosion, encourage infiltration upstream of major water bodies, and reduce nutrients before runoff enters major water bodies.

OBJECTIVE 3.3: Minimize nonpoint source pollution through implementation of BMPs, following existing spill prevention and hazardous materials management protocols, and education.

OBJECTIVE 3.4: Monitor at-risk construction sites to ensure erosion and sediment control measures are effective.

OBJECTIVE 3.5: Maintain riparian management zones around water resources.

GOAL 4: Manage water resources so they remain resilient and with no net loss of acreage or functions and values.

OBJECTIVE 4.1: Minimize impacts to water resources and comply with all laws and regulations pertaining to wetlands, streams, floodplains and regulated water bodies.

TASK 4.1.1: Review proposed activities for potential impacts to water resources.

TASK 4.1.2: Coordinate with USACE and ADEQ regarding activities likely to impact wetland or other water resource and identify mitigation options.

OBJECTIVE 4.2: Maintain or enhance riparian management zones around water resources.

Task 4.2.1: Update wetland and other water resources mapping and delineations.

OBJECTIVE 4.3: Implement management measures to reduce impacts to water quality in major water bodies.

OBJECTIVE 4.4: Mitigate/enhance stream and riparian area IAW permits issued under Section 404 of Clean Water Act

GOAL 5: Manage vegetation to promote a diversity of native species using cost effective and sustainable methods.

OBJECTIVE 5.1: Develop comprehensive vegetation community data based on the National Vegetation Classification System (NVCS)

Task 5.1.1: Conduct vegetation survey using remote sensing and ground truthing.

OBJECTIVE 5.2: Maintain intact, healthy habitat and enhance or restore degraded habitat, without increasing BASH risk.

OBJECTIVE 5.3: Maintain intact, healthy habitat and enhance or restore degraded habitat, without increasing BASH risk

OBJECTIVE 5.4: Promote ecosystem diversity through mechanical and approved herbicidal treatments to remove or reduce invasive plant species utilizing an integrated pest management approach in accordance with IPMP.

TASK 5.4.1: Monitor regularly for new invasive species or sudden increases in densities of existing invasive species.

TASK 5.4.2: Survey and map invasive plant species.

TASK 5.4.3: Conduct ecosystem surveys in invasive species areas considered for potential management in order to assess ecosystem benefits and risks of invasive species removal.

OBJECTIVE 5.5: Maintain forested areas and ensure management does not cause impacts to nesting migratory birds.

OBJECTIVE 5.6: Coordinate with nearby installation foresters to assess forest health and determine management recommendations.

OBJECTIVE 5.7: Manage airfield environments so that trees and other vegetation do not violate airfield clearance specified in Uniform Facilities Criteria (UFC 3-260-01).

TASK 5.7.1: Remove any trees penetrating the Airspace Imaginary Surfaces at LRAFB and BDZ.

OBJECTIVE 5.8: Perform Timber Stand Improvement operations for enhanced forest health.

TASK 5.8.1: Conduct updated forest inventory as directed by AFI 32-7064

TASK 5.8.2: Acquire appropriate equipment necessary for timber-stand improvement operations.

OBJECTIVE 5.9: Develop and administer the sale of forest products. Establish sale boundaries, protecting Streamside Management Zones and other sensitive areas. Perform quality assurance for logging operations as per contract specifications.

OBJECTIVE 5.10: Promote the health and condition of forest ecosystems through fire management

TASK 5.10.1: Apply prescriptive fire as a tool to mimic the natural forces in fire maintained ecosystems.

OBJECTIVE 5.11: Evaluate urban forest sustainability and provide locally specific strategies for sustainable urban forest planning and management.

TASK 5.11.1: Coordinate tree protection efforts on all construction projects.

TASK 5.11.2: Provide consultation on projects that impact trees on base. As a general policy, plantings should occur at the same or greater frequency than removals.

TASK 5.11.3: Apply for Tree City USA certification annually.

TASK 5.11.4: Use native plant species and materials for landscaping activities.

OBJECTIVE 5.12: Develop Golf Course Environmental Management Plan.

GOAL 6: Manage fish and wildlife to maintain populations of game and non-game species consistent with 19AW mission and ecosystem management.

OBJECTIVE 6.1: Minimize BASH risk by deterring hazardous birds and other wildlife from the airfield and its critical zone.

OBJECTIVE 6.2: Maintain populations of wildlife away from the airfield on LRAFB by minimizing negative impacts and by providing healthy, diverse habitat types and corridors for wildlife movement between those habitats.

OBJECTIVE 6.3: Install and maintain habitats that encourage pollination activities in appropriate areas on base.

OBJECTIVE 6.4: Improve game management practices on LRAFB.

TASK 6.4.1: Conduct annual deer population survey to determine on-base deer population, and establish and implement effective population control strategies.

TASK 6.4.2: Manage hunting programto reduce deer herd size and increase the quality of habitat.

TASK 6.4.3: Maintain annual record of harvested game.

TASK 6.4.4: Develop strategies to manipulate deer herd population sex ratios and age structure to more natural levels such as harvest regulations.

TASK 6.4.5: Improve wild turkey and quail habitat by creating small forest openings that promote growth of shrubs, small trees, and vine tangles interspersed in patches of herbaceous vegetation to provide cover, nesting sites, and a variety of food sources for birds.

OBJECTIVE 6.5: Improve recreational fisheries at LRAFB.

TASK 6.5.1: Manage vegetation to maintain properly balanced aquatic ecosystem.

TASK 6.5.2: Use herbicidal and/or mechanical treatments to control the spread of Alligatorweed in the base lakes.

TASK 6.5.3: Install artificial structures to attract fish and provide cover for forage species.

TASK 6.5.4: Implement yearly fertilization program, as advised by AGFC, to increase lake productivity.

OBJECTIVE 6.6: Continue to develop and maintain the wildlife habitat on LRAFB to support existing and recovering wildlife species.

TASK 6.6.1: Create and maintain wildlife openings throughout forest.

TASK 6.6.2: Conduct current fisheries/wildlife surveys with an emphasis on rare species.

OBJECTIVE 6.7: Conduct avian surveys to supplement previous inventories and establish distribution, abundance, and long range trends of seasonal bird communities found on the installation for bird habitat management decisions, Bird-Aircraft Strike Hazard management decisions, environmental assessments, and construction citing decisions.

TASK 6.6.1 Create and maintain wildlife openings throughout forest.

GOAL 7: Manage endangered, threatened, and rare species habitat using an ecosystem approach, while maintaining the military mission at LRAFB.

OBJECTIVE 7.1: Manage rare water-dependent species (e.g., Interior Least Tern) by protecting the shorelines of, and water quality in, the Big Base Lake, Small Base Lake, and streams.

OBJECTIVE 7.2: Protect and enhance ILT nesting habitat.

TASK 7.2.1: Develop conservation management plan for ILT

TASK 7.2.2: Apply for 10(a)(1)(A) Reseaerrch and Recovery Permit.

TASK 7.2.2: Implement ILT roof protocol during nesting season.

TASK 7.2.3: Install features, i.e. wooden pallets, on rooftops to provide shade.

TASK 7.2.4: Apply for USFWS 10(a)(1)(A) Research/Recovery Permit.

OBJECTIVE 7.3: Manage rare forest-dependent species by using sustainable forestry practices and avoiding tree removal during nesting periods.

OBJECTIVE 7.4: Manage rare prairie-dependent species by protecting existing prairie habitat, initiating regular disturbance mechanisms to maintain early successional habitat, and any other action that would degrade prairie quality.

TASK 7.4.1: Conduct surveys of Rattlesnake Master Borer Moth and its host plant, the Rattlesnake Master in order to provide protection as practical of candidate species, and provide an overall ecosystem management strategy for the protection and recovery of candidate species.

TASK 7.4.2: Reduce BASH risk by transplanting/planting Rattlesnake Master seeds to promote plant establishment in areas on base away from airfield.

OBJECTIVE 7.5: Monitor for potential listed species during any natural resources activities.

TASK 7.5.1: Conduct survey to document status and likelihood of potential federally listed species.

OBJECTIVE 7.6: Review all demolition/construction projects and military activities for potential impacts to rare, threatened, and endangered species by following guidelines and obtaining appropriate permits, as required.

GOAL 8: Minimize impacts of invasive plant and pest species with mechanical treatment and minimal chemical applications, utilizing an integrated pest management approach.

GOAL 9: Enhance Natural Resources Programs with continual training opportunities

OBJECTIVE 9.1: Provide training opportunities that will provide Natural Resources staff with the current skills needed to keep program in compliance with applicable law.

9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.1 INRMP Implementation

Management goals and objectives for the INRMP were developed through a thorough evaluation of the natural resources present on LRAFB. In accordance with AFI 32-7064 and the principles of adaptive ecosystem management, subject areas were identified, and management alternatives developed by an interdisciplinary team of ecologists, biologists, geologists, planners, and environmental scientists. Appendix I presents the preferred management alternatives based on the professional opinions of the LRAFB INRMP Task Force, including the USFWS and AGFC. Through these evaluations, a set of natural resources management goals have been established (see Section 8.0).

This INRMP will be implemented through the various policies and programs described throughout the document and accomplishment of the goals and objectives as described in Section 8.0. The implementation schedule, project and activity lists, and how the projects relate to INRMP implementation are detailed in Tables 10 and 11.

This INRMP is a living document that is based on short-, medium-, and long-term planning horizons. Short-term tasks include activities and projects that are planned to occur in 0 to 5 years, while medium-term tasks include activities and projects in a 6- to 10-year period. Long-term tasks are usually scheduled beyond 10 years. The majority of the tasks discussed in this INRMP are short and medium-term natural resources management tasks. Goals, objectives and tasks should be revised over time to reflect evolving environmental condition, adaptive management and the completion of tasks as the INRMP is implemented. In addition, medium- and long-term tasks should eventually become short-term tasks over time.

9.1.1 Implementation

In accordance with AFI 32-7064, an INRMP is considered implemented if an installation:

- Actively requests, receives, and uses funds for "must fund" projects and activities as defined by AFI 32-7001 (Environmental Quality Programming and Budgeting).
- Air Force determines the requirement for an installation INRMP based on Category I and II criteria as defined in AFI 32-7064.
- Executes all "must fund" projects and activities in accordance with specific time frames identified in the INRMP.
- Prepares the INRMP in cooperation with appropriate stakeholders. Notify stakeholders when a new or revised INRMP will be prepared and solicit participation and input to the INRMP development and review process.
- Ensures that sufficient numbers of professionally trained natural resources management personnel are available to perform the tasks required by the INRMP.
- INRMP is considered compliant with the Sikes Act if has been approved in writing by the appropriate representative from each cooperating agency within the past five years.
- Reviews the INRMP annually and coordinates annually with cooperating agencies.
- Establish and maintain regular communications with the appropriate federal and state agencies for the region where the installation is located.
- Documents specific INRMP action accomplishments undertaken each year.
- INRMP updates and reviews must be conducted in cooperation with the USFW, state fish and wildlife agency, and NOAA Fisheries where applicable

- Actions proposed as part of development of an INRMP generally will constitute an action subject to the National Environmental Policy Act (42 U.S.C. §§ 4321 - 4347, et seq.), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the NEPA (40 C.F.R. §§.1500 - 1508), and the Air Force's Environmental Impact Analysis Process (EIAP) (32 C.F.R. § 989)
- An INRMP implements ecosystem management on Air Force installations by setting goals for attaining a desired land condition

Natural resource and land use management issues are not the only factors contributing to the development and implementation of the INRMP. Facility management and other seemingly unrelated issues affect implementation. It is important to the implementation of this INRMP that LRAFB personnel take ownership of the INRMP to provide the necessary resources (i.e., personnel and equipment), and to utilize the appropriate funding allocated by AFCEC to enact the INRMP. It is extremely important that the INRMP Working Group continue to participate in the implementation of this INRMP. The INRMP Working Group is made up of the key LRAFB personnel, and has an oversight role to ensure the effective implementation of this INRMP. Top- and middle-level management representation, as well as representation from several individuals with day-to-day on-site experience will provide the INRMP Working Group with the leadership and structure necessary for the successful implementation of this INRMP.

Table 10 provides an overview of recurring natural resource management activities. These activities are generally performed by LRAFB Natural Resources Manager and/or other LRAFB personnel. The implementation schedule and planned projects for this updated INRMP are detailed in Table 11. Table 11 will be used to develop budget requests and schedule annual project requirements. Funding requests will be submitted in accordance with current NGB procedures for conservation projects. In addition, an extended table is presented in Appendix D that includes man-hour estimates and budget estimates.

9.1.2 Natural Resources Management Staffing

The Natural Resources Program at LRAFB is administered by the Natural Resource Management (NRM) team. Responsibilities of the NRM team in regard to implementation of this INRMP include:

- Providing oversight and coordination with other agencies.
- Using professionally trained natural resources management personnel with a degree in the natural sciences to develop and implement the installation INRMP
- Developing and implementing programs to ensure the inventory, delineation, classification, and management of all applicable natural resources to include: forests, wetlands, listed species, sensitive or unique habitats, and other natural resource areas of special interest.
- Providing for the training of natural resources personnel, including CECOS DoD Natural Resources Compliance course.
  <www.netc.navy.mil/centers/csfe/cecos/CourseDetail2.htm#tab25>
- Maintaining natural resources management records.
- Reviewing environmental documents (e.g. environmental impact assessments and remedial action plans) and construction designs and proposals to ensure adequate consideration of natural resources, while ensuring that technical guidance as presented in this INRMP is adequately considered.
- Evaluating impacts of military missions and providing guidance to military personnel regarding natural resources.
- Coordinating with the cultural resources program and Section 106 compliance.

- Coordinating with local, state, and federal governmental and civilian conservation organizations relative to the LRAFB natural resources management program.
- Implementing and executing AFI 32-7064.

Natural Resources Management responsibilities among LRAFB organizations are outlined in Section 2.3. Implementation of this INRMP also involves the combined efforts of agencies outside of the 19th AW. Other Federal agencies involved in implementing the INRMP are the U.S. Forest Service (USFS) (forest inventory and management recommendations); the US Corps of Engineers (USACE) (wetland delineation); and the US Fish and Wildlife Service (USFWS) (cooperating agency, INRMP signatory agency). At the State level, the Arkansas Game and Fish Commission (AGFC) assists in development and implementation of the INRMP and is also a signatory agency for the INRMP. The Arkansas Natural Heritage Commission has conducted surveys and assessments of natural resources on LRAFB. The Nature Conservancy, a non-governmental organization, has also provided Natural Resources management support in the form of surveys, assessments, and prescribed burns.

LRAFB currently has an employee whose primary responsibility is to implement natural resource management. Additional sources of temporary labor, hired with term limitations, could be utilized to augment current staff, such as seasonal employees (e.g. grounds maintenance summer hires). Outside agency reimbursable hires and Guardsman, Reservists, or Active Duty USAF personnel assigned to LRAFB on temporary duty are another source of supplemental labor. Implementation of a number of projects discussed in this INRMP will require active outside assistance. The outside assistance could come from state and federal agencies, private consortiums and organizations, universities, and contractors. Using these resources is the most efficient and cost-effective method for acquiring expertise on a temporary basis. Some parties will be reimbursed for their assistance, as agreed based on the MOU and contractual agreements, whereas others will supply their assistance in accordance with cooperative agreements. The INRMP Working Group should assess the level of additional resources necessary to fully implement this INRMP during the annual review process (see Section 9.1.3) and determine the extent to which outside assistance will be required.

9.1.3 Monitoring INRMP Implementation

9.1.3.1 LRAFB INRMP Implementation Monitoring

Monitoring of INRMP implementation is necessary to facilitate the legal requirements of the SAIA for review for operation and effect (see discussion above). These SAIA implementation criteria do not necessarily measure the effectiveness of an INRMP in facilitating mission accomplishment while conserving natural resources. The LRAFB INRMP implementation will be monitored for meeting the legal requirements of the SAIA as well as for other mission and biological measures of effectiveness.

The ultimate successful implementation of this INRMP is realized in no net loss in the capability of the LRAFB training lands to support the military mission while at the same time providing effective natural resources management. Initiation of projects is one measure that is used to monitor INRMP implementation, but it does not give the total picture of the effectiveness of the natural resources management program. Natural resources management is not the sum total of projects, interagency coordination or program funding and staffing. Natural resources management at the LRAFB is a program and a philosophy that guides the Air Force's approach to land use. A significant portion of INRMP implementation is done through internal coordination in regard to training site operations and land use decision making. This type of implementation cannot be measured by project implementation or funding levels. It is evidenced by such things as the ability

to continually train, sustainable land use, ongoing regulatory compliance, retention of species diversity, retention of surface water quality, and the acknowledgement of sustainable natural resources management by partnering conservation agencies and other interested organizations and individuals.

In order to monitor and evaluate the effectiveness of the INRMP implementation, the following will be reviewed as applicable and discussed within the context of the annual review and/or a formal review of operation and effect:

- Impacts to/from the military mission
- Conservation program budget
- Staff requirements
- Program and project implementation
- Trends in species and habitat diversity as evidenced by recurring biological surveys, land use changes, and opinions of natural resource experts.
- Compliance with regulatory requirements
- Feedback from military trainers, the USFWS, the AGFC, and others.

Some of these areas may not be looked at every year due to lack of data or pertinent information. The effectiveness of the INRMP as a mission enabling conservation tool will be decided by mutual agreement of the USFWS and the AGFC during annual reviews and / or reviews for operation and effect.

9.1.3.2 USAF and DoD INRMP Implementation Monitoring

The USAF uses the Defense Environmental Programs Annual Report to Congress (DEPARC) to monitor SAIA compliance. DEPARC is the automated system used to collect installation environmental information for reporting to DoD and Congress.
Established to fulfill an annual requirement to report the status of DoD's Environmental Quality program to Congress, DEPARC collects information on enforcement actions, inspections and other performance measures for high-level reports and quarterly reviews. DEPARC also helps the USAF track fulfillment of DoD Measures of Merit requirements.

The Deputy under Secretary of Defense (DUSD) *Updated Guidance for Implementation of the SAIA* updated Conservation Metrics for Preparing and Implementing INRMPs. Progress toward meeting these measures of merit is reported in the annual report to Congress. DEPARC reporting requirements currently include answers to these questions:

- The installation plans, programs and budgets for actions that support INRMP goals and objectives?
- Was the INRMP "fully-implemented" during previous execution year?
- Were all funds allocated for INRMP implementation (Environmental Quality [EQ], Reimbursable, and other) executed for the intended purpose?
- Is there adequate participation / collaboration from USFWS during Annual INRMP Review and major revisions?
- Is there adequate participation / collaboration from the state Fish and Wildlife (F&W) Agency during Annual INRMP Review and major revisions?
- Is the INRMP consistent with the goals of the SWAP, Candidate Conservation Agreements, & other regional ecosystem management agreements for which DoD/USAF is signatory?
- Are communications with USFWS and State F&W Agency documented?

- Does the installation have on-site USAF natural resources management staff employed in the GS-0400 Biological Sciences Job Series?
- Is there a sufficient number of natural resources staff to adequately implement INRMP goals and objectives?
- Are the capabilities of the USAF natural resources team enhanced through use of volunteers, cooperative agreements with non-governmental organizations, on-site contractor support, or Interagency Agreements with other federal or state agencies?
- Does the installation have adequate conservation law enforcement capability through employment of a credentialed conservation law enforcement officer, or through interagency agreement with another agency?
- Is there adequate participation/collaboration from the Operations Group, Range and Airspace managers, Community Planners, Tenant Organizations and other organizations in INRMP update and revision to ensure mission needs are addressed?
- Does the INRMP support unrestricted use of the installation?
- Has there been a net loss of operations area, airspace, or training lands? Is there a deficiency in capacity, size, or arrangement of the installation natural infrastructure to support the current mission and foreseeable future needs?
- Name the federally listed species present on the installation.
- List the state protected species present on the installation.
- Have surveys for the presence of potentially-occurring, federally-listed species, or suitable habitat within the historic range of a listed species, been conducted on the installation?
- Does the INRMP adequately address potentially-occurring listed species and/or potentially-suitable habitat within the historic range of a listed species?
- Have listed species locations, or potentially-suitable habitats within the historic range of a listed species, been mapped and included as part of the Environmental Functional Data Set and Geodatabase?
- Does the INRMP provide adequate conservation measures for identified listed species and their habitat, as mutually-agreed by USFWS and state fish and wildlife agency during the INRMP Annual Review or major revision coordination?
- Has Critical Habitat for listed species been designated on the installation?
- Have all major ecosystems (i.e., vegetative communities / habitats) been surveyed and mapped for the installation?
- Does the INRMP address the desired future condition for ecosystems, habitats and communities to sustain current and future mission activities and achieve natural resources management goals and objectives?
- Are native habitat restoration projects to support INRMP goals and objectives being planned, programmed, budgeted and executed?
- Does the INRMP provide for adequate control of invasive and exotic species?
- Does the INRMP address the availability of outdoor recreational opportunities (e.g. hunting, fishing, and other dispersed outdoor recreation) on the installation?
- Does the INRMP address the availability of outdoor recreation opportunities for the public, and establish access and usage categories for installation areas in accordance with mission and security requirements (i.e. Open, Restricted, Off-Limits)?
- For each outdoor recreation access category (Open, Restricted, Off- Limits), does the INRMP address and justify allowable access to those areas by category of participant (e.g. Active Duty Military, Military Dependents, DoD Civilians, Military Retirees, Defense Contractors, General Public)?

- Does the INRMP address program management for hunting, fishing and other outdoor recreation, and the role of the installation natural resources manager?

9.1.4 Priorities and Scheduling

The Office of Management and Budget (OMB) considers funding for the preparation and implementation of this INRMP, as required by the Sikes Act, to be a high priority. However, the reality is that not all of the projects and programs identified in this INRMP will receive immediate funding. Therefore, projects need to be funded consistent with timely execution to meet future deadlines. Projects are generally prioritized with respect to compliance. Highest priority projects are projects related to recurring or current compliance, and these are generally scheduled earliest. As such, these projects have been placed into three priority- based categories: (Level 0) is a natural resource requirement for maintaining compliance (Operations and Services) or for successful natural resources management, (Level 1) natural resource requirement is a non-recurring action needed to correct a non-conformance or out-of-compliance condition with a supported driver in the programmed year, and (Level 2) natural resource requirement is a non-recurring natural resources requirement for activities and projects programmed in a fiscal year which is in advance of the year in which compliance is mandatory and necessary to prevent non-compliance beyond the program year. Level 3) natural resources requirement are activities and projects that are not explicitly required by an applicable legal driver but needed to enhance the environment beyond statutory compliance to achieve overall INRMP goals and objectives. The prioritization of the projects is based on need, legal drivers, and ability to further implementation of the INRMP.

Recurring requirements include projects and activities needed to cover the recurring administrative, personnel and other costs that are necessary to meet applicable compliance requirements (federal and state laws, regulations, Presidential EOs, and DoD policies) or which are in direct support of the military mission. Recurring costs include manpower, training, supplies; hazardous waste disposal; operating recycling activities; permits and fees; testing, monitoring and/or sampling and analysis; reporting and record keeping; maintenance of environmental conservation equipment; and compliance self-assessments.

Current compliance includes projects and activities needed because an installation is currently or will be out of compliance if projects or activities are not implemented in the current program year. Examples include:

- Environmental analyses, monitoring, and studies required to assess and mitigate potential effects of the military mission on conservation resources.
- Planning documents.
- Baseline inventories and surveys of natural and cultural resources (historical and archaeological sites).
- Biological Assessments (BAs), surveys, or habitat protection for a specific listed species.
- Mitigation to meet existing regulatory permit conditions or written agreements.
- Wetland delineations in support of subsequent jurisdictional determinations and consequent permitting.
- Efforts to achieve compliance with requirements that have deadlines that have already passed.
- Initial documenting and cataloging of archaeological materials.

Maintenance requirements include those projects and activities needed that are not currently out of compliance but shall be out of compliance if projects or activities are not implemented in time to meet an established deadline beyond the current program year. Examples include:

- Compliance with future requirements that have deadlines.
- Conservation and GIS mapping to be in compliance.
- Efforts undertaken in accordance with non-deadline specific compliance requirements of leadership initiatives.
- Wetlands enhancement, in order to achieve the executive order for no net loss or to achieve enhancement of existing degraded wetlands.
- Public education programs that educate the public on the importance of protecting natural resources.

Lower priority project include those that enhance conservation resources of the installation mission, or are needed to address overall environmental goals and objectives, but are not specifically required under regulation or EO and are not of an immediate nature. These projects are generally funded after those of higher priority are funded. Examples include:

- Community outreach activities, such as Earth Day and Historic Preservation Week activities.
- Educational and public awareness projects, such as interpretive displays, oral histories, nature trails, wildlife checklists, and conservation teaching materials.
- Biological assessments, surveys, or habitat protection for a non-listed species.
- Restoration or enhancement of cultural or natural resources when no specific compliance requirement dictates a course or timing of action.
- Management and execution of volunteer and partnership programs.

9.1.5 Funding

Implementation of this INRMP is subject to the availability of annual funding. Funding sources for specific projects can be grouped into three main categories by source: federal USAF funds, other federal funds, and non-federal funds. When projects identified in the Plan are not implemented due to lack of funding, or other compelling circumstances, the installation will review the goals and objectives of this INRMP to determine whether adjustments are necessary. The following discussion of funding options is not all-inclusive of funding sources. Many funding sources rely on a variety of grant programs, award criteria and amounts can change considerably from one year to another. Funding through grant programs can occur on a one-time award, annually or in multiples of years.

The AFCEC/CR Environmental Quality (EQ) is the primary source of funding to support the management of natural resources at LRAFB. This budget is managed by AFCEC/TDNC and AFCEC/CZOW. AFCEC/CR EQ provides funding for natural resource surveys, environmental monitoring projects, and compliance-related projects.

The Legacy Resource Management Program provides financial assistance to DoD efforts to conserve natural and cultural resources on federal lands. Legacy projects could include regional ecosystem management initiatives, habitat preservation efforts, archeological investigations, invasive species control, and/or flora or fauna surveys. Project proposals are submitted to the Legacy program during their annual funding cycle (*see* <https://www.dodlegacy.org/Legacy/index.aspx>).

There are also grant and assistance programs administered by other federal agencies that could be accessed for natural resources management at LRAFB. Examples include funds associated with the CWA and endangered species.

Other non-federal funding sources that could be considered include The Public Lands Day Program, which coordinates volunteers to improve the public lands they use for recreation, education, and enjoyment, and the National Environmental Education & Training Foundation, which manages, coordinates, and generates financial support for the program (https://www.neefusa.org/npld).

State and local agencies are also a great source of additional resources. For example, the LRAFB NRM may consider entering into cooperative or mutual aid agreements with states, local governments, non-governmental organizations, and other individuals.

9.1.6 Consultation Requirements

LRAFB NRM has multiple natural resources consultation requirements in addition to the INRMP development and review requirements as identified in the Sikes Act (see Section 2.3.1). Federally listed species management requires ESA Section 7 consultation with the USFWS. State listed and game species management require consultation with AGFC. Actions that fall under the jurisdiction of Section 404 or 401 of the Clean Water Act (CWA) necessitate permitting from the Arkansas Department of Environmental Quality (ADEQ).

In addition to natural resources consultation requirements, there are National Historic Preservation Act (NHPA) and tribal consultation requirements. In particular, there is an archeological sensitive area (100 acres along northwest shoreline), where any projects that involve digging must meet NHPA consultation requirements. A general summary of the cultural resources and consultation requirements are in the ICRMP (LRAFB 2018b).

9.2 Annual INRMP Review and Coordination Requirements

Per DoD policy, the LRAFB NRM team will review the INRMP annually in cooperation with the USFWS and AGFC. On an annual basis, the NRM will invite the USFWS Regional Office, the USFWS local field office, the AGFC, and other interested parties to attend a meeting or participate in a conference call to review previous year INRMP implementation and discuss implementation of upcoming programs and projects. Invitations will be either by letter or email. Attendance is at the option of those invited, but at minimum the USFWS local field office and one representative of AGFC are expected to attend. The meeting will be documented with an agenda, meeting minutes and sign in roster of attendees.

At this annual meeting the need for updates or revisions will be discussed. If updates are needed, the NRM will initiate the updates and after agreement of all three parties they will be added to the INRMP. If it is determined that major changes are needed, all three parties will provide input and an INRMP revision will be initiated with NRM acting as the lead coordinating agency. The annual meeting will be used to expedite the more formal review for operation and effect and if all parties agree and document their mutual agreement, it can fulfill the requirement to review the INRMP for operation and effect.

If not already determined in previous annual meetings, by the fourth year annual review a determination will be made jointly to continue implementation of the existing INRMP with updates or to proceed with a revision. If the parties feel that the annual reviews have not been sufficient to evaluate operation and effect and they cannot determine if the INRMP implementation should continue or be revised, a formal review for operation and effect will be initiated. The determination on how to proceed with INRMP implementation or revision will be made after the parties have had time to complete this review.

As part of the annual review, the LRAFB NRM will specifically:

- Invite feedback from USFWS and AGFC on the effectiveness of the INRMP;
- Inform USFWS and AGFC which INRMP projects and activities are required to meet current natural resources compliance needs; and
- Document specific INRMP action accomplishments from the previous year.

Information for the annual reviews comes from the LRAFB environmental staff, the NRM, cooperating agencies, and project files as applicable. Natural resources data and program and project information are available to cooperating agencies.

9.3 INRMP Update, and Revision Process

9.3.1 Review for Operation and Effect

Not less than every five years, the INRMP will be reviewed for operation and effect to determine if the INRMP is being implemented as required by the SAIA and contributing to the management of natural resources at LRAFB. The review will be conducted by the three cooperating parties to include the Commander responsible for the INRMP, the Regional Director of the USFWS, and Director of the AGFC. While these are the responsible parties, technical representatives generally are the personnel who actually conduct the review.

The review for operation and effect will either conclude that the INRMP is meeting the intent of the SAIA, and only needs an update and implementation can continue; or that it is not effective in meeting the intent of the SAIA and it must be revised. The conclusion of the review will be documented in a jointly executed memorandum, meeting minutes, or in some other way that reflects mutual agreement.

If only updates are needed, they will be done in a manner agreed to by all parties. The updated INRMP will be reviewed by the local USFWS field office in Arkansas and AGFC Director. Once concurrence letters or signatures are received from USFWS Regional Director and the AGFC Director, the update of the INRMP will be complete and implementation will continue. Generally, the environmental impact analysis will continue to be applicable to updated INRMPs and a new analysis will not be required.

If a review of operation and effect concludes that an INRMP must be revised, there is no set time to complete the revision. The existing INRMP remains in effect until the revision is complete and USFWS and AGFC concurrence on the revised INRMP is received. The NRM will endeavor to complete such revisions within 18 months depending upon funding availability. Revisions to the INRMP will go through a more detailed review process similar to development of the initial INRMP to ensure LRAFB military mission, USFWS, and AGFC concerns are adequately addressed, and the INRMP meets the intent of the SAIA.

9.3.2 National Environmental Policy Act

The initial step in compliance with NEPA for any activity that might impact the environment by the NRM is to complete USAF Form 813: Request for Environmental Impact Analysis. The form is prepared to aid in the development of the assessment, providing information on the proposed action and its alternatives, purpose, and potential environmental effects. This allows the proponent to identify potential environmental impacts early and facilitates making a determination about whether an Environmental Assessment (EA) or Environmental Impact Statement (EIS) might be required for a specific action.

The Environmental Impact Analysis Process (EIAP) is the process by which federal agencies facilitate compliance with environmental regulations. The primary legislation affecting these agencies' decision-making process is the National Environmental Policy Act of 1969 (NEPA; 42 USC § 4321 *et seq*.). NEPA requires that any organization using federal monies, proposing work on federal lands or requiring a federal permit consider potential environmental consequences of proposed actions. The law's intent is to protect, restore, or enhance the environment through well-informed decisions.

The Council on Environmental Quality (CEQ) was established under NEPA for the purpose of implementing and overseeing federal policies as they relate to the NEPA process. The adoption of an INRMP can be considered a major federal action as defined by Section 1508.18 of the CEQ regulations. This requires an analysis of potential environmental impacts for the implementation of an INRMP, although a complete Environmental Assessment (EA) is not necessarily required as individual actions and projects for an INRMP typically undergo their own separate NEPA analysis.

CEQ regulations require intergovernmental notifications prior to making any detailed statement of environmental impacts. Through the Interagency and Intergovernmental Coordination for Environmental Planning (IICEP) process, MEANG notifies relevant federal, state, and local agencies and allows them sufficient time to make known their environmental concerns specific to a Proposed Action. Comments and concerns submitted by these agencies during the IICEP process are subsequently incorporated into the analysis of potential environmental impacts. This coordination fulfills requirements under Executive Order (EO) 12372, *Intergovernmental Review of Federal Programs,* and AFI 32-7060, IICEP. Furthermore, public participation in decision making on new proposals is also required. Consideration of the views and information of all interested persons promotes open communication and enables better decision-making. Agencies, organizations, and members of the public with a potential interest in the Proposed Action, including minority, low-income, disadvantaged, and Native American groups, are urged to participate.

The EIAP for the implementation of LRAFB IINRMP 2001-2006 was conducted in 1999 in accordance with NEPA, CEQ *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* (40 Code of Federal Regulations [CFR] § 1500-1508), and 32 CFR Part 989. The EIAP and decision-making process for the Proposed Action (implementation of the 2001 LRAFB INRMP) involved an examination of all environmental issues pertinent to the action proposed. Impact evaluations of the 2001 LRAFB INRMP determined that no significant environmental impacts would result from implementation of the Proposed Action or any identified alternative. This determination was based on thorough review and analysis of existing resource information, and coordination with knowledgeable, responsible personnel from the MEANG and other relevant local, state, and federal agencies. The EIAP for the implementation of the 2001 LRAFB INRMP does not include an analysis of effects for individual actions or projects. Individual actions or projects that have the potential to impact the environment will be analyzed separately in accordance with the NEPA process. A new EIAP is not required for this INRMP update.

If a future action or project has the potential to impact the environment, the initial step in compliance with NEPA is to complete USAF Form 813 "Request for Environmental Impact Analysis". The form is prepared to aid in the development of the assessment, providing information on the proposed action and its alternatives, purpose, and potential environmental

effects. This allows the proponent to identify potential environmental impacts early and facilitates making a determination about whether an EA or an Environmental Impact Statement (EIS) might be required for a specific action. Some sections are prepared by the proponent and other sections are prepared by the Environmental Management Office 101 CES/CEV. If the action is not covered by a categorical exclusion, then an EA is prepared to determine if there are potential significant impacts. If potential significant impacts are identified, either while completing USAF Form 813 or during the EA, then an EIS is prepared. The majority of natural resources management actions in this INRMP are covered by categorical exclusions.

If the action is not covered by a categorical exclusion, then an EA is prepared to determine if there are potential significant impacts. If potential significant impacts are identified, either while completing AF Form 813 or during the EA, then an EIS is prepared. The majority of natural resources management actions are covered by categorical exclusions.

10.0 ANNUAL WORK PLANS

The INRMP Annual Work Plans contain projects and activities that are recurring (Table 10) and planned prjoects (Table 11), which include the current year and 4 succeeding years. For each project, there is a priority number (described below), specific timeframe for implementation, and corresponding goal and objective referenced from Section 8.0. Priorities are defined as follows:

- High(1): The INRMP signatories assert that if the project is not funded the INRMP is not being implemented and the Air Force is non-compliant with the Sikes Act; or that it is specifically tied to an INRMP goal and objective and is part of a "Benefit of the Species" determination necessary for ESA Sec 4(a)(3)(B)(i) critical habitat exemption.

- Medium(2): Project supports a specific INRMP goal and objective, and is deemed by INRMP signatories to be important for preventing non-compliance with a specific requirement within a natural resources law or by EO 13112 on Invasive Species. However, the INRMP signatories would not contend that the INRMP is not be implemented if not accomplished within programmed year due to other priorities and/or funding shortfalls.

- Low(3): Project supports a specific INRMP goal and objective, enhances conservation resources or the integrity of the installation mission, and/or support long-term compliance with specific requirements within natural resources law; but is not directly tied to specific compliance within the proposed year of execution.

Table 10. Recurring Natural Resource Management Activities				
	Activity	**Priority**	**Objective(s) in Section 8.0**	**Timing**
1	Prepare budget to implement the natural resources management program	1	1.1	Annual
2	Purchase equipment and supplies necessary for program management	1	1.1	As Needed
3	Purchase parts and supplies necessary to maintain equipment related to program management		1.1	As Needed
4	Complete review for operation and effect at least every 5 years with INRMP Task Force; initiate update or revision as appropriate	1	1.2	2023
5	Complete annual review of INRMP	1	1.2	Annual
6	Continue implementing BASH risk reduction measures	1	1.5	As Needed
7	Assess BASH related-populations and apply for depredation-permit renewal for appropriate species	1	2.3	Annual
8	Maintain Federal Migratory Bird Airport Depredation Permit under Migratory Bird Treaty Act	1	2.3	As Needed
9	Evaluate effectiveness of erosion and sediment control measures	1	3.1	As Needed
10	Manage stormwater runoff in order to reduce erosion, encourage infiltration upstream of major water bodies, and reduce nutrients before runoff enters major water bodies.	1	3.2	As Needed
11	Minimize nonpoint source pollution through implementation of BMPs, following existing spill prevention and hazardous materials management protocols, and education	1	3.3	As Needed
12	Monitor at-risk construction sites to ensure erosion and sediment control measures are effective	1	3.4	As Needed
13	NRM personnel will review proposed activities for potential to impact water resources	1	4.1	As Needed
14	If an activity will impact a wetland or other water resource, coordination with USACE and ADEQ will be completed and mitigation options identified	1	4.1	As Needed
15	Maintain riparian management zones around water resources	1	4.2	As Needed
16	Implement IPMP, including methods for control and reporting requirements	1	5.4	As Needed

17	Monitor regularly for new invasive species or sudden increases in density of existing invasive species	1	5.4	As Needed
18	Conduct any tree management to minimize impacts to migratory birds and roosting bats	1	5.5	As Needed
19	Manage airfield environments so that trees and other vegetation do not violate airfield clearance specified in Uniform Facilities Criteria (UFC 3-260-01)	1	5.7	As Needed
20	Perform timber stand improvement operations to improve forest health	1	5.8	
21	Provide consultation on projects that impact trees on base. As a general policy, plantings should occur at the same or greater frequency than removals	1	5.1	As Needed
22	Use native plant species and materials for landscaping activities	1	5.1	As Needed
23	Apply for Tree City USA certification annually	2	5.1	Annual
24	Minimize BASH risk by deterring birds and other wildlife from the airfield	1	6.1	As Needed
25	Conduct annual deer population survey	1	6.4	Annual
26	Oversee hunting program and maintain annual records of take	2	6.4	Annual
27	Manage aquatic vegetation to maintain properly balanced aquatic ecosystem	1	6.5	As Needed
28	Implement least tern roof protocol during nesting season	1	7.2	Annual
29	Develop and implement a least tern nest monitoring program	1	7.2	Annual
30	Monitor for potential listed species during natural resources activities	1	7.5	
31	When new activities are undertaken at LRAFB or BJDZ, a review for impacts to listed species and their habitat should be conducted and reviewed by USFWS	1	7.6	As Needed
32	Provide environmental and natural resources training to LRAFB personnel	1	9.10	Annually

This table is also presented in Appendix XX with details of labor hours and estimated costs.
Priority Codes: 1=High, 2=Medium, 3=Low.
Priority codes are roughly equivalent to funding priorities as described in DoDI 4715.03 and AFI 32-7064.

Table 11. Projects Identified to Implement the INRMP (Subject to Funding Availability)				
	Project	**Priority**	**Objective(s) in Section 8.0**	**Projected Date**
1	Update/revise INRMP as determined by INRMP Task Force meeting during review for operation and effect	1	1.2	2023
2	Implement BASH risk reduction measures	1	1.5	
3	Maintain and improve Geographic Information System (GIS) data and access to that data by LRAFB personnel	1	1.10	As Needed
4	Maintain current USFWS Depredation permits to allow taking of birds posing a hazard to human life and equipment on and around the flightline	1	2.3	Annually
5	Maintain current AGFC Depredation Permit for allow the taking of deer and coyote posing a hazard to human life and equipment on and around the flightline	1	2.3	Annually
6	Develop erosion and sediment control manual with site-specific BMPs	2	3.1	2020
7	Maintain riparian management zones around water resources	1	3.5	As Needed
8	Review proposed activities for potential impacts to water resources	1	4.1	As Needed
9	Coordinate with USACE and ADEQ regarding activities likely to impact wetland or other water resources and identify mitigation options	1	4.1	As Needed
10	Update wetland and other water resources mapping and delineations	2	4.2	2020
11	Mitigate/enhance stream and riparian area IAW permits issued under Section 404 of Clean Water Act	1	4.4	As Needed
12	Conduct vegetation survey using remote sensing and ground truthing	2	5.1	2020
13	Monitor for new invasive species or sudden increases in densities of existing invasive species	1	5.4	2021
14	Monitor priority invasive species, once identified, and implement control projects if needed, possibly in conjunction with local government agencies	1	5.4	As Needed

15	Remove any trees that are penetrating the Airspace Imaginary Surfaces at LRAFB and BDZ	1	5.7	As Needed
16	Conduct updated forest inventory as directed by AFI 32-7064	1	5.8	2020
17	Perform Timber Stand Improvement operations for enhanced forest health.	1	5.8	As Needed
18	Develop and administer the sale of forest products	2	5.9	As Needed
19	Apply prescriptive fire as a tool to mimic the natural forces in fire maintained ecosystems.	1	5.10	Anually
20	Provide consultation on projects that will impact base trees. Planting should occure at a greater frequency than removals.	1	5.11	As Needed
21	Apply for Tree City Certification annually	2	5.11	Annually
22	Develop Golf Course Environmental Management Plan	3	5.12	2022
23	Conduct annual on-base deer population survey	1	6.4	Annually
24	Establish and implement effective deer population control strategies in order to reduse BASH risk	1	6.4	As Needed
25	Improve wild turkey and quail habitat	2	6.4	As Needed
26	Create and maintain small wildlife openings throughout forest	2	6.4	As Needed
27	Manage vegetation to maintain properly balanced aquatic ecosystem	1	6.5	As Needed
28	Use aquatic herbicide to control alligator weed in base lakes	1	6.5	As Needed
29	Install artificial structures to attract fish and provide cover for forage species	2	6.5	As Needed
30	Implement yearly fertilization program, as advised by AGFC, to increase lake productivity	1	6.5	Annually
31	Update wildlife surveys with an emphasis on rare species	1	6.6	2021
32	Conduct avian surveys to supplement previous inventories and establish distribution, abundance, and long range trends of seasonal bird communities found on the installation	2	6.7	2019
33	Develop conservation management plan for ILT	1	7.2	2019

34	Make improvements to ILT habitat, i.e. install wooden pallets, on rooftops to provide shade for the least tern	2	7.2	As Needed
35	Conduct surveys of RMBM and its host plant, the Rattlesnake Master in order to provide protection as practical of candidate species, and provide an overall ecosystem management strategy for the protection and recovery of candidate species	2	7.4	2019
36	Transplant existing RM plants and plant RM seeds to encourage plant establishment away from airfield to reduse BASH risk	2	7.4	As Needed
37	Conduct a survey to document status and likelihood of potential federally listed species	1	7.5	2020
38	Provide environmental and natural resources training to LRAFB personnel	1	9.1	Annually
This table is also presented in Appendix B with details of labor hours and estimated costs. Priority Codes: 1=High, 2=Medium, 3=Low. Priority codes are roughly equivalent to funding priorities as described in DoDI 4715.03 and AFI 32-7064.				

11.0 APPENDICES

Appendix A. References

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Appendix B. Acronyms

°F	Degrees Fahrenheit
ACC	Air Combat Command
ACM	Asbestos Containing Material
ADEQ	Arkansas Department of Environmental Quality
AETC	Air Education and Training Command
AF	Air Force
AFB	Air Force Base
AFCEC	Air Force Civil Engineering Center
AFI	Air Force Instruction
AFM	Air Force Manual
AFPD	Air Force Policy Directive
AGFC	Arkansas Game and Fish Commission
AGL	Above Ground Level
AHAS/BAM	Avian Hazard Advisory System/Bird Avoidance Model
AICUZ	Air Installation Compatible Use Zone
AMC	Air Mobility Command
ANG	Air National Guard
AOA	Air Operations Area
AOC	Area of Concern
AR	Arkansas
ADEQ	Arkansas Department of Environmental Equality
AST	Above-ground Storage Tank
ATV	All-terrain Vehicle
AW	Airlift Wing
BA	Biological Assessment
BASH	Bird/Aircraft Strike Hazard
BAM	Bird Avoidance Model
BCE	Base Civil Engineer
BGP	Base General Plan
BHWG	Bird Hazard Working Group
BJDZ	Blackjack Drop Zone
BMP	Best Management Practice
BST	Bird Strike Threat
BX	Base Exchange

CEF	Civil Engineer Fire Protection Flight
CEIE	Civil Engineer Environmental Element
CEOIF	Civil Engineer Liquid Fuels Maintenance Shop
CES	Civil Engineer Squadron
CFR	Code of Federal Regulations
cm	Centimeter
CRM	Cultural Resource Manager
CV	Vice-Commander
CWA	Clean Water Act
DEPARC	Defense Environmental Programs Annual Report to Congress
DOD	Department of Defense
DOI	Department of the Interior
DRMO	Defense Reutilization and Marketing Office
DUSD	Deputy Under Sectretary of Defense
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EO	Executive Order
EOD	Explosive Ordnance Disposal
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPC	Environmental Protection Committee
EQ	Environmental Quality
ESOHC	Environmental Safety and Occupational Health Committee
FGS	Final Governing Standards
FONPA	Finding of No Practicable Alternative
ft	Feet
FONSI	Finding of No Significant Impact
FY	Fiscal Year
GEM	Golf Environmental Management
GIS	Geographic Information Systems
GPS	Global Positioning System
HAZMART	Hazardous Materials Pharmacy
HQ	Headquarters
IAW	In Accordance With

ICBM	Intercontinental Ballistic Missile
ICEMAP	Installation Complex Encroachment Management Action Plan
IDP	Installation Development Plan
ILT	Interior Least Tern
INRMP	Integrated Natural Resources Management Plan
INCRMP	Integrated Natural Culture Resources Management Plan
IPM	Integrated Pest Management
IPMIS	Integrated Pest Management Information System
IPMP	Integrated Pest Management Program
IRP	Installation Restoration Program
ISS	Installation Support System
IST	Installation Support Team
JRTC	Joint Readiness Training Center
LBP	Lead-based Paint
LRAFB	Little Rock Air Force Base
m	Meter
MAC	Military Airlift Command
MAJCOM	Major Command
MOU	Memorandums of Understanding
MSA	Metropolitan Statistical Area
msl	Mean Sea Level
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Adminstration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRM	Natural Resrouce Manager
OMB	Office of Mangement and Budget
ORC	Outdoor Recreation Center
PAO	Public Affairs Office
PCB	Polychlorinated Biphenyls
PFH	Privatized Family Housing
POL	Petroleum, Oils, and Lubricants
RADD	Remedial Action Decision Document
ROD	Record of Decision
ROW	Right of Way

RMZ	Riparian Management Zones
SFS	Security Forces Squadron
SAIA	Sikes Act Improvement Act
SAC	Strategic Air Command
SMZ	Streamside Management Zone
SMW	Strategic Missile Wing
sq ft	Square Foot/Feet
TAC	Tactical Airlift Command
TAW	Tactical Airlift Wing
TMS	Turfgrass Management System
U.S.	United States
USACE	United States Army Corps of Engineers
USAF	United State Air Force
USC	United States Code
USCB	United States Census Bureau
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WMA	Wildlife Management Area

Agricultural Outleasing is the use of DOD lands under a lease to an agency, organization, or person for the purpose of growing crops or grazing animals.

Biological Diversity is the variety of life forms, the ecological roles they perform, and the genetic variability they contain within any defined time and space.

Commercial Forest Land is land under management capable of producing at least 20 cubic feet of merchantable timber per acre a year. It must be accessible and programmed for silvicultural prescriptions. The smallest area for this classification is 5 acres. Roadside, streamside, and shelterbelt strips of timber must have or be capable of producing a crown width of at least 120 feet to be classified as a commercial forest.

Cooperative Agreement is a written agreement between an Air Force installation and one or more outside agencies (Federal, State, or Local) which coordinates planning strategies. It is a vehicle for obtaining assistance in developing natural resources programs.

Critical Habitat is any air, land, or water area (exclusive of those existing man-made structures or settlements that are not necessary to the survival and recovery of a listed species) and constituents thereof, the loss of which would appreciably decrease the likelihood of the survival and recovery of an endangered or threatened species or a distinct segment of its population and so designated by the Fish and Wildlife Service.

Cropland is land primarily suited for producing farm crops, including grain, hay, and truck crops.

Defensible Space is an area as defined by the "Authority Having Jurisdiction" [typically a width of 9.14 m (30 ft) or more] between an improved property and a potential wildfire where combustible materials and vegetation have been removed to reduce the potential for fire on improved property spreading to wildland fuels or to provide a safe working area for fire fighters protecting life and improved property.

Ecosystem Management is an approach to natural resources management that recognizes the interrelationships of ecological processes linking soils, plants, animals, minerals, climate, water, and topography as a living system that has importance to and is affected by human activity beyond traditional commodity and amenity uses and acknowledges the importance of ecosystem services such as water conservation, oxygen recharge, and nutrient recycling.

Endangered Species are all plants and animals listed or proposed for listing as threatened or endangered by the Federal government or State governments.

Exotic Species are any plant or animal not native to a region, state, or country.

Fire Hazard. A fuel complex, defined by kind, arrangement, volume, condition, and location, that determines the ease of ignition and/or resistance to fire control.

Fish includes fresh and salt water fin-fish, other aquatic vertebrate organisms, crustaceans, and mollusks.

Floodplains are defined as 100-year floodplains or areas with a 1% chance of inundation in any given year.

Forest Fire. See Wildland Fire.

Forest Land is land on which forest trees of various sizes comprise at least 10% of the area. This category includes open land that is capable of supporting trees, though not currently developed for forest uses, but planned for forest regeneration and management.

Forest Management is developing, conserving, and protecting forest resources to provide sustained yield and multiple use from the forest resources.

Forest Products are all plant materials in wooded areas that have commercial value, such as sawlogs, veneer (peeler) logs, poles, pilings, pine needles, cordwood (for pulp, paper, firewood, etc.), fence posts, mine timber, Christmas trees (from unsheared trees cut during intermediate harvests), and similar wood or chemical products.

Fuel Modification. Any manipulation or removal of fuels to reduce the likelihood of ignition or the resistance to fire control.

Fuels. All combustible materials within the wildland/urban interface or intermix including, but not limited to, vegetation and structures.

Game are any species of fish or wildlife for which seasons and bag or creel limits have been prescribed, and which are taken under State or Federal laws and regulations.

Grass Fire. See Wildland Fire.

Grazing Land is land with vegetative cover that consists of grasses, forbs, and shrubs valuable as forage.

Ground Fuels. All combustible materials such as grass, duff, loose surface litter, tree or shrub roots, rotting wood, leaves, peat, or sawdust that typically support combustion.

Habitat is an area that provides the environmental elements of air, water, food, cover, and space necessary for a given species to survive and reproduce.

Highly Erodible Soils are soils whose physical properties and/or slope are identified by the U.S. Department of Agriculture, Soil Conservation Service as being highly susceptible to wind and/or water erosion.

Improved Property Is a piece of land or real estate upon which a structure has been placed, a marketable crop is growing (including timber), or other property improvement has been made.

Improved Grounds are grounds on which intensive maintenance activities are annually planned and performed. These are developed areas of an installation that have lawns and landscape plantings that require intensive maintenance. These usually include the cantonment, parade grounds, drill fields, athletic areas, golf courses (excluding roughs), cemeteries, housing areas, etc.

Integrated Natural Resources Management Plan is a natural resources management plan based on ecosystem management which shows the interrelationships of all individually addressed component plans such as forestry plans, fish and wildlife plans, and outdoor recreation plans as well as other mission and adjacent land use activities to the basic land management plans as well.

Land Management Unit is the smallest land management division used in developing specific plans to accomplish natural resources management goals. Land management units may correspond to grazing units on agricultural outleased lands, stands, or compartments on commercial forest lands, various types of improved grounds (for example, athletic fields, parks, yards in family housing, or landscaped areas around administrative buildings), or identifiable semi-improved grounds (for example, airfield areas, utility rights-of-way, roadside areas, etc.).

Land-Use Regulation is a document that prescribes the specific, technical actions, or land use and restrictions with which lessees, permittees, or contractors must comply. It is derived from the grazing or cropland management plan and is included as a part of all outleases, landuse permits, or other contracts.

Livestock are domestic animals kept or raised for food, by-products, work, transportation, or recreation.

Mitigation is any action that moderates the severity of a fire hazard or risk.

Multiple-use is the integrated, coordinated, and compatible use of various natural resources to derive the best benefit while perpetuating and protecting those resources.

Multiple-use and Sustained Yield Management is the care and use of natural resources in the combination best serving the present and future needs of the United States and its people without impairing the productivity of the land and water.

Natural Resources Management Professional is an individual with a degree in the natural sciences who has responsibility for managing natural resources on a regular basis and receives periodic training to maintain proficiency in managing natural resources.

"No Funds" Service Contract involves no exchange of funds for land management service rendered in lieu of other considerations received for performing this service. This contract is necessary when a party agrees to make no charge to establish, control, or remove vegetative cover or growth and is given the growth in payment of service.

Noncommercial Forest Land is land not capable of yielding forest products of at least 20 cubic feet per acre per year because of adverse site conditions. The classification also includes productive forest land on which mission requirements, accessibility, or non-compatible uses preclude forest management activities.

Noncombustible Materials Are any materials that, in the form in which they are used and under the conditions anticipated, will not ignite and burn nor will add appreciable heat to an ambient fire.

Outdoor Interpretation is observing and explaining the history, development, and significance of our natural heritage and natural resources.

Outdoor Recreation is recreation that relates directly to and occurs in natural, outdoor environments.

Outdoor Recreation Resources are land and water areas and associated natural resources that provide, or have the potential to provide, opportunities for outdoor recreation for present and future generations.

Parcourses are physical fitness trails that combine jogging and calisthenics. They are usually located in wooded areas and are about 1.5 to 2 miles in length. Numerous exercise stations, located along the route, direct the participants through various exercises.

Prescribed Fire is a fire burning within prescription from either planned or unplanned ignitions.

Prevention Activities are activities, including public education, law enforcement, personal contact, and reduction of fuel hazards, directed at reducing the incidence of fires.

Prime Farmland is land that has the best combination of chemical and physical characteristics for producing food, feed, forage, fiber, and oil-seed crops, and is also available or potentially available for these uses. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods. Existing pastureland, rangeland, forest land, or other land not in an urban buildup condition is considered eligible for designation as prime farmland, providing it meets the other criteria.

Procurement Contract is an agreement for payment by the government to the contractor for land management service rendered to establish, control, or remove vegetative cover or growth. This contract may not extend beyond the period for which appropriations are provided for the procurement.

Rangeland is land on which the native vegetation is predominantly grasses, grass-like plants, forbs, or shrubs suitable for grazing or browsing use. Includes lands revegetated naturally or artificially to provide a forage cover that is managed like native vegetation and includes natural grasslands, savannas, shrubland, most deserts, tundra, alpine communities, coastal marshes, and wet meadows.

Recreation Carrying Capacity is the level of recreational use for a specific activity that an area can sustain without degrading environmental qualities.

Reforestation is the renewal or regeneration of a forest by natural or artificial means.

Rotation Age is the planned number of years between the regeneration of a forest stand and its final cutting at a specified stage of maturity.

"Sales" Service Contract is an agreement for payment by contractor to the government for crops, crop residue, or grazing privileges incidental to control or removal of vegetative growth for land management purposes. Sales contracts will be for a period of 1 to 5 years.

Savanna is a grassland region with scattered trees and shrubs, grading into either open plains or woodlands.

Semi-Improved Grounds are grounds where periodic maintenance is performed primarily for operational and aesthetic reasons (such as erosion and dust control, bird control, and visual clear zones). These usually include grounds adjacent to runways, taxiways, and aprons; runway clear zones; lateral safety zones (AFR 86-14); rifle and pistol ranges; picnic areas; ammunition storage areas; antenna facilities; golf course roughs; etc.

Stewardship is the management of a resource base with the goal of maintaining or increasing the resource's value indefinitely into the future.

Threatened Species are those Federally or State-listed species of flora and fauna that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range and which have been designated for special protection and management pursuant to the Endangered Species Act.

Timber Management is applying silvicultural knowledge and prescriptions to forest lands within economic and environmental constraints to produce a sustained yield of forest products.

Timber Stand Improvement is silvicultural treatments applied to existing stands to improve their quality, composition, condition, or rate of growth (such as pruning, thinning, releasing, and prescribed burning).

Unimproved Grounds are all grounds not classified as improved or semi-improved and usually not mowed more than once per year. These include weapons ranges; forest lands; cropland and grazing lands; lakes, ponds, and wetlands; and areas in airfield beyond the safety zones (AFRs 86-5 and 86-14).

Unique Farmland is land, other than prime farmland, used for producing specific high-value food and fiber crops at the time of designation. It has the special combination of soil quality, location, growing season, and moisture supply needed to produce sustained high-quality or high yields of a specific crop when treated and managed according to modern farming methods. Examples include citrus, tree nuts, olives, cranberries, fruit, and vegetables.

Urban Forests are planted or remnant native tree species existing within urbanized areas such as parks, tree-lined residential streets, scattered tracts of undisturbed woodlands, and cantonment areas.

Urban Wildlife are wildlife that habitually live or periodically survive in an urban environment on improved or semi-improved grounds.

Watchable Wildlife Areas are areas identified under the Watchable Wildlife Program as suitable for passive recreational uses such as bird watching, nature study, and other non-consumptive uses of wildlife resources.

Wetlands are areas inundated or saturated by surface or ground water at a frequency and a duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wildfire. See Wildland Fire.

Wildland Fire is an unplanned and uncontrolled fire spreading through vegetative fuels, at times involving structures.

Wildland/Urban Interface is any area where wildland fuels threaten to ignite combustible homes and structures.

Wildland/Urban Interface Coordinator is the person responsible for the development of the plan(s) for the reduction of the fire risks and hazards associated in the wildland/urban interface.

Wildland/Urban Interface Protection Specialist is the person responsible for the development and/or implementation of a plan to protect people, communities, or individual structures from a wildland fire.

Wildland/Urban Intermix is an area where improved property and wildland fuels meet with no clearly defined boundary.

Wildlife-Carrying Capacity is the maximum density of wildlife which a particular area or habitat is capable of carrying on a sustained basis without deterioration of the habitat.

Appendix D. Detailed INRMP Implementation Tables

Table D-1 provides an overview of recurring natural resource management activities. These activities are generally performed by LRAFB Environmental Manager or other LRAFB personnel. The implementation schedule for planned projects for this updated INRMP are detailed in Table D-2. Table D-2 will be used to develop budget requests and schedule annual project requirements. Funding requests will be submitted in accordance with current NGB procedures for conservation projects. Schedules are only estimates and are based on availability of funding.

Abbreviated Tables are presented in Section 10.0.

Table D-1 Detailed LRAFB INRMP Activities

Table D-1. Detailed Little Rock AFB INRMP Recurring NRM Activities																				
Abbreviated Table Presented in Section 10, Table XX					LRAFB NRM Personnel Labor Hours										Equipment & Supply Funding					
	Activity	Priority	Objective(s) in Section 8.0	Timing	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY18	FY19	FY20	FY21	FY22	FY23
1	Prepare budget to implement the natural resources management program	1	1.1	Annual	40	40	40	40	40	40	40	40	40	40	N/A	N/A	N/A	N/A	N/A	N/A
2	Purchase equipment and supplies necessary for program management	1	1.1	As Needed	40	40	40	40	40	40	40	40	40	40	7000	7000	7000	7000	7000	7000
3	Purchase parts and supplies necessary to maintain equipment related to program management		1.1	As Needed	40	40	40	40	40	40	40	40	40	40	4000	4000	4000	4000	4000	4000
4	Complete review for operation and effect at least every 5 years with INRMP Task Force; initiate update or revision as appropriate	1	1.2	2023	120	20	20	20	20	120	20	20	20	20	N/A	N/A	N/A	N/A	N/A	1000
5	Complete annual review of INRMP	1	1.2	Annual	40	80	80	80	80	80	80	80	80	80	N/A	N/A	N/A	N/A	N/A	N/A
6	Continue implementing BASH risk reduction measures	1	1.5	As Needed	120	120	120	120	120	120	120	120	120	120	TBD	TBD	TBD	TBD	TBD	TBD
7	Assess BASH related-populations and apply for depredation-permit renewal for appropriate species	1	2.3	Annual	40	40	40	40	40	40	40	40	40	40	2500	2500	2500	2500	2500	2500
8	Maintain Federal Migratory Bird Airport Depredation Permit under Migratory Bird Treaty Act	1	2.3	As Needed	30	30	30	30	30	30	30	30	30	30	N/A	N/A	N/A	N/A	N/A	N/A
9	Evaluate effectiveness of erosion and sediment control measures	1	3.1	As Needed	80	80	80	80	80	80	80	80	80	80	TBD	TBD	TBD	TBD	TBD	TBD
10	Manage stormwater runoff in order to reduce erosion, encourage infiltration upstream of major water bodies, and reduce nutrients before runoff enters major water bodies.	1	3.2	As Needed	120	120	120	120	120	120	120	120	120	120	3000	3000	3000	3000	3000	3000
11	Minimize nonpoint source pollution through implementation of BMPs, following existing spill prevention and hazardous materials management protocols, and education	1	3.3	As Needed	60	60	60	60	60	60	60	60	60	60	3000	3000	3000	3000	3000	3000
12	Monitor at-risk construction sites to ensure erosion and sediment control measures are effective	1	3.4	As Needed	80	80	80	80	80	80	80	80	80	80	TBD	TBD	TBD	TBD	TBD	TBD
13	NRM personnel will review proposed activities for potential to impact water resources	1	4.1	As Needed	40	60	60	60	60	60	60	60	60	60	200	200	200	200	200	200

14	If an activity will impact a wetland or other water resource, coordination with USACE and ADEQ will be completed and mitigation options identified	1	4.1	As Needed	60	60	60	60	60	60	60	60	60	60	N/A	N/A	N/A	N/A	N/A	N/A
15	Maintain riparian management zones around water resources	1	4.2	As Needed	60	60	60	60	60	60	60	60	60	60	4000	4000	4000	4000	4000	4000
16	Implement IPMP, including methods for control and reporting requirements	1	5.4	As Needed	80	120	120	120	120	120	120	120	120	120	TBD	TBD	TBD	TBD	TBD	TBD
17	Monitor regularly for new invasive species or sudden increases in density of existing invasive species	1	5.4	As Needed	40	40	40	40	40	40	40	40	40	40	1500	1500	1500	1500	1500	1500
18	Conduct any tree management to minimize impacts to migratory birds and roosting bats	1	5.5	As Needed	40	40	40	40	40	40	40	40	40	40	TBD	TBD	TBD	TBD	TBD	TBD
19	Manage airfield environments so that trees and other vegetation do not violate airfield clearance specified in Uniform Facilities Criteria (UFC 3-260-01)	1	5.7	As Needed	80	80	80	80	80	80	80	80	80	80	TBD	TBD	TBD	TBD	TBD	TBD
20	Perform timber stand improvement operations to improve forest health	1	5.8	As Needed	240	240	240	240	240	240	240	240	240	240	TBD	TBD	TBD	TBD	TBD	TBD
21	Provide consultation on projects that impact trees on base. As a general policy, plantings should occur at the same or greater frequency than removals	1	5.1	As Needed	40	40	40	40	40	40	40	40	40	40	1000	1000	1000	1000	1000	1000
22	Use native plant species and materials for landscaping activities	1	5.1	As Needed	40	40	40	40	40	40	40	40	40	40	TBD	TBD	TBD	TBD	TBD	TBD
23	Apply for Tree City USA certification annually	2	5.1	Annual	20	20	20	20	20	20	20	20	20	20	N/A	N/A	N/A	N/A	N/A	N/A
24	Minimize BASH risk by deterring birds and other wildlife from the airfield	1	6.1	As Needed	120	120	120	120	120	120	120	120	120	120	2000	2000	2000	2000	2000	2000
25	Conduct annual deer population survey	1	6.4	Annual	40	40	40	40	40	40	40	40	40	40	400	400	7000	400	400	400
26	Oversee hunting program and maintain annual records of take	2	6.4	Annual	120	120	120	120	120	120	120	120	120	120	800	800	800	800	800	800
27	Manage aquatic vegetation to maintain properly balanced aquatic ecosystem	1	6.5	As Needed	100	100	100	100	100	100	100	100	100	100	6000	6000	6000	6000	6000	6000
28	Implement least tern roof protocol during nesting season	1	7.2	Annual	20	20	20	20	20	20	20	20	20	20	200	200	200	200	200	200
29	Develop and implement a least tern nest monitoring program	1	7.2	Annual	N/A	60	60	60	60	60	60	60	60	60	1500	1500	1500	1500	1500	1500
30	Monitor for potential listed species during natural resources activities	1	7.5	As Needed	60	60	60	60	60	60	60	60	60	60	5000	5000	5000	5000	5000	5000
31	When new activities are undertaken at LRAFB or BJDZ, a review for impacts to listed species and their habitat should be conducted and reviewed by USFWS	1	7.6	As Needed	40	40	40	40	40	40	40	40	40	40	TBD	TBD	TBD	TBD	TBD	TBD
32	Provide environmental and natural resources training to LRAFB personnel	1	9.10	Annually	120	80	80	80	80	80	80	80	80	80	TBD	TBD	TBD	TBD	TBD	TBD

Table D-2 Detailed LRAFB INRMP Projects

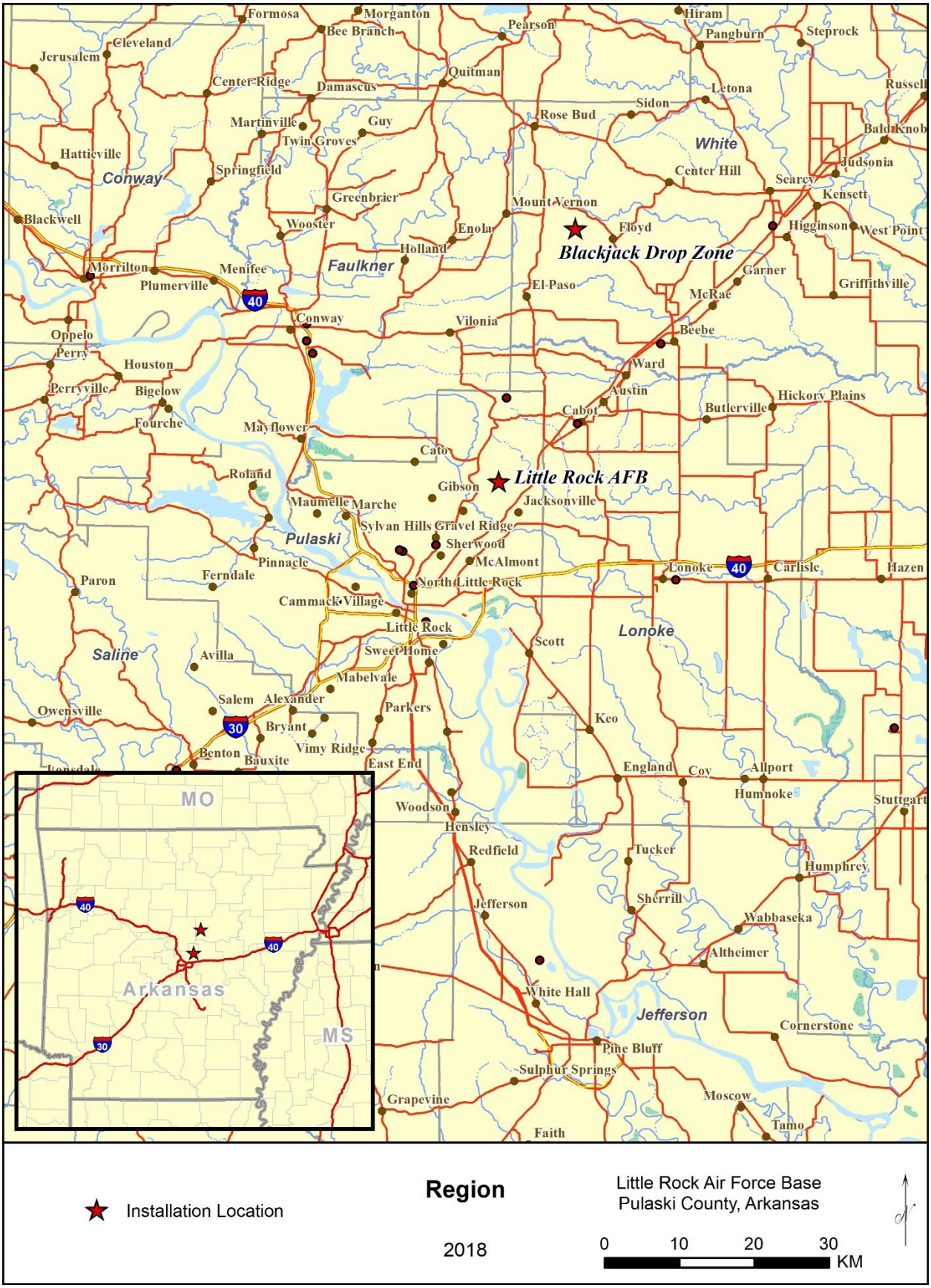
Table D-2. Detailed LRAFB INRMP Implementation Projects																															
Abbreviated Table Presented in Section X, Table X					Labor Hours (LRAFB Personnel and Contract Man-Hours)							Equipment and Supply Funding							Contractor Funding							Total Funding						
	Project	Priority	Objective(s) in Section 8.0	Projected Date	FY18	FY19	FY20	FY21	FY22	FY23	TBD FY	FY18	FY19	FY20	FY21	FY22	FY23	TBD FY	FY18	FY19	FY20	FY21	FY22	FY23	TBD FY	FY18	FY19	FY20	FY21	FY22	FY23	TBD FY
1	Update/revise INRMP as determined by INRMP Task Force meeting during review for operation and effect	1	1.2	2023	600	20	20	20	20	600		N/A	N/A	N/A	N/A	N/A	1000		45000	N/A	N/A	N/A	N/A	42000		48000	TBD	TBD	TBD	TBD	47000	
2	Implement BASH risk reduction measures	1	1.5	As Needed	TBD	120	120	120	120	120		TBD	TBD	TBD	TBD	TBD	TBD		TBD	6000	6000	6000	6000	6000		TBD	7000	7000	7000	7000	7000	
3	Maintain and improve Geographic Information System (GIS) data and access to that data by LRAFB personnel	1	1.10	As Needed	TBD	120	120	120	120	120		TBD	TBD	TBD	TBD	TBD	TBD		TBD	5000	5000	5000	5000	5000		TBD	6500	6500	6500	6500	6500	
4	Maintain current USFWS Depredation permits to allow taking of birds posing a hazard to human life and equipment on and around the flightline	1	2.3	Annually	30	30	30	30	30	30		N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A		750	750	750	750	750	750	
5	Maintain current AGFC Depredation Permit for allow the taking of deer and coyote posing a hazard to human life and equipment on and around the flightline	1	2.3	Annually	20	20	20	20	20	20		N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A		500	500	500	500	500	500	
6	Develop erosion and sediment control manual with site-specific BMPs	2	3.1	2020	0	20	300	20	20	20		0	300	TBD	300	300	300		0	0	16500	0	0	0		0	800	TBD	800	800	500	
7	Maintain riparian management zones around water resources	1	3.5	As Needed	TBD	160	160	160	160	160		TBD	4000	4000	4000	4000	4000		TBD	7500	7500	7500	7500	7500		TBD	13000	13000	13000	13000	13000	
8	Review proposed activities for potential impacts to water resources	1	4.1	As Needed	40	60	60	60	60	60		200	200	200	200	200	200		N/A	N/A	N/A	N/A	N/A	N/A		1200	1700	1700	1700	1700	1700	
9	Coordinate with USACE and ADEQ regarding activities likely to impact wetland or other water resources and identify mitigation options	1	4.1	As Needed	60	100	100	100	100	100		TBD	TBD	TBD	TBD	TBD	TBD		TBD	3000	3000	3000	3000	3000		TBD	TBD	TBD	TBD	TBD	TBD	
10	Update wetland and other water resources mapping and delineations	2	4.2	2020	TBD	20	100	20	20	20		TBD	500	3000	500	500	500		TBD	N/A	6000	N/A	N/A	N/A		TBD	500	9500	500	500	500	
11	Mitigate/enhance stream and riparian area IAW permits issued under Section 404 of Clean Water Act	1	4.4	As Needed	500	250	250	250	250	TBD		TBD	TBD	TBD	TBD	TBD	TBD		60000	30000	30000	30000	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD	
12	Conduct vegetation survey using remote sensing and ground truthing	2	5.1	2020	0	50	360	50	50	50		0	500	3000	500	500	500		0	0	24000	0	0	0		0	1750	28000	1750	1750	1750	
13	Monitor for new invasive species or sudden increases in densities of existing invasive species	1	5.4	As Needed	TBD	80	80	80	TBD	TBD		TBD	1000	1000	1000	1000	1000		30000	30000	30000	30000	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD	
14	Monitor priority invasive species, once identified, and implement control projects if needed, possibly in conjunction with local government agencies	1	5.4	As Needed	TBD	80	80	80	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD		30000	30000	30000	30000	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD	
15	Remove any trees that are penetrating the Airspace Imaginary Surfaces at LRAFB and BDZ	1	5.7	As Needed	0	TBD	TBD	TBD	TBD	TBD		0	TBD	TBD	TBD	TBD	TBD		0	TBD	TBD	TBD	TBD	TBD		0	TBD	TBD	TBD	TBD	TBD	
16	Conduct updated forest inventory as directed by AFI 32-7064	1	5.8	2020	0	TBD	600	TBD	TBD	TBD		0	0	2500	TBD	TBD	TBD		0	TBD	30000	TBD	TBD	TBD		0	TBD	37500	TBD	TBD	TBD	

17	Perform Timber Stand Improvement operations for enhanced forest health.	1	5.8	As Needed	40	240	240	240	240	240		1000	1000	1000	1000	1000	1000		TBD	TBD	TBD	TBD	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD	
18	Develop and administer the sale of forest products	2	5.9	As Needed	80	80	80	80	80	80		200	200	200	200	200	200		1500	1500	1500	1500	1500	1500		1700	1700	1700	1700	1700	1700	
19	Apply prescriptive fire as a tool to mimic the natural forces in fire maintained ecosystems.	1	5.10	Anually	60	60	60	60	60	60		TBD	TBD	TBD	TBD	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD	
20	Provide consultation on projects that will impact base trees. Planting should occure at a greater frequency than removals.	1	5.11	As Needed	40	40	40	40	40	40		1000	1000	1000	1000	1000	1000		N/A	N/A	N/A	N/A	N/A	N/A		2000	2000	2000	2000	2000	2000	
21	Apply for Tree City Certification annually	2	5.11	Annually	20	20	20	20	20	20		N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A		500	500	500	500	500	500	
22	Develop Golf Course Environmental Management Plan	3	5.12	2022	0	0	20	20	120	0		N/A	N/A	500	500	2000	N/A		0	0	0	0	6000	0		0	0	500	500	7000	0	
23	Install and maintain habitats that encourage pollination activities in appropriate areas on base.	2	6	2018	20	40	TBD	TBD	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD		30000	TBD	TBD	TBD	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD	
23	Conduct annual on-base deer population survey	1	6.4	Annually	40	40	40	40	40	40		400	400	7000	400	400	400		N/A	N/A	N/A	N/A	N/A	N/A		1400	1400	8000	1400	1400	1400	
24	Establish and implement effective deer population control strategies in order to reduce BASH risk	1	6.4	As Needed	40	40	40	40	40	40		1500	1500	1500	1500	1500	1500		N/A	N/A	N/A	N/A	N/A	N/A		2500	2500	2500	2500	2500	2500	
25	Improve wild turkey and quail habitat	2	6.4	As Needed	0	40	40	40	40	40		0	500	500	500	500	500		N/A	N/A	N/A	N/A	N/A	N/A		1500	1500	1500	1500	1500	1500	
26	Create and maintain small wildlife openings throughout forest	2	6.4	As Needed	20	20	20	20	20	20		200	200	200	200	200	200		N/A	N/A	N/A	N/A	N/A	N/A		700	700	700	700	700	700	
27	Manage vegetation to maintain properly balanced aquatic ecosystem	1	6.5	As Needed	40	40	40	40	40	40		TBD	TBD	TBD	TBD	TBD	TBD		3000	3000	3000	3000	3000	3000		6000	6000	6000	6000	6000	6000	
28	Use aquatic herbicide to control alligator weed in base lakes	1	6.5	As Needed	20	40	40	40	40	40		0	2000	2000	2000	2000	2000		0	3000	3000	3000	3000	3000		500	6000	6000	6000	6000	6000	
29	Install artificial structures to attract fish and provide cover for forage species	2	6.5	As Needed	60	20	20	20	20	20		200	TBD	TBD	TBD	TBD	TBD		N/A	N/A	N/A	N/A	N/A	N/A		1700	TBD	TBD	TBD	TBD	TBD	
30	Implement yearly fertilization program, as advised by AGFC, to increase lake productivity	1	6.5	Annually	TBD	40	40	40	40	40		TBD	2000	2000	2000	2000	2000		N/A	N/A	N/A	N/A	N/A	N/A		TBD	3000	3000	3000	3000	3000	
31	Update wildlife surveys with an emphasis on rare species	1	6.6	2021	0	TBD	TBD	TBD	TBD	TBD		0	TBD	TBD	TBD	TBD	TBD		0	TBD	TBD	TBD	TBD	TBD		0	TBD	TBD	TBD	TBD	TBD	
32	Conduct avian surveys to supplement previous inventories and establish distribution, abundance, and long range trends of seasonal bird communities found on the installation	2	6.7	2019	0	80	20	0	0	0		0	TBD	TBD	0	0	0		0	85000	0	0	0	0		0	TBD	TBD	0	0	0	
	Manage rare water-dependent species (e.g., Interior Least Tern) by protecting the shorelines of, and water quality in, the Big Base Lake, Small Base Lake, and streams.	1	7.1	2018	60	60	60	60	60	60		TBD	TBD	TBD	TBD	TBD	TBD		46000	46000	46000	46000	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD	
33	Develop conservation management plan for ILT	1	7.2	2019	0	TBD	TBD	TBD	TBD	TBD		0	TBD	TBD	TBD	TBD	TBD		0	TBD	TBD	TBD	TBD	TBD		0	TBD	TBD	TBD	TBD	TBD	
34	Make improvements to ILT habitat, i.e. install wooden pallets, on rooftops to provide shade for the least tern	2	7.2	As Needed	0	20	TBD	TBD	TBD	TBD		0	1500	TBD	TBD	TBD	TBD		N/A	N/A	N/A	N/A	N/A	N/A		0	2000	TBD	TBD	TBD	TBD	
35	Conduct surveys of RMBM and its host plant, the Rattlesnake Master in order to provide protection as practical of candidate species, and provide an overall ecosystem management strategy for the protection and recovery of candidate species	2	7.4	2018	30	0	30	0	TBD	TBD		100	0	100	0	TBD	TBD		3000	0	3000	0	TBD	TBD		3850	0	3850	0	TBD	TBD	

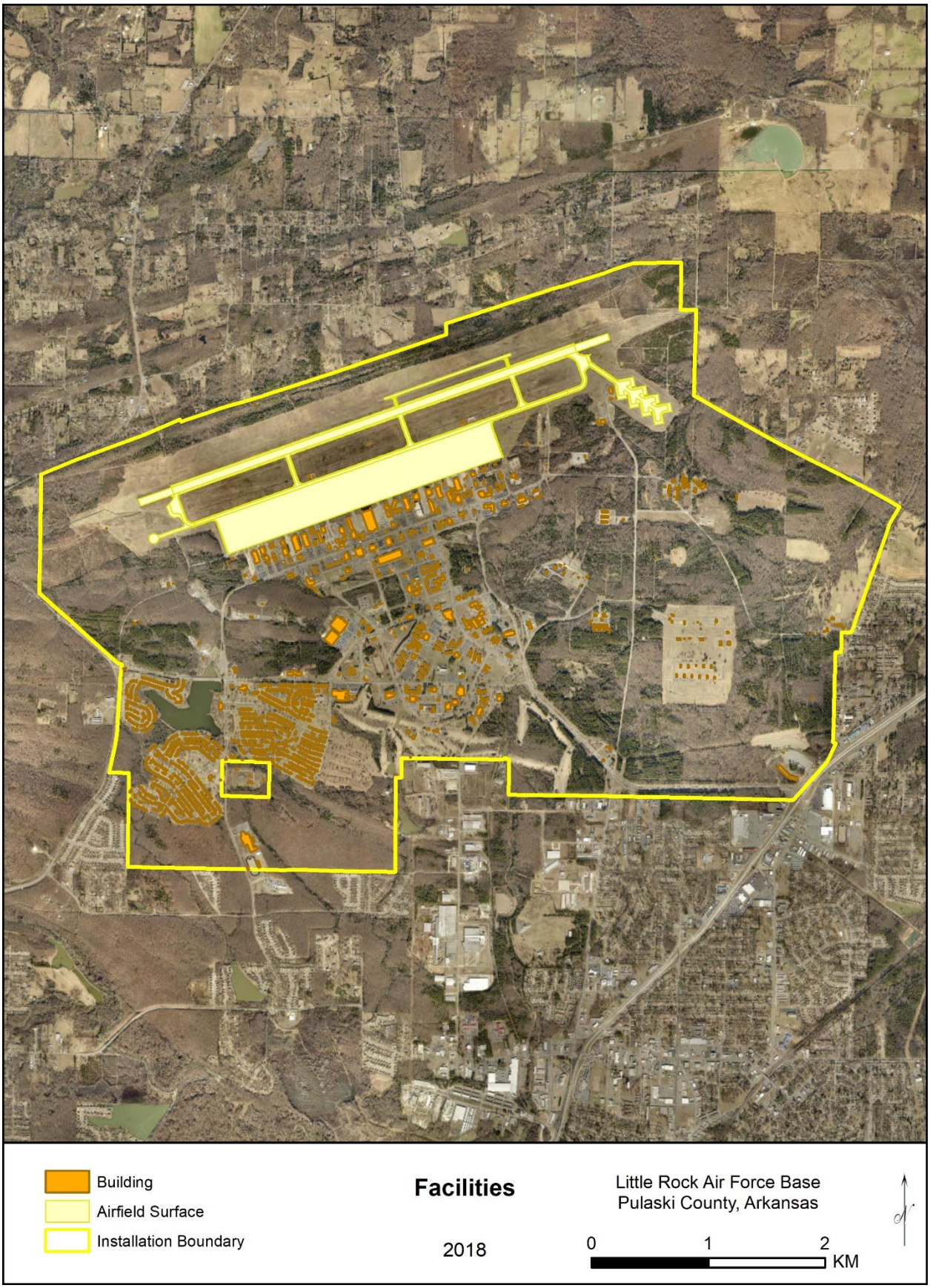
36	Transplant existing RM plants and plant RM seeds to encourage plant establishment away from airfield to reduse BASH risk	2	7.4	As Needed	TBD	TBD	TBD	TBD	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD	
37	Conduct a survey to document status and likelihood of potential federally listed species	1	7.5	2020	0	TBD	TBD	TBD	TBD	TBD		0	TBD	TBD	TBD	TBD	TBD		0	TBD	TBD	TBD	TBD	TBD		0	TBD	TBD	TBD	TBD	TBD	
38	Provide environmental and natural resources training to LRAFB personnel	1	9.1	Annually	120	80	80	80	80	80		TBD	TBD	TBD	TBD	TBD	TBD		N/A	N/A	N/A	N/A	N/A	N/A		TBD	TBD	TBD	TBD	TBD	TBD	

Appendix E. Maps

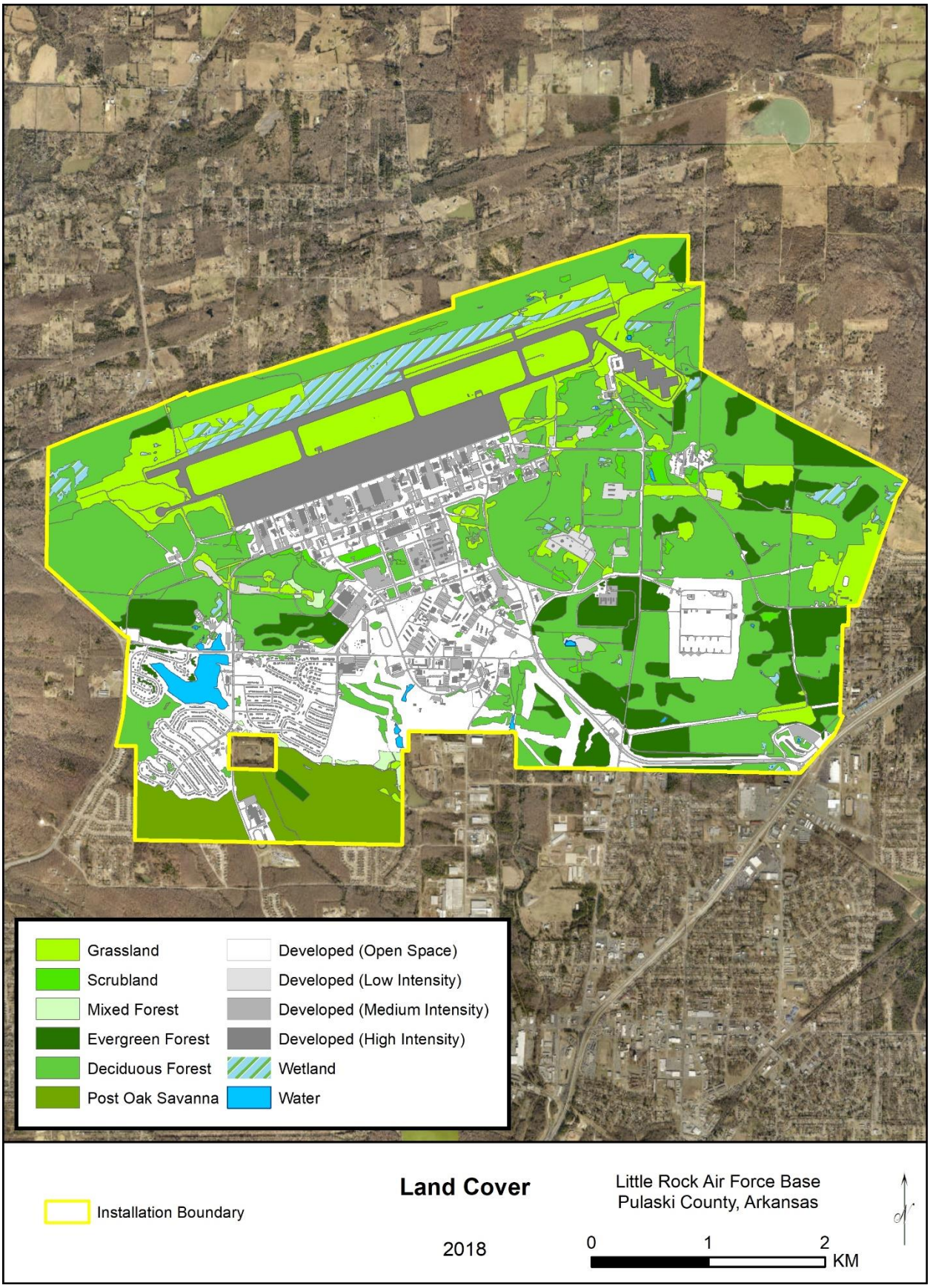
Map E-1. Regional Location Map



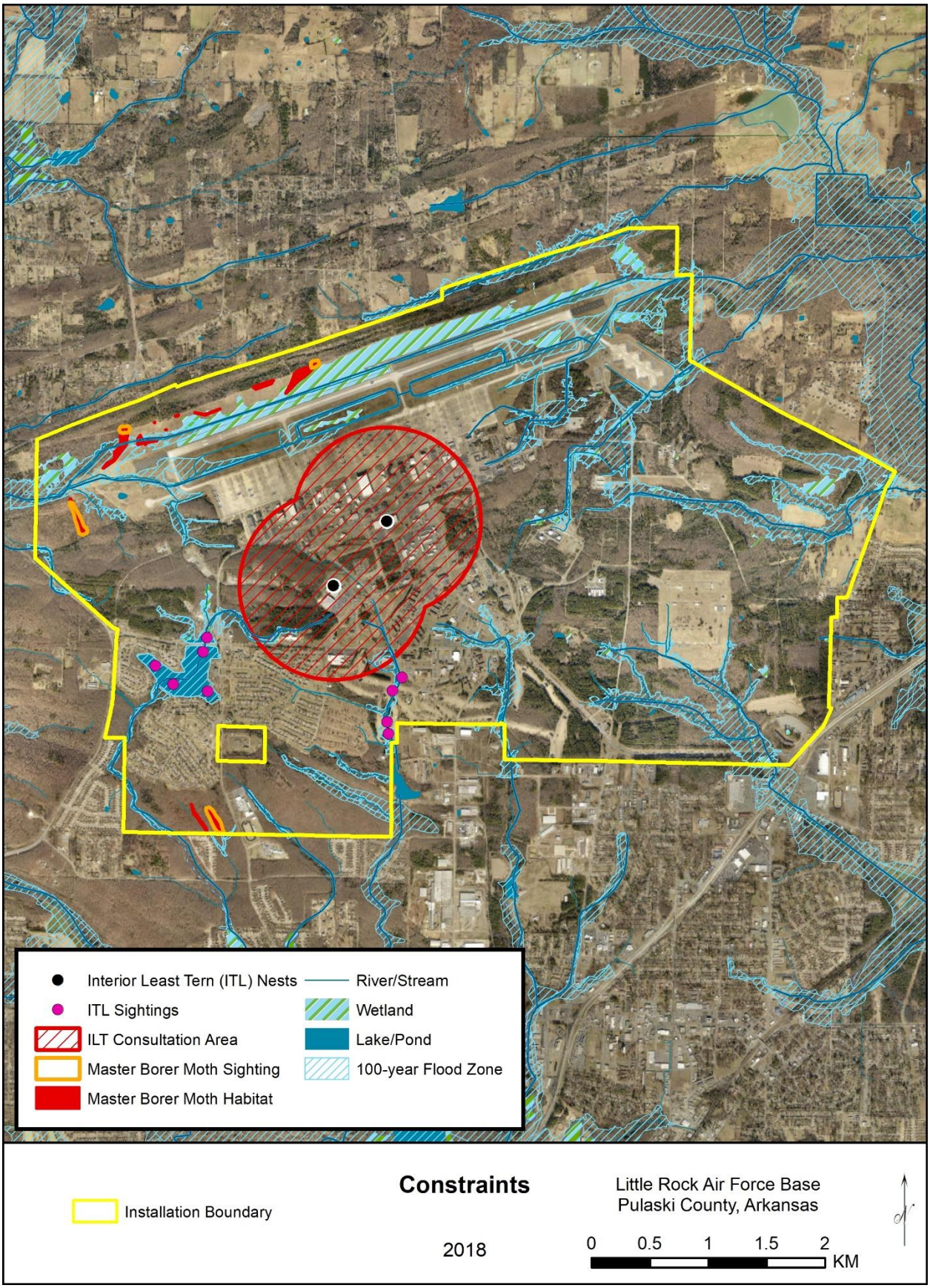
Map E-2. Facility Map



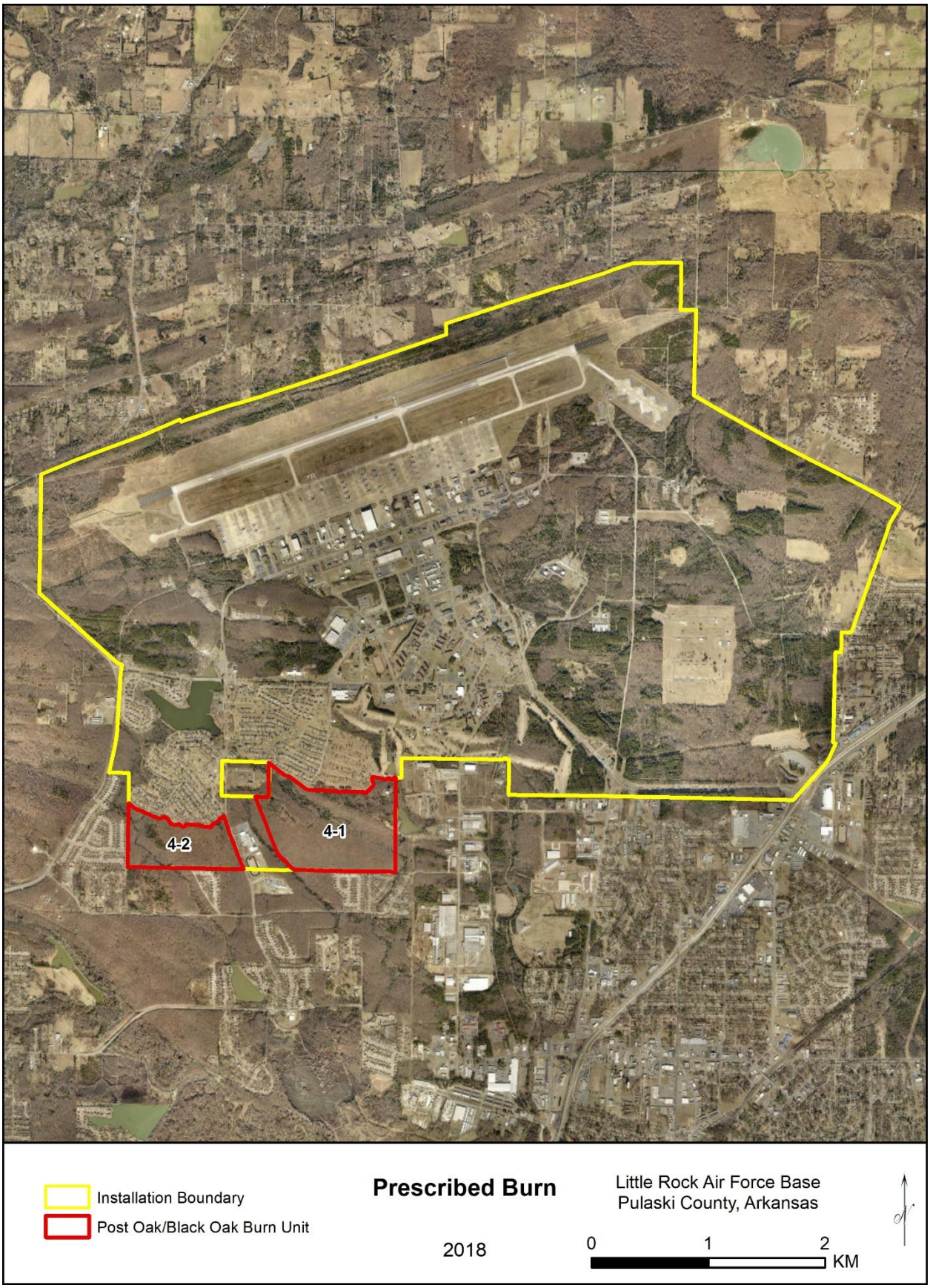
Map E-3. Land Cover



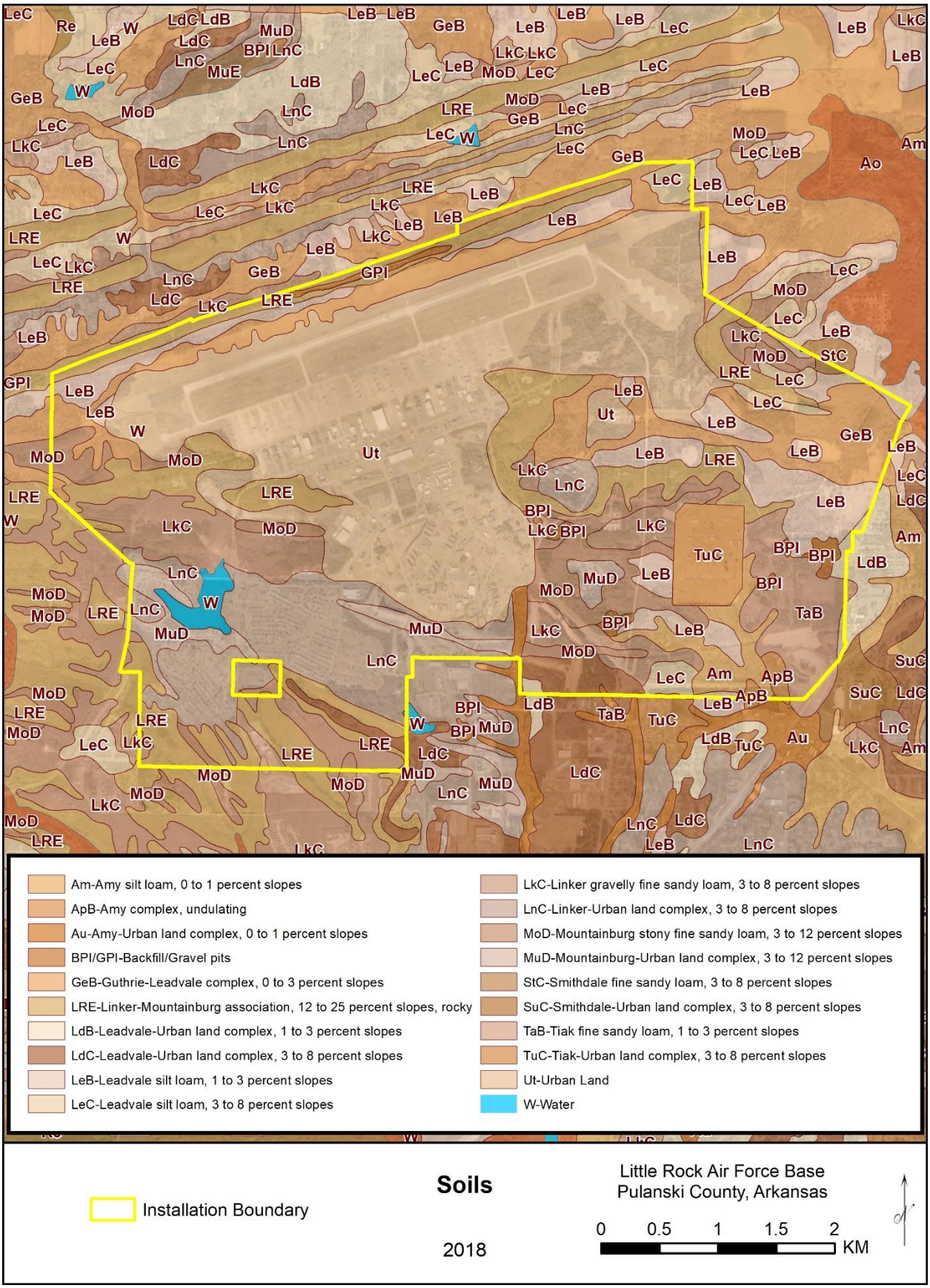
Map E-4. Constraints Map



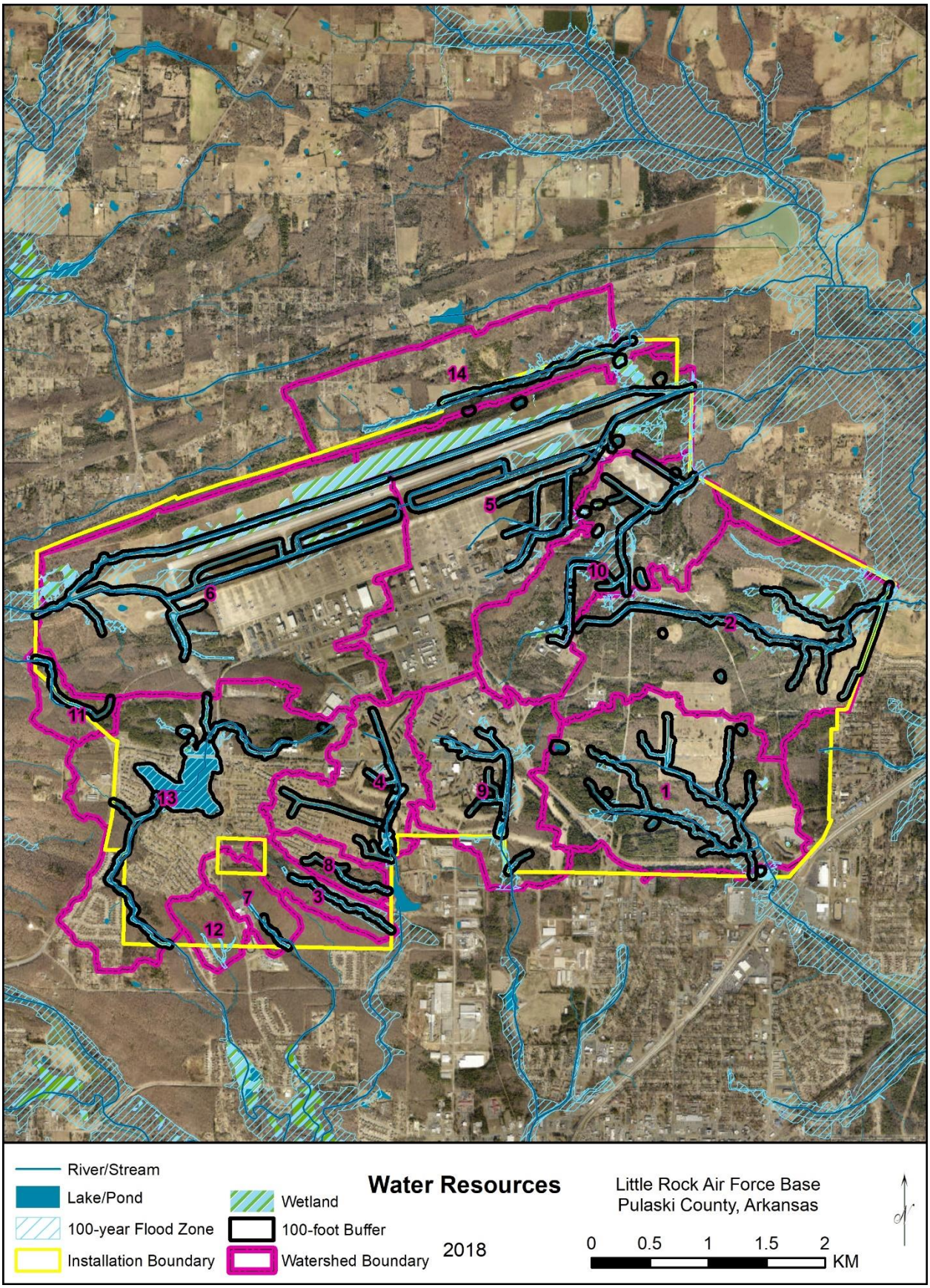
Map E-5. Fire


4-2
4-1
Installation Boundary
Post Oak/Black Oak Burn Unit
Prescribed Burn
2018
Little Rock Air Force Base
Pulaski County, Arkansas
0
1
2
KM

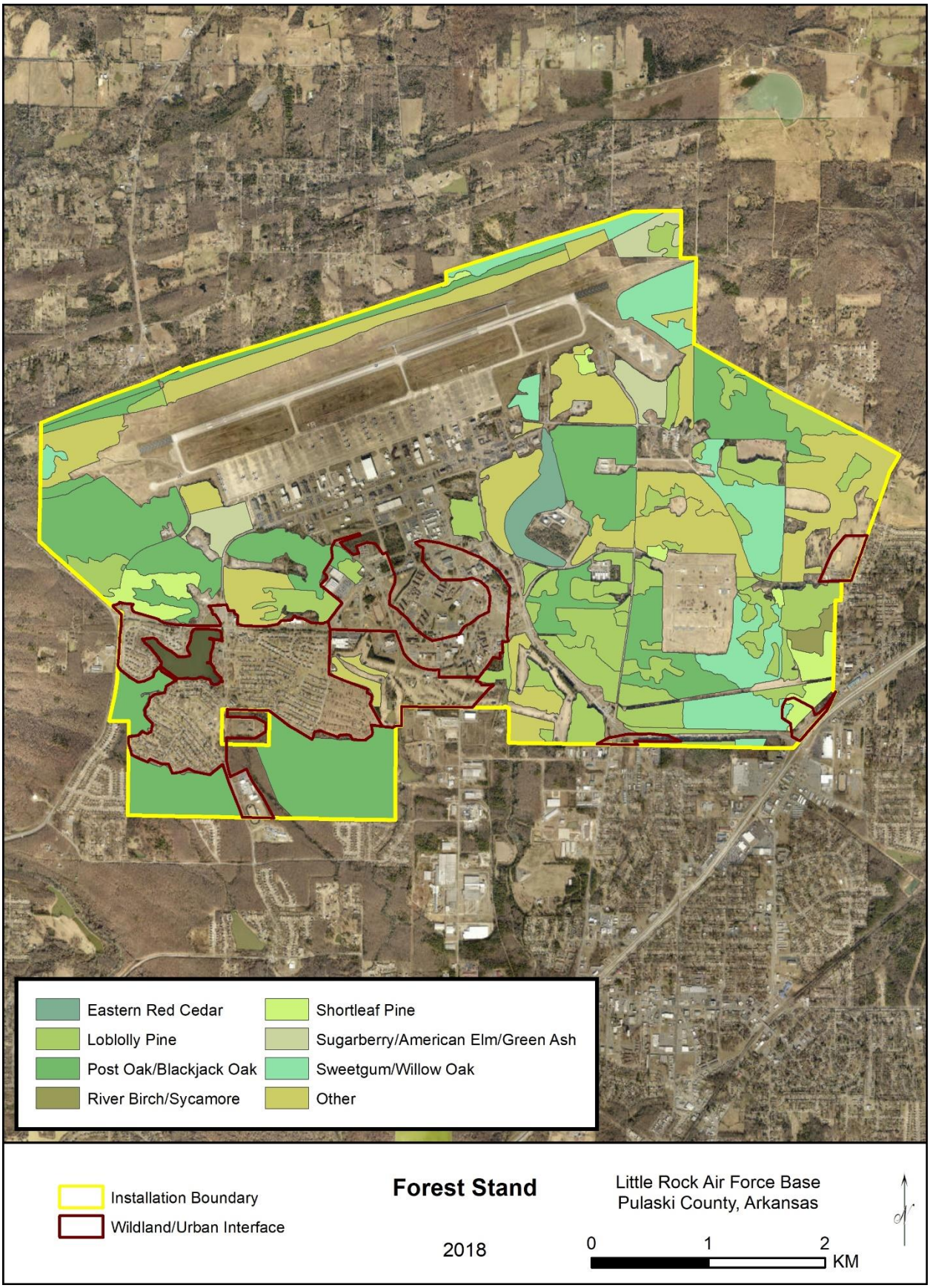
Map E-6. Soils Map



Map E-7. Water Resources Map



Map E-8. Forest Stands Map



Appendix F. Environmental Summary

F.1. Physical Environment

F.1.1. Climate

The climate of Pulaski County is affected by all North American air mass types. Summers are typically hot, with long periods of high humidity. Based upon the base climatic data for 1981 through 2010 provided in Table F-1, the average daily temperature from June to August is approximately 80 degrees Fahrenheit (°F), with average high temperature during this period of approximately 92°F and average low of 67°F. A daily high temperature greater than 100°F occurs frequently.

Winters are generally mild, with an average temperature from December to February of 42°F. Occasional periods of arctic type weather occur but are typically of short duration. Daily average temperatures during January, typically the coldest month, are a low of 27°F and a high of 52°F. Low temperatures of 10°F frequently occur in January. Historically, annual snowfall has ranged from a trace to as much as 37 inches, with an average of 6.3 inches. Most of the annual snowfall occurs in January and February.

Average annual precipitation is 50.7 inches. Precipitation is well distributed throughout the year, although the period of March to May is typically the wettest, and July to October typically the driest. Winter and spring rains are widespread. Summer rains are typically thundershowers of localized extent, but they may produce heavy downpours.

Table F-1. Average Precipitation and Temperature for Jacksonville, AR (1981-2010)

Month	Average Rainfall (inches)	Temperature (°F)		
		Minimum	Maximum	Average
January	3.41	27.1	51.7	39.4
February	3.80	30.6	56.3	43.4
March	4.77	39.1	65.1	52.1
April	4.75	46.9	73.7	60.3
May	5.53	57.3	81.2	69.3
June	3.50	65.5	89.0	77.3
July	3.47	68.9	92.8	80.8
August	2.97	67.8	93.1	80.4
September	3.28	59.7	86.8	73.2
October	4.67	47.9	76.2	62.1
November	5.70	38.3	64.1	51.2
December	4.84	29.8	53.3	41.6
Total/Average	50.69/4.22	48.2	73.6	60.9

Source: NOAA 2018

F.1.2. Land Forms

LRAFB is located along the eastern edge of the Ouachita Mountains, above the Mississippi Alluvial Plain and an ancient coastal embayment, in an area known as the Arkansas Valley and Ridges Land Resources area. The northern portion of Pulaski County can be typified as low, broad ridges. Folding and faulting are less acute than in the southwestern portion of the county, although a series of narrow, east-west oriented ridges occur just north of the base. The most southern ridge of this series runs across the northern portion of the base, north of the airfield. A similar, shorter ridge originally occurred in the airfield area between the current locations of the runway and the ramp. The ridge was cut during the construction of the airfield. Coincidentally, a significant amount of filling to raise the grade was also performed in the central portion of the operations and maintenance area near the airfield.

Most of the base currently has a rolling topography with gentle slopes. Steeper slopes are primarily limited to stream valleys in the northwestern and southwestern corners of the base, and along the ridge north of the airfield. The highest point on the base is northwest of the commissary at 421 feet above mean sea level (msl). The lowest point on the base occurs along the eastern perimeter at 258 feet above msl. Elevations along drainage ways at the perimeter of the base range from between 260 to 320 feet above msl.

F.1.3. Geology and Soils

The Soil Survey of Pulaski County, Arkansas (Haley et. al., 1975) generally describes the soils of the base and much of the northern third of Pulaski County as soils formed in material weathered from predominantly acid sandstone and shale, and in valley fill washed mainly from local highlands. Two soil associations are identified on the base. The northern half of the base is the Leadvale-Guthrie-Linker association. These soils range from poorly drained to well drained, level to gently sloping, deep and moderately deep, loamy soils in valleys and on tops of low mountains. The Linker-Mountainburg association occupies the southern half of the base. It is described as typically well-drained, gently sloping to steep, moderately deep and shallow, loamy, and stony soils on hills, mountains, and ridges. Soils throughout the base are low in organic matter and medium to very strongly acidic, owing to the sandstone and shale parent material from which most of them were derived.

The soil types are shown on Map E-6 and characteristics of the soil series provided in Table F-2.

Most of the improved and some of the semi-improved portions of the base are considered Urban land, Borrow Pit, or Urban land complexes of several soil series. The Urban land or Borrow Pit designations indicate that the soil has been significantly altered and no longer retains enough characteristics of the original soil to be classified. An Urban land complex is a soil that is composed of materials from the original soil but that has been modified from its original profile. The remainder of the base is classified as one of 16 different soil types of seven separate soil series, as shown on Table F-2.

Linker and Mountainburg soils occur over a large portion of the base. These soils are both well drained, but are shallow to very shallow (1 to 4 feet) to bedrock. The surface soil, to 9 or 10 inches, is gravely to stony, fine sandy loam in both soils. The subsoil is clay loam to gravely sandy clay loam.

The deep, poorly drained Amy and Guthrie series dominate a significant portion of the soils in the eastern and northern sections of the base. The Guthrie-Leadvale and Amy complexes occur

in areas of undulating topography. The poorly drained soils occur in lower areas between higher ridges or mounds, with the well-drained Leadvale and other soils present on the mounds. It should be noted that a large portion of the mapped poorly drained soils on the base have historically been altered hydrologically by deep drainage ditches and channels or did not possess the typical hydric soil characteristics, and therefore were eliminated as jurisdictional wetlands. The Smithdale, Leadvale, and Tiak soils are generally deep, moderately well- to well-drained soils. These soils primarily occur north of the airfield and in the southeastern portion of the base.

Table F-2. Mapped soils of LRAFB

Series	Natural Drainage Class	Parent Material	Reaction	Depth to Bedrock (inches)	Depth to Seasonal Water Table (feet)	Typical Profile	
						Depth (inches)	Texture
Amy	Poorly drained	Loamy valley sediments	Strongly to very strongly acid	> 72	0-1	0-12 12-72	silt loam silt loam and silty clay loam
Guthrie	Poorly drained	Loamy sediments (sandstone and shale)	Medium to very strongly acid	> 72	0-1	0-16 16-46 46-72	silt loam silty clay loam (fragipan) silt loam
Leadvale	Moderately well drained	Loamy sediments (sandstone and shale)	Strongly to very strongly acid	> 72	1.5-2.5	0-16 16-72	silt loam silt loam and silty clay loam (fragipan)
Linker	Well drained	Sandstone	Very strongly acid	20-40	> 4	0-4 4-9 9-30	gravely fine sandy loam fine sandy loam clay loam
Mountainburg	Well drained	Sandstone, syenite quartzite	Medium to very strongly acid	12-20	> 2	0-10 10-15	stone fine sandy loam gravely sandy clay loam
Smithdale	Well drained	Coastal plain sediment	Medium to very strongly acid	> 72	> 6	0-5 5-16 16-72	fine sandy loam clay loam sandy loam
Tiak	Moderately well drained	Coastal plain sediment	Medium to very strongly acid	> 72	2-3	0-10 10-72	fine sandy loam and loam silty clay

F.1.4. Water Resources

Water resources encompass both groundwater and surface water. Groundwater comprises subsurface water resources, which are essential to agricultural and industrial activities in many areas. Groundwater properties are often described in terms of depth to aquifer, aquifer or well capacity, and/or water quality. Surface water resources include lakes, rivers, streams, and wetlands, all of which are important for ecological, economical, recreational, and health related reasons.

F.1.4.1. Groundwater Resources

Information regarding the groundwater resources at LRAFB is sparse. The base obtains all water supplies from surface water reservoirs in Little Rock. There are no production wells on the base.The available information is limited to groundwater monitoring wells on base. Generally, these wells have low yield. Depth to the groundwater table varies across the base with depth to bedrock and season. In some locations, the bedrock is very shallow and a seasonal perched water table occurs near the surface. While at other locations, the water table is as much as 30 feet below the surface.

F.1.4.2. Surface Water

The northeastern watersheds (2, 6, 8, 11; Map E-7) drain via several unnamed tributaries to Jack Bayou. This area includes the eastern half of the airfield, the fuel storage area, and most of the area east of Thomas Avenue and north of the explosive ordnance disposal (EOD) area. The northwestern watershed (5; Map E-7) drains to Cypress Branch, a tributary to Bayou Meto with its headwaters on LRAFB. This area includes the western half of the airfield and most of the area north of Sixth Street, the commissary, and the Scout camp. Watershed 12 drains to the north.

The other watersheds drain south via Rocky Branch and other unnamed tributaries to Bayou Meto. The southeastern watershed (1; Map E-7) includes areas east of Vandenburg Boulevard and south of, and including, the EOD area. The south-central watersheds (3, 4; Map E-7) include areas south of Sixth Street and west of Vandenberg Boulevard, the golf course, and a portion of the privatized family housing area. This area largely drains via the streams which flow through the golf course ponds. The southwestern watersheds (7, 9, 10, 13, 14; Map E-7) include the commissary, the Fam Camp, the scout camp, and most of the privatized family housing area. There are no perennial streams on the base. Intermittent streams primarily sustain flow from fall through early summer then form small, shallow pools during dry periods. These pools have a tendency to stagnate and eventually evaporate.

There are several stationary water bodies on the base (Map E-7). The largest is Pat Wilson Lake (approximately 37 acres). The lake has a total drainage area of approximately 460 acres, approximately 15 acres of which is located off base. The lake and its watershed are divided into two areas by Arnold Drive, resulting in the common delineation of the collective impoundment named Pat Wilson Lake and the “small base lake.” Additionally, there are three ponds within the golf course and seven small impoundments on the eastern half of the base ranging from 0.2 to 1.2 acres. The impoundments hold varying amounts of water and support limited wetland vegetation. In addition to the impoundments, there are a number of small ponds (each less than 0.5 acre) that appear to have been created by excavation for soil borrow.

F.1.4.3. Floodplains

Floodplains generally are areas of low, level ground present on one or both sides of a stream channel that are subject to periodic or infrequent inundation by flood waters. Floodplains are typically the result of lateral erosion and deposition that occurs as a river valley is widened. The porous material that composes the floodplain is conducive to retaining water that enters the soil during flooding events and at times when the groundwater table is elevated. Floodplains in their natural form are beneficial in reducing the number and severity of floods, minimizing non-point source water pollution, filtering storm water, providing habitat for plants and animals, and providing aesthetic appeal and outdoor recreation benefits. Inundation dangers associated with development of floodplains have prompted federal, state, and local legislation to limit floodplain development to recreation, agriculture, and preservation activities. Floodplains are regulated by the Federal Emergency Management Agency (FEMA) with standards outlined in 44 Code of Federal Regulations (CFR) Part 60.3. Executive Order (EO) 11988 (Floodplain Management) requires agencies to assess the effects that their actions may have on floodplains and to consider alternatives to avoid adverse effects and incompatible development on floodplains.

A 100-year floodplain survey using 1-foot contours was completed in 2012 (Map E-7). The northern areas of LRAFB, which contain the landing strip, are flatter and lower than the rest of the base and, therefore, are susceptible to flooding (Map E-7). Other areas susceptible to flooding on the base include the riparian areas on the east side of LRAFB; however, these areas are primarily wooded and undeveloped (Map E-7).

F.1.4.4. Wetlands

Wetlands are an important natural system because of the diverse biological and hydrologic functions they perform. These functions may include water quality improvement, groundwater recharge, pollution treatment, nutrient cycling, the provision of wildlife habitat and niches for unique flora and fauna, storm water storage, and erosion protection. Wetlands are protected as a subset of the "waters of the United States" under Section 404 of the CWA, as well as EO 11990 (Protection of Wetlands) which requires federal agencies to take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the beneficial values of wetlands. The US Army Corps of Engineers (USACE) defines wetlands as:

> "…those areas that are inundated or saturated with ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR 328)."

The wetlands also contribute to the food chain because they typically provide for dense, high-quality wildlife vegetation. Amphibians, which are very important in the ecology due to their position in the food chain and their important biomass, are dependent on wetlands. Frequent small wetlands can be just as important as large ones and allow for a wider dispersal of amphibians across the landscape. The wetlands and surrounding vegetation of the floodplain (marsh, submerged vegetation, wet meadow, etc.) are an important part of amphibian's habitat in their life cycle; they use both the aquatic environment and the terrestrial environment, making them very sensitive to water level variation. Water level fluctuations offer food and shelter against potential predators. The variation in water level can affect these habitats, therefore affecting amphibians. Periodic drying of smaller wetlands prevents the establishment of fish, which can eat amphibian eggs. In addition, the presence of wetlands plays a valuable role in decreasing pollution in the runoff to streams and drainage. The natural filtering system of wetlands decreases contaminant

flow into water bodies.

Woolpert (1993) conducted an inventory of the wetlands at LRAFB. The wetlands survey was updated in 1997 by FTN Associates and in 2004 by the USACE and again in 2006-2007 by the USACE. USACE (2007) listed 76 wetland sites which range in size from 0.1 to 11.6 acres, totaling 70.4 acres (Map E-7). These sites are described as forested, forested (recently timbered), emergent, and scrub-shrub. The majority of these have are designated as "low" threat level with 6 sites listed as having a "moderate" threat level (USACE 2007). The majority of the wetlands are less than 1 acre, and they rarely contain a diverse aquatic regime or plant diversity.

F.2. Ecosystems & Biotic Environment

F.2.1. Ecosystem Classification

This classification is a hierarchical system with four levels: domains, divisions, provinces, and sections. Domains are the largest geographic levels and are defined by climate, e.g., polar domain, dry domain, or humid tropical domain. Domains are split into smaller divisions that are defined by climate and vegetation. Divisions are split into smaller provinces usually defined by major plant formations. Some divisions also include varieties of "mountain provinces." These generally have a similar climatic regime to the neighboring lowlands, but show some altitudinal zonation, and are defined according to the types of zonation present. Provinces are divided into sections, which are defined by the landforms present.

LRAFB lies within the Humid Temperate Domain. The climate of the Humid Temperate Domain, located in the middle latitudes (30 to 60 degrees N), is governed by both tropical and polar air masses. The middle latitudes are subject to cyclones; much of the precipitation in this belt comes from rising moist air along fronts within these cyclones. Pronounced seasons are the rule, with strong annual cycles of temperature and precipitation. The seasonal fluctuation of energy and temperature is greater than the diurnal. Climates of the middle latitudes have a distinctive winter season, which tropical climates do not. The Humid Temperate Domain contains forests of broadleaf deciduous and needleleaf evergreen trees. The variable importance of winter frost determines six divisions: warm continental, hot continental, subtropical, marine, prairie, and Mediterranean.

LRAFB is within the subtropical division. It lies on the border of this region with the hot continental division. The subtropical division, which prevails in Southern Atlantic and Gulf Coast States, is defined by a subtropical climate, high humidity (especially in summer), and the absence of really cold winters. Soils in the moister, warmer parts of the humid subtropical regions are strongly leached Ultisols that are poor in many of the plant nutrients essential for successful agricultural production. Forest provides the typical vegetation throughout most of this division.

The Southern Mixed Forest Province is comprised of the Piedmont and the irregular Gulf Coastal Plains, ranging from 100 to 600 feet above msl on the Gulf Coastal Plains, and 300 to 1,000 feet above msl on the Piedmont. Most of the numerous streams in the region are sluggish, and marshes, lakes, and swamps are numerous. This province is by far the largest within the Temperate Broadleaf and Mixed Forests crossing nine states and running northeast to southwest from Maryland to Louisiana. The Southeastern Mixed Forest Province, lying between all of these species-rich provinces, is enriched by the proximity to these other units. However, this province is perhaps the most heavily altered, having been heavily and repeatedly logged and now largely converted to agriculture.

In areas left undisturbed, this province is covered by bottomland deciduous forest with an abundance of green and Carolina ash, elm, cottonwood, sugarberry, sweetgum, and water tupelo, as well as oak and baldcypress. Other common species include pecan associated with eastern sycamore, American elm, and roughleaf dogwood. Vines are prolific along water courses. Bird species found in the province include the prothonotary warbler, white-eyed vireo, wood duck, yellow-billed cuckoo, Louisiana waterthrush, and all the species found in the Southeastern Mixed Forest.

Jacksonville, including LRAFB, lies on the boundary of the Lower Mississippi Riverine Forest Province and the Southeastern Mixed Forest Province. The Lower Mississippi Riverine Forest Province is characterized by flat to gently sloping broad floodplain and low terraces. From near sea level in the south, altitude increases gradually to about 660 feet above msl in the north. Most of the area is flat; the only noticeable slopes are sharp terrace scarps and natural levees that rise sharply to several meters above adjacent bottom lands or stream channels.

Climax vegetation is medium-tall to tall forests of broadleaf deciduous and needleleaf evergreen trees. At least 50% of the stands are made up of loblolly pine, shortleaf pine, and other southern yellow pine species, singly or in combination. Common associates include oak, hickory, sweetgum, blackgum, red maple, and winged elm. The main grasses are bluestem, panicums, and longleaf uniola. Dogwood, viburnum, haw, blueberry, American beautyberry, youpon, and numerous woody vines are common.

Fauna vary with the age and stocking of timber stands, percent of deciduous trees, proximity to openings, and presence of bottom-land forest types. Whitetail deer and cottontail rabbits are widespread. When deciduous trees are present on uplands, the fox squirrel is common. Gray squirrels live along intersecting drainages. Raccoon and fox inhabit the whole region. The nine-banded armadillo is among mammals frequently encountered in the western part of this province. The eastern wild turkey, bobwhite, and mourning dove are widespread. Of the 20-odd bird species present in mature forest, the most common are the pine warbler, cardinal, summer tanager, Carolina wren, ruby-throated hummingbird, blue jay, hooded warbler, eastern towhee, and tufted titmouse. The red-cockaded woodpecker is an endangered species that inhabits areas of this province. Snakes present in the forests include cottonmouth moccasin, copperhead, rough green snake, rat snake, coachwhip, and speckled kingsnake. French and glass lizards and salamanders are also found in the province.

Seven sections have been delineated in the Southeastern Mixed Forest Province. LRAFB lies within the Arkansas Valley Section. About 80% of this land consists of plains with hills, and 20% includes open low mountains. Elevation ranges from 258 to 3,000 feet above msl. Dominant vegetation is oak-hickory forest, oak-hickory-pine forest, cross timbers, and southern floodplains forest. The predominant vegetation form is about equal areas of cold-deciduous, broad-leaved forest and needle-leaved evergreen trees. Principal forest cover types are oak-hickory and loblolly- shortleaf pine. Species include white, black, bur, post, and blackjack oaks; pignut and mockernut hickories; and loblolly and shortleaf pines. The oak-gum-cypress forest type is dominant along major river bottoms and includes cottonwood, sugarberry, river birch, and green ash.

Historically, elk, Florida panther, bison, passenger pigeon, ivory-billed woodpecker, Carolina parakeet, and Bachman's warbler inhabited this section. Presently, the fauna include white-tailed deer, black bear, bobcat, gray fox, raccoon, cottontail rabbit, gray squirrel, fox squirrel, striped skunk, swamp rabbit, and many small rodents and shrews. In flooded areas, beavers, ibises, cormorants, herons, egrets, and kingfishers are common.

F.2.2. Vegetation

Historic logging, vegetation management, and development have altered the vegetation at the base. Currently, approximately 2,820 acres of woodland remain, with the rest being semi-improved and improved lawns, open fields, and impervious surfaces. The forested areas are very fragmented. The existing vegetative cover types at the base and their acreages are shown in Map E-3.

According to the Arkansas Natural Heritage Commission (ANHC 1996), the dominant plant community in the undeveloped area is the post oak (*Quercus stellata*) and blackjack oak (*Q. marilandica*) community. This community comprises approximately 1,700 acres of the base. Other species associated with this series are cedar elm (*Ulmus crassifolia*), red oak (*Q. falcata*), yaupon (*Ilex comitoria*), and deciduous holly (*I. decidua*). A common invader of this series is the Eastern red cedar (*Juniperus virginiana*). The next most common plant on the undisturbed portions of the base is a bottomland hardwood series containing pin oak (*Q. palustris*), sweet gum (*Liquidambar styraciflua*), and willow oak (*Q. phellos*). The plant series containing loblolly (*Pinus taeda*) and shortleaf (*P. echinata*) pine is found on approximately 615 acres of the base. Approximately 509 acres of loblolly pine stands and 106 acres of shortleaf pine stands are present. Other plant species associated with this series include a variety of oak species including post oak, blackjack oak, white oak (*Q. alba*), and water oak (*Q. nigra*). Common understory species include flowering dogwood (*Cornus florida*), yaupon, and American beautyberry (*Callicarpa Americana*) (ANHC 1996). A complete list of plant species detected during the 1996 survey can be found in Table H-1 in Appendix H.

The pine series present on the base is mostly a result of the area being cleared for timber between 1960 to the 1980s, and subsequently replanted with primarily loblolly pines. In addition, some portion of the sweet gum dominated bottomland stands was also planted. The remainder of the forest has become established naturally.

The ANHC (1996) also performed a survey of rare plant communities. A somewhat rare oak savanna community type has been identified at two locations south of privatized family housing (Map E-3). This habitat was once widespread in Arkansas in areas of poor, shallow soils, but has since been largely obliterated. The presence of this community at the base represents an example of a pre-settlement vegetation type.

There is currently an ongoing program to survey and treat invasive species occurring at LRAFB (HDR Engineering 2016; Section 12). The priority species targeted are listed in Table 4. In 2010, survey areas focused on linear features (i.e., roads, ditches, mowed rights-of-way) and expanded to a commercial timber in 2012 (HDR Engineering 2016; Section 12). Not all target species were located on LRAFB but are known to occur in Pulaski County (Table 4).

Most turf and landscaped areas (2300 acres) occur in the improved and semi-improved sections of the base, including the airfield, around structures in the cantonment area, around privatized family housing, along major roadways, and the Deer Run Golf Course. Lawns around the cantonment area are primarily composed of Bermuda grass (*Cynodun dactylon*).

On the golf course, fairways are primarily composed of common Bermuda grass, with a limited amount of other species (e.g., *Zoysia*). Greens are primarily bentgrass. Common turfgrass pest species on the golf course include pythium, dollar spot, brown patch, cutworms, armyworms, wild onion, goosegrass, bluegrass (*Poa* spp.), and crabgrass.

In 2010, an urban forestry survey was conducted on the base (Davey Resource Group 2012; Section 12) in order to inventory currently landscaped trees, evaluate their current condition, and establish an effective planning and management program. During the survey, 12,031 point locations were inventoried and trees were recorded at 10,686 of these points. The tree population included 76 species, representing 38 genera. *Quercus* (oak) comprises 34.66 percent of the inventoried tree population, with *Pinus* (pine) contributing 15.76 percent, *Lagerstroemia* (crapemyrtle) 10.30 percent, *Ulmus* (elm) 5.94 percent, *Acer* (maple) 5.17 percent, *Juniperus* (juniper) 4.61 percent, *Ilex* (holly) 3.42 percent, *Fraxinus* (ash) 3.25 percent, *Pyrus* (pear) 3.06 percent, and *Carya* (hickory) contributing 1.89 percent. This report noted that the urban population has 31.41% young or small trees (less than 6 inches in diameter), 16.88% mature trees (between 6 and 24 inches in diameter), and 8.23% were large trees (greater than 24 inches in diameter). There were 131 (1.23 percent) trees in good condition, 9,326 (87.26 percent) are in Fair condition, 939 (8.79 percent) are in Poor condition, and 161 (1.51 percent) are in Critical condition. There are 129 (1.21 percent) trees rated as Dead.

F.2.3. Plant Species

Historic logging, vegetation management, and development have altered the vegetation at the base. Currently, approximately 3,000 acres of woodland remain, with the rest being semi-improved and improved lawns, open fields, and impervious surfaces. The forested areas are very fragmented.

According to the Arkansas Natural Heritage Commission (ANHC 1996), the dominant plant community in the undeveloped area is the post oak (*Quercus stellata*) and blackjack oak (*Q. marilandica*) community. This community comprises approximately 1,700 acres of the base. Other species associated with this series are cedar elm (*Ulmus crassifolia*), red oak (*Q. falcata*), yaupon (*Ilex comitoria*), and deciduous holly (*I. decidua*). A common invader of this series is the Eastern red cedar (*Juniperus virginiana*). The next most common plant on the undisturbed portions of the base is a bottomland hardwood series containing pin oak (*Q. palustris*), sweet gum (*Liquidambar styraciflua*), and willow oak (*Q. phellos*). The plant series containing loblolly (*Pinus taeda*) and shortleaf (*P. echinata*) pine is found on approximately 615 acres of the base. Approximately 509 acres of loblolly pine stands and 106 acres of shortleaf pine stands are present. Other plant species associated with this series include a variety of oak species including post oak, blackjack oak, white oak (*Q. alba*), and water oak (*Q. nigra*). Common understory species include flowering dogwood (*Cornus florida*), yaupon, and American beautyberry (*Callicarpa Americana*) (ANHC 1996).

In 1996, ANHC also conducted a survey for the Blackjack Drop Zone (ANHC 1996). This property is primarily mowed grassland with hedgerows and woods at the edges.

For full details regarding threatened and endangered plant species with the potential to occur on LRAFB, refer to Appendix G. For a list of species documented at LRAFB, refer to Appendix H.

F.2.4. Fish and Wildlife

The large undeveloped areas of the base provide suitable and desirable habitat for many of the wildlife species that inhabit the region. The base's location near other undeveloped areas increases the wildlife habitat available in the region and the diversity and abundance of wildlife on the base. The base provides a variety of terrestrial habitats, and limited aquatic habitats. The Nature Conservancy has conducted extensive baseline surveys for birds, terrestrial and flying mammals, reptiles, amphibians, insects, crayfish, and aquatic macroinvertebrates from streams and lakes on the base as part of the threatened and endangered species survey. USACE Environmental Laboratory has conducted several long-term bird population surveys between 1997 and 2017 (Peacock and Zollner 1997, Fischer 2001, Guilfoyle 2017). A summary of the species found in these surveys are provided in Appendix H.

Federally listed wildlife species with known occurrence in White County include the threatened Piping Plover, the threatened Northern Long-eared Bat, the endangered Gray Bat (*Myotis grisescens*), and 5 federally protected mussel species (Appendix G). No protected species have been documented at the Blackjack Drop Zone in White County to date. The Rattlesnake Master Borer-moth, a candidate species is not documented at the Blackjack Drop Zone and is not listed as a species present in White County; however, the moth's host plant, *Eryngium yuccifolium*, has been documented on the property. For full details regarding threatened and endangered animal species with the potential to occur on LRAFB, refer to Appendix G.

Appendix G. Endangered and Threatened Listed Species Summary

G.1. Federally Listed Species

Federal status, as a threatened or endangered species, is derived from the Endangered Species Act (ESA) of 1973 (16 US Code [USC] §1531 et seq.) and is administered by the US Fish and Wildlife Service (USFWS). Federally listed wildlife species with known occurrence in Pulaski County include the endangered Interior Least Tern (*Sterna antillarum athalossos*), the threatened Piping Plover (*Charadrius melodus*), the threatened Northern Long-eared Bat (*Myotis septentrionalis*), and the Rattlesnake Master Borer-Moth (Papaipema eryngi), a Federal candidate species (Table G-1). Both the Interior Least Tern and the Rattlesnake Master Borer-Moth have been documented on LRAFB but there is no critical habitat designated.

Federally listed wildlife species with known occurrence in White County include the threatened Piping Plover, the threatened Northern Long-eared Bat, the endangered Gray Bat (*Myotis grisescens*), and 5 federally protected mussel species (Table G-1). No protected species have been documented at the Blackjack Drop Zone in White County to date. The Rattlesnake Master Borer-moth, a candidate species is not documented at the Blackjack Drop Zone and is not listed as a species present in White County; however, the moth's host plant, *Eryngium yuccifolium*, has been documented on the property.

Bald eagles (*Haliaeetus leucocephalus*), which were delisted under the ESA but remain protected under the Bald and Golden Eagle Protection Act (BGEPA), have also been historically (1998) documented on LRAFB. However, this species is likely only a transient visitor to LRAFB as there are no documented nesting locations at the base.

In 2018, AFCEC ordered a Programatic Biological Assessment (PBA) regarding threatened and endangered species and flight operations for 32 installations in order to provide a model so that the AF and the USFWS may have a quantifiable and defenseible means for tracking, amending, and/or renewing incidental take statements in the future at both a national- and base-scale as missions change over time (LRAFB 2018c). As of 2018, two species of bat, *Myotis lucifugus* and *Perimyotis subflavus*, known to occur at LRAFB (Saugey 1997, Hauer and Scwhab 2017) are not listed but under review by the USFWS to become candidate species under the ESA (Table G-1; LRAFB 2018c). USFWS suggested that, though not listed, the Little Brown Bat and the Tricolored Bat should be included in the PBA (LRAFB 2018b).

There are seven special status plant species documented for Pulaski County and one species for White County. A summary of federal special status wildlife and plant species known to occur in Pulaski County are included in Table G-1, respectively. Further, these tables list their federal and state conservation rank as well as habitat characteristics for each species.

G.2. State Listed Species

There is not currently a state law in Arkansas that mandates the protection of wildlife or plant species beyond those covered by the ESA. The Arkansas Natural Heritage Commission (ANHC) maintains a list of species which it considered to be endangered or threatened in Arkansas. The ANHC encourages appropriate parties to take these taxa into account in environmental planning.

Table G-1. Special Status Wildlife Species Occurring in Pulaski and White Counties, Arkansas						
Scientific Name	**Common Name**	**Federal Status**	**State Rank**	**County**		**Habitat**
				Pulaski	**White**	
Birds						
Charadrius melodus	piping plover	T	S1	✓	✓	During migration, plovers use rest sites along migration pathway including shorelines of resevoirs/man-made lakes, industrial ponds/fish farm ponds, rivers, marsh, wetlands, and natural lakes.
Sterna antillarum athalassos	interior least tern	E	S3	✓		Sandbars of the large, sandy-shored rivers. Also nest in sand and gravel pits, on dredge inlands, dike fields, ash disposal areas of power plants, along the shores of reservoirs, and gravel roof tops.
Mammals						
Myotis grisescens	gray bat	E	S2S3		✓	Roost in caves which are primarily located along rivers during the summer.
Myotis septentrionalis	northern long-eared bat	T	S1S2	✓	✓	Roost underneath bark or in cavities or crevices of live trees or snags or in caves and mines. Overwinter roosts more often on upper or middle slopes which have large passages and entrances with relatively constant cooler temperatures, high humidity, and no air current.
Myotis lucifugus	little brown bat	NL	S3	✓	✓	Roost in trees and buildings and hibernates in caves and mines.
Perimyotis subflavus	tricolored bat	NL	S2S3	✓	✓	Hiberate in caves or mines with minimal air flow. Roost during the summer in building, tree cavities, and rock crevices. Forage along forest edges and waterways for small insects.

Table G-1. Special Status Wildlife Species Occurring in Pulaski and White Counties, Arkansas, *cont.*						
Scientific Name	**Common Name**	**Federal Status**	**State Rank**	**County**		**Habitat**
				Pulaski	**White**	
Invertebrates						
Papaipema eryngi	rattlesnake master borer-moth	C	S1	✓		Mesic prairies and associated wetlands with a large amount of the rattlesnake master (*Eryngium yuccifolium*) plant and no fire during the dormant season.
Lampsillis aburpta	pink mucket	E	S2		✓	Mud and sand and in shallow riffles and shoals swept free of silt in major rivers and tributaries.
Leptodea leptodon	scaleshell	E	S2	✓	✓	Medium-sized and large rivers with stable channels and good water quality.
Lampsillis streckeri	speckled pocketbook	E	S1		✓	Endemic to Little Red River drainage.
Potamilus capax	fat pocketbook	E	S2		✓	Sand, mud, and fine gravel bottoms of large rivers.
Quadrula cylindrica cylindrica	rabbitsfoot	T	S1		✓	Small to medium sized streams and some large rivers with bottom substrates that generally include gravel and sand.

Table G1. Special Status Species Occurring within Pulaski and White Counties, AR, *cont.*						
Scientific Name	**Common Name**	**Federal Status**	**State Rank**	**County**		**Habitat**
				Pulaski	**White**	
Eriocaulon microcephalum	small-head pipewort	-	S2	✓		Found in or near sandy, permanently moist to wet acidic seepage areas, particularly upland sandstone glade seeps and sandy hillside seeps; in hillside seepage bogs, particularly the less densely vegetated, sandy bog margins; and (rarely) in wet prairies.
Platanthera flava	southern rein-orchid	-	S2S3	✓		Sandy silt alluvium and rotting logs in bottomland forests, wet thickets, hydric hammock communities, wet-mesic prairies, and wet meadows.
Platanthera peramoena	purple fringeless orchid	-	S2	✓	✓	Moist forests, woodlands, meadows, and thickets, marshes, and swamps.
Rhynchospora colorata	white-top sedge	-	S1	✓		Moist or sandy soil in coastal plains, marshes, wet savannas, ditches, pastures, and along roads.
Sabatia campanulata	slender rose-gentian	-	S1	✓		Wet pine savannahs and along shores of ponds.
Thalictrum arkansanum	Arkansas meadow-rue	-	S2	✓		Low rich woods, edges of swamps, and along stream banks.
Trifolium stoloniferum	running buffalo clover	E	SH	✓		Moist habitats with filtered sunlight and a pattern of moderate or periodic disturbance (grazing, mowing, trampling, flood scouring, etc.). It cannot tolerate full sun, full shade, or severe or prolonged disturbance.

Table G-1. Special Status Wildlife Species Occurring in Pulaski and White Counties, Arkansas, *cont.*
FEDERAL STATUS
E = Endangered = Danger of extinction throughout range **T** = Threatened = Likely to become endangered in foreseeable future throughout range **C** = Candidate = While the USFWS encourages cooperative conservation efforts for these species, they do not receive statutory protection under the ESA designated under the ESA to benefit a threatened or endangered species **NL** = Not Listed = either officially under review or a species of interest by USFWS
STATE STATUS
S1 = Extremely rare. Typically S or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation. **S2** = Very rare. Typically between S and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated. **S3** = Rare to uncommon.Typically between 20 and 100 estimated occurrences, may have fewer occurrences but with large number of individuals in some populations, may be susceptible to becoming extirpated **SH** = Historically known from the state, but not verified for an extended period, usually 15 years. ✓ = Documented within the county
Sources: USFWS 2018; Fowler 2015; ANHC 2018

G.3. Priority Special Status Species

Priority species were identified based on their regulatory status, known occurrence on or near LRAFB, or their likelihood of occurring on LRAFB. This section presents information about the management of sensitive species that are located within, or may be located at, LRAFB, along with requirements and strategies for management. Two priority special status wildlife species have been identified at LRAFB: the interior least tern (*Sterna antillarum athalassos*) is listed as federally endangered, as designated by USFWS, is found to nest and forage on LRAFB (Section 5.4.1; Map E-4). Additionally, a candidate species, the rattlesnake-master borer moth (*Papaipema eryngii*) and its host plant occur in several locations on LRAFB (Section 5.4.2; Map E-4).

G.3.1 Interior least tern (*Sterna antillarum athalassos*)

Species Description: Least terns are the smallest North American terns. Adults average 8 to9 inches in length, with a 20-inch wingspan. Their narrow, pointed wings make them streamlined flyers. Males and females are similar in appearance. Breeding adults are gray above and white below, with a black cap, black nape, and eye stripe, white forehead, yellow bill with a black or brown tip, and yellow to orange legs. Hatchlings are about the size of ping pong balls and are yellow and buff with brown mottling. Fledglings (young birds that have left the nest) are grayish brown and buff colored, with white heads, dark bills, and eye stripes, and stubby tails. Young terns acquire adult plumage after their first molt at about 1 year, but do not breed until they are 2 to 3 years old.

Habitat: Nesting habitat of the interior least tern includes bare or sparsely vegetated sand, shell, and gravel beaches, sandbars, islands, and salt flats associated with rivers and reservoirs. The birds prefer open habitat and tend to avoid thick vegetation and narrow beaches. Sand and gravel bars within a wide unobstructed river channel, or open flats along shorelines of lakes and reservoirs, provide favorable nesting habitat. As natural nesting sites have become scarce, the birds have used sand and gravel pits, ash disposal areas of power plants, reservoir shorelines, and other manmade sites. For feeding, interior least terns need shallow water with an abundance of small fish. Shallow water areas of lakes, ponds, and rivers located close to nesting areas are preferred (USFWS 2006).

Distribution: Interior least terns breed in isolated areas along the Missouri, Mississippi, Ohio, Red, and Rio Grande river systems. They winter along coastal areas of Central and South America and the Caribbean Islands, but not a lot is known about their wintering areas (USFWS 2006).

Dams, reservoirs, water diversion and other changes to river systems have eliminated most historic least tern nesting habitat. Wide channels dotted with sandbars, which are preferred by least terns, have been replaced by narrow, armor-banked rivers with highly altered flows (USFWS 2006).

Climate Change Vulnerability: Significant changes in weather patterns coupled with increasing demand for water across their range will increase the threats to terns in the future (USFWS 2006).

G.3.2 Rattlesnake-master borer moth (*Papaipema eryngii)*

Figure G-1. Rattlesnake master borer-moth (Photograph Courtesy of TNC 2014)

Species Description: The adult rattlesnake master borer-moth, picture on its host plant (*Erygium yuccifolium*) in Figure G-1, measures 1.4 to 1.9 inches (3.5-4.8 cm) with purple brown to red brown wings and yellow markings and white spots in the middle of the forewing (Bird 1917). Their larvae develop in five instars, all having a yellowish head and deep purplish brown body with white lines until pupation (Bird 1917).

Habitat: Rattlesnake-master borer moths are obligate residents in undisturbed tallgrass prairies, a highly threatened habitat, or woodland edges which contain their host plant, rattlesnake-master (*Eryngium yuccifolium*). The moths are not thought to disperse over large distances, typically no more than 2 miles and only do so when host plants are limited (Panzer 2003, LaGesse et al. 2009).

Distribution: Currently known to exist in patchy distributions in six states: Illinois, Arkansas, Kentucky, Kansas, North Carolina, Missouri, and Oklahoma.

Additional Threats to this Species: Threatened by habitat fragmentation and altered disturbance regimes and, potentially, from collectors.

Appendix H. Species Checklist for LRAFB

Table H-1. Vascular Plant Species – LRAFB

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: Dry, disturbed south slopes overstory	
Aesculus pavia	red buckeye
Carya texana	black hickory
Crataegus crus-galli	cockspur hawthorn
Diospyros virginiana	persimmon
Juniperus virginiana	eastern red cedar
Ligustrum vulgare	common privet
Liquidambar styraciflua	sweet gum; red gum
Pinus echinata	shortleaf pine; yellow pine
Prunus angustifolia	Chickasaw plum
Prunus serotina	black cherry
Quercus marilandica	blackjack oak
Quercus phellos	willow oak
Quercus stellata	post oak
Rhus copallina	winged sumac; dwarf sumac
Ulmus alata	winged elm
Habitat: Dry, disturbed south slopes understory	
Acalypha gracilens	no common name
Achillea millefolium	common milfoil; yarrow
Agalinis tenuifolia	slender false-foxglove
Ambrosia artemisifolia	annual ragweed
Ambrosia bidentata	ragweed
Andropogon gerardii	big bluestem
Andropogon ternarius	splitbeard bluestem
Antennaria plantaginifolia	pussytoes; plantainleaf; everlasting; mouse ear
Aster fragilis	no common name
Aster simplex	no common name
Baptisia bracteata	cream wild indigo
Bidens aristosa	tickseed sunflower
Campanula americana	tall bellflower
Cerastium arvense	no common name
Chaetopappa asteroides	no common name
Chamaecrista fasciculata	no common name
Cirsium carolinianum	purple thistle
Coreopsis tinctoria	tickseed; calliopsis
Croton capitatus	no common name
Crotonopsis elliptica	no common name
Danthonia spicata	poverty oat grass
Dicanthelium linearifolium	no common name
Dicanthelium scoparium	no common name
Diodia teres	poor joe
Elymus glaucus	no common name
Elymus villosus	silky wild rye
Euphorbia corollata	flowering spurge
Euthamia leptocephala	no common name
Geranium carolinianum	Carolina cranesbill
Glandularia canadensis	no common name
Gnaphalium purpureum	purple cudweed
Helenium amarum	bitterweed
Helianthus hirsutus	stiff-haird sunflower

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: Dry, disturbed south slope understory, cont.	
Heterotheca pilosa	no common name
Heterotheca villosa var. villosa	no common name
Hordeum pusillum	no common name
Houstonia caerulea	no common name
Hypericum gentianoides	pine weed; orange grass
Krigia virginica	no common name
Lespedeza capitata	round-headed bush clover
Lespedeza cuneata	serecia lespedeza; Chinese bush clover
Lespedeza hirta	hairy bush clover
Lespedeza procumbens	no common name
Lespedeza repens	no common name
Lespedeza striata	no common name
Lobelia puberula	no common name
Lonicera japonica	Japanese honeysuckle
Opuntia humifusa	no common name
Oxalis violacea	violet wood sorrel
Panicum capillare	old witchgrass
Parthenium integrifolium	American feverfew; wild quinine
Passiflora incarnata	passion flower; maypop
Passiflora lutea	yellow passion flower
Phytolacca americana	pokeweed
Plantago aristida	no common name
Plantago cordata	heart-leaf plantain
Prunus angustifolia	chickasaw plum
Rhexia mariana	Maryland meadow beauty
Rhus aromatica	fragrant sumac
Rosa bracteata	no common name
Schizachyrium scoparium	no common name
Schrankia nuttallii	no common name
Senecio tomentosus	wooly ragwort
Setaria sp.	no common name
Smilax bona-nox	saw greenbriar
Smilax rotundifolia	common greenbriar
Solanum rotundifolia	horse nettle; bull nettle
Solidago altissima	goldenrod spp.
Solidago nemoralis	old-field goldenrod
Solidago rugosa	goldenrod spp.
Spiranthes cernua	no common name
Taraxacum officinale	common dandelion
Tradescantia hirsuticaulis	hairy spiderwort
Tridens flavus	no common name
Triodanis perfoliata	Venus' looking glass
Valerianella radiata	corn salad
Verbena stricta	hoary vervain
Wisteria floribunda	Japanese wisteria
Habitat: Grassy area north of runway	
Campanula americana	tall bellflower
Cicuta maculata	spotted cowbane; water hemlock
Eupatorium serotinum	late boneset

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: Grassy area north of runway cont.	
Helianthus annuus	common sunflower
Juncus sp.	rush
Liatris pycnostachya	cattail gayfeather; Kansas gayfeather
Oenothera villosa	no common name
Passiflora incarnata	passion flower; maypop
Polygonum hydropiperoides	swamp smartweed
Pycnanthemum albescens	mountain mint
Rhexia mariana	Maryland meadow beauty
Sonchus asper	spiney-leaved sow thistle
Wisteria floribunda	Japanese wisteria
Habitat: lake area overstory	
Albizia julibrissin	silktree; mimosa
Carya cordiformis	bitternut hickory
Cercis canadensis	eastern redbud
Cornus florida	flowering dogwood
Crataegus marshallii	parsley hawthorn
Diospyros virginiana	persimmon
Ilex decidua	possumhaw
Ilex apaca	American holly
Juniperus virginiana	eastern red cedar
Ligustrum sinense	Chinese privet
Liquidambar styraciflua	sweet gum; red gum
Nyssa sylvatica	black gum; black tupelo
Pinus echinata	shortleaf pine; yellow pine
Populus deltoides	eastern cottonwood
Prunus munsoniana	wildgoose plum
Prunus serotina	black cherry
Quercus alba	white oak
Quercus falcata	southern red oak
Quercus imbricaria	shingle oak; laurel oak
Quercus nigra	water oak
Quercus phellos	willow oak
Quercus rubra	northern red oak
Quercus stellata	post oak
Robinia pseudo-acacia	black locust
Salix nigra	black willow
Sassafras albidum	sassafras
Tilia americana	American basswood; American linden
Ulmus alata	winged elm
Ulmus rubra	slippery elm
Habitat: lake area understory	
Allium vineale	no common name
Ambrosia artemisifolia	annual ragweed
Ambrosia trifida	great ragweed
Andropogon virginicus	broomsedge
Asplenium platyneuron	ebony spleenwort
Berchemia scandens	Alabama supple-jack
Bromus inermis	no common name
Cicuta maculata	spotted cowbane; water hemlock

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: lake area understory cont.	
Claytonia virginiana	no common name
Commelina virginica	Virginia dayflower
Coreopsis grandiflora	tickseed
Crotonopsis elliptica	no common name
Cunila origanoides	no common name
Cynodon dactylon	no common name
Delphinium carolinianum	Carolina larkspur
Dicanthelium acuminatum	no common name
Dicanthelium boscii	no common name
Elymus canadensis	no common name
Erigeron annuus	Annual fleebane
Erodium sp	no common name
Eryngium yuccifolium	eryngo; rattlesnake master; button snakeroot
Festuca elatior	no common name
Gnaphalium purpureum	purple cudweed
Helianthus divaricatus	woodland sunflower
Juncus effusus	soft rush
Krigia dandelion	no common name
Lactuca canadensis	tall lettuce
Lepidium virginicum	no common name
Lespedeza cuneata	serecia lespedeza; Chinese bush clover
Lespedeza striata	no common name
Lespedeza virginica	no common name
Linum sp.	no common name
Lonicera japonica	Japanese honeysuckle
Panicum gattingeri	panic grass
Parthenocissus quinquefolia	Virginia creeper
Paspalum dilatatum	dallasgrass
Pedicularis canadensis	wood betony
Phlox pilosa	prairie flox; downy phlox
Phytolacca americana	pokeweed
Plantago cordata	heart-leaf plantain
Polygonum sp.	no common name
Potentilla simplex	cinquefoil; five-finger
Prunella vulgaris	self-heal; heal-all
Pueraria montana var. lobata	kudzu
Ranunculus micranthus	no common name
Rhus copallina	winged sumac; dwarf sumac
Rhus hirta	no common name
Rubus sp.	raspberry; blackberry
Rumex crispus	curly dock
Salvia lyrata	cancer weed; lyre-leaved sage
Sambucus canadensis	American elder
Sanicula canadensis	no common name
Smilax bona-nox	saw greenbriar
Smilax glauca	cat greenbriar
Smilax rotundifolia	common greenbriar
Smilax sp.	no common name
Solidago ulmifolia	elm-leaved goldenrod

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: lake area understory cont.	
Spigelia marilandica	spiglea; indian pink; pinkroot marilandica
Symphoricarpos orbiculatus	no common name
Taraxacum officinale	dandelion
Tephrosia virginiana	goat's rue
Tradescantia hirsuticaulis	hairy spiderwort
Tradescantia ohiensis	Ohio spiderwort
Trifolium dubium	no common name
Trifolium rupens	white clover
Urtica chamaedroyoides	no common name
Vaccinium stamineum	deerberry
Valerianella radiata	corn salad
Verbesina alternifolia	yellow ironweed
Vernonia baldwinii	no common name
Viola bicolor	no common name
Vitis aestivalis	summer grape; possum grape
Vitis rotundifolia	muscadine; scuppernong
Habitat: mesic oak-hickory north-slopes overstory	
Acer rubrum	red maple
Acer saccharum	sugar maple
Aesculus pavia	red buckeye
Carpinus caroliniana	American hornbeam
Carya tomentosa	Mockernut hickory
Cornus florida	flowering dogwood
Diospyros virginiana	persimmon
Juniperus virginiana	eastern redcedar; cedarna
Liquidambar styraciflua	sweet gum; red gum
Ostrya virginiana	eastern hophornbeam
Pinus echinata	shortleaf pine; yellow pine
Platanus occidentalis	American sycamore
Prunus serotina	black cherry
Quercus alba	white oak
Quercus falcata	southern red oak
Quercus nigra	water oak
Quercus phellos	willow oak
Quercus rubra	northern red oak
Quercus velutina	black oak
Rhamnus caroliniana	Carolina buckthorn
Rhus copallina	winged sumac; dwarf sumac
Sassafras albidum	sassafras
Ulmus rubra	slippery elm
Habitat: mesic oak-hickory north-slopes understory	
Agrostis hyemalis	no common name
Allium sp.	garlic; onion
Amsonia illustris	no common name
Arisaema dracontium	green dragon
Asplenium platyneuron	ebony spleenwort
Berchemia scandens	Alabama supple-jack
Camassia scilloides	wild hyacinth
Campsis radicans	trumpet-creeper

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: mesic oak-hickory north-slopes understory	
Carex caroliniana	Carolina sedge; hirsute sedge
Carex flaccosperma	thin-fruit sedge
Cassia fasciculata	partridge pea
Chasmanthium latifolium	inland seaoats; upland seaoats; river oats
Chasmanthium laxum	slender spikegrass
Cirsium carolinianum	purple thistle
Claytonia virginiana	no common name
Coreopsis tinctoria	tickseed; calliopsis
Desmodium humifusum	no common name
Desmodium obtusum	no common name
Desmodium paniculatum	no common name
Desmodium rotundifolium	no common name
Dicanthelium boscii	no common name
Erigeron annuus	annual fleabane
Eupatorium rotundifolium	false-horehound
Helianthus divaricatus	woodland sunflower
Hordeum pusillum	no common name
Ipomoea pandurata	wild potato vine
Lespedeza capitata	round-headed bush clover
Lespedeza repens	no common name
Lonicera japonica	Japanese honeysuckle
Oxalis stricta	yellow wood sorrell
Oxalis violacea	violet wood sorrel
Panicum dichotomiflorum	fall panic grass
Parthenocissus quinquefolia	Virginia creeper
Podophylum peltatum	mayapple
Polypodium polypodioides	no common name
Polystichum acrostichoides	Christmas fern
Ranunculus harveyi	no common name
Rhexia mariana	Maryland meadow beauty
Ribes sp.	no common name
Rubus sp.	raspberry; blackberry
Salvia lyrata	cancer weed; lyre-leaved sage
Sanicula canadensis	no common name
Smilax glauca	cat greenbriar
Solidago ulmifolia	elm-leaved goldenrod
Thalictrum thalictroides	no common name
Toxicodendron radicans	poison ivy
Vaccinium stamineum	deerberry
Viola pedata	bird's-foot violet
Viola sororia	no common name
Vitis aestivalis	summer grape; possum grape
Vitis rotundifolia	muscadine; scuppernong
Habitat: mesic oak woods overstory	
Acer rubrum	red maple
Acer saccharum	sugar maple
Carya cordiformis	bitternut hickory
Carya ovata	shagbark hickory
Carya tomentosa	Mockernut hickory

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: mesic oak woods overstory	
Cornus florida	flowering dogwood
Fraxinus americana	white ash
Liquidambar styraciflua	sweet gum; red gum
Prunus serotina	black cherry
Quercus alba	white oak
Habitat: mesic oak woods understory	
Agrostis hyemalis	no common name
Aralia spinosa	devils-walkingstick
Arisaema dracontium	green dragon
Aristida purpurascens	no common name
Avena fatua	no common name
Bidens sp.	no common name
Botrychium dissectum	no common name
Carex frankii	Frank's sedge
Carex muhlenbergii	no common name
Chasmanthium latifolium	inland seaoats; upland seaoats; river oats
Chasmanthium laxum	slender spikegrass
Conyza canadensis	no common name
Crataegus marshallii	parsley hawthorn
Desmodium rotundifolium	no common name
Desmodium sp.	tick trefoil; beggar's lice
Eryngium yuccifolium	eryngo; rattlesnake master; button snakeroot
Hypericum prolificum	shrubby St. John's wort
Listera australis	no common name
Lonicera japonica	Japanese honeysuckle
Oxalis stricta	yellow wood sorrell
Panicum capillare	old witchgrass
Parthenocissus quinquefolia	Virginia creeper
Penstemon digitalis	foxglove beard-tongue
Porteranthus stipulatus	no common name
Psoralea psoralioides	no common name
Rudbeckia triloba	three-lobbed rudbeckia; brown-eyed susan
Scleria oligantha	little-head nutrush
Senecio tomentosus	wooly ragwort
Smilax rotundifolia	common greenbriar
Toxicodendron radicans	poison ivy
Trachelospermum difforme	no common name
Trepocarpus aethusae	no common name
unknown legume	no common name
Vaccinium arboreum	farkleberry; tree huckleberr
Vaccinium stamineum	deerberry
Vernonia baldwinii	no common name
Vitis aestivalis	summer grape; possum grape
Vitis rotundifolia	muscadine; scuppernong
"spagnum moss"	"spagnum moss"
Habitat: old fields overstory	
Albizia julibrissin	silktree; mimosa
Diospyros virginiana	persimmon
Juniperus virginiana	eastern redcedar; cedarna

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: old fields overstory cont.	
Nyssa sylvatica	black gum; black tupelo
Quercus stellata	post oak
Robinia pseudo-acacia	black locust
Habitat: old fields understory	
Agalinis tenuifolia	slender false-foxglove
Allium bivalve	no common name
Ambrosia artemisifolia	annual ragweed
Ambrosia bidentata	ragweed
Anthemis tinctoria	no common name
Bidens aristosa	tickseed sunflower
Cassia occidentalis	no common name
Chaetopappa asteroides	no common name
Collinsia violacea	no common name
Digitaria ischmamum	no common name
Diodia teres	poor joe
Eupatorium rugosum	white snakeroot
Gaura longiflora	no common name
Helenium flexuosum	purplehead sneezeweed
Lespedeza cuneata	serecia lespedeza; Chinese bush clover
Lespedeza striata	no common name
Oenothera villosa	no common name
Opuntia humifusa	no common name
Oxalis stricta	yellow wood sorrell
Poa pratensis	no common name
Rhus copallina	winged sumac; dwarf sumac
Robinia pseudo-acacia	black locust
Setaria glauca	no common name
Solidago altissima	goldenrod spp.
Solidago nemoralis	old-field goldenrod
Verbena simplex	no common name
Habitat: roadsides	
Acalypha gracilens	no common name
Achillea millefolium	milfoil
Agalinis fasciculata	gerardia
Albizia julibrissin	silktree; mimosa
Ambrosia artemisifolia	annual ragweed
Ambrosia bidentata	ragweed
Ambrosia trifida	great ragweed
Andropogon gerardii	big bluestem
Arisaema dracontium	green dragon
Aster anomalus	aster
Aster dumosus	no common name
Aster oblongifolius	small-leaved aster; aromatic aster; shale aster
Bidens aristosa	tickseed sunflower
Carex frankii	Frank's sedge
Cassia fasciculata	partridge pea
Chasmanthium latifolium	inland seaoats; upland seaoats; river oats
Cirsium carolinianum	purple thistle
Coreopsis grandiflora	tickseed

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: roadsides cont.	
Coreopsis tinctoria	tickseed; calliopsis
Coronilla varia	crown vetch
Delphinium carolinianum	Carolina larkspur
Desmodium paniculatum	no common name
Diodia teres	poor joe
Echinacea pallida	pale-purple coneflower
Echinochloa muricata	no common name
Elymus sp.	no common name
Eragrostis sp.	no common name
Erechtities hieraciifolia	no common name
Erianthus alopecuroides	no common name
Erigeron annuus	annual fleabane
Eupatorium coelestinum	wild ageratum; mistflower; blue boneset
Eupatorium fistulosum	joepyeweed; queen-of-the-meadow; trumpetweed
Eupatorium rugosum	white snakeroot
Euphorbia corollata	flowering spurge
Euthamia leptocephala	no common name
Glandularia canadensis	no common name
Helenium flexuosum	purplehead sneezeweed
Helianthus angustifolius	swamp sunflower; narrowleaf sunflower
Helianthus divaricatus	woodland sunflower
Heterotheca pilosa	no common name
Hibiscus moscheutos ssp lasiocarpos	no common name
Houstonia purpurea	no common name
Hypericum hypericoides	St. Andrew's cross
Hypericum mutilum	no common name
Hypericum prolificum	shrubby St. John's wort
Ilex decidua	possumhaw
Impatiens capensis	spotted touch-me-not
Iva angustifolia	no common name
Kuhnia eupatoroides	no common name
Lactuca sp.	lettuce
Lespedeza cuneata	serecia lespedeza; Chinese bush clover
Liatris pycnostachya	cattail gayfeather; Kansas gayfeather
Ludwigia alternifolia	seedbox
Oenothera pilosella ssp. Pilosella	no common name
Onoclea sensibilis	sensitive fern; bead fern
Panicum anceps	beaked panic grass
Parthenium integrifolium	American feverfew; wild quinine
Paspalum floridanum	no common name
Phlox pilosa	prairie flox; downy phlox
Phytolacca americana	pokeweed
Plantago cordata	heart-leaf plantain
Polygonum persicaria	lady's thumb
Potentilla simplex	cinquefoil; five-finger
Prunella vulgaris	self-heal; heal-all
Psoralea psoralioides	no common name
Ptilimnium nuttallii	no common name
Pycnanthemum albescens	mountain mint

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: roadsides cont.	
Pyrrhopappus grandiflorus	no common name
Rhexia mariana	Maryland meadow beauty
Rhus copallina	winged sumac; dwarf sumac
Rhus glabra	smooth sumac
Robinia pseudo-acacia	black locust
Rubus flagellaris	no common name
Rudbeckia hirta	black-eyed susan
Rudbeckia triloba	three-lobed rudbeckia; brown-eyed susan
Sassafras albidum	sassafras
Schrankia nuttallii	no common name
Setaria glauca	no common name
Setaria viridis	no common name
Smilax bona-nox	saw greenbriar
Smilax glauca	cat greenbriar
Solidago altissima	goldenrod spp.
Solidago rigida	goldenrod spp.
Solidago rugosa	goldenrod spp.
Sorghum halepense	Johnson grass
Taraxicum officinale	dandelion
Teucrium canadense	no common name
Torillis japonica	no common name
Tragopogon dubius	no common name
Tridens flavus	no common name
Verbascum thapsis	no common name
Verbesina helianthoides	no common name
Vernonia baldwinii	no common name
Xanthium strumarium	no common name
Habitat: savannas overstory	
Aesculus pavia	red buckeye
Albizia julibrissin	silktree; mimosa
Carya texana	black hickory
Carya tomentosa	mockernut hickory
Crataegus crus-galli	cockspur hawthorn
Crataegus marshallii	parsley hawthorn
Diospyros virginiana	persimmon
Juniperus virginiana	eastern redcedar; cedarna
Ligustrum sinense	Chinese privet
Liquidambar styraciflua	sweet gum; red gum
Nyssa sylvatica	black gum; black tupelo
Pinus echinata	shortleaf pine; yellow pine
Prunus mexicana	no common name
Prunus serotina	black cherry
Quercus alba	white oak
Quercus marilandica	blackjack oak
Quercus nigra	water oak
Quercus palustris	pin oak
Quercus phellos	willow oak
Quercus rubra	northern red oak
Quercus stellata	post oak

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: savannas overstory cont.	
Ulmus alata	winged elm
Habitat: savannas understory	
Acalypha gracilens	no common name
Agalinis tenuifolia	slender false-foxglove
Allium canadense var. mobilense	wild garlic; purple onion
Ambrosia artemisifolia	annual ragweed
Ambrosia bidentata	ragweed
Antennaria plantaginifolia	pussytoes; plantainleaf; everlasting; mouse ear
Aster oblongifolius	small-leaved aster; aromatic aster; shale aster
Aster patens	aster
Baptisia bracteata	cream wild indigo
Bromus tectorum	no common name
Cardamine bulbosa	no common name
Carex complanata	blue sedge; hirsute sedge
Carex muhlenbergii	no common name
Claytonia virginiana	no common name
Clitoria mariana	no common name
Coreopsis grandiflora	tickseed
Coreopsis lanceolata	no common name
Corylus americana	no common name
Croton capitatus	no common name
Crotonopsis elliptica	no common name
Cunila origanoides	no common name
Danthonia spicata	poverty oat grass
Desmodium paniculatum	no common name
Desmodium sp.	tick trefoil; beggar's lice
Desmodium strictum	no common name
Dicanthelium boscii	no common name
Dicanthelium linearifolium	no common name
Dicanthelium scoparium	no common name
Echinacea pallida	pale-purple coneflower
Erechtites hieraciifolia	no common name
Eryngium yuccifolium	eryngo; rattlesnake master; button snakeroot
Eupatorium rugosum	white snakeroot
Eupatorium serotinum	late boneset
Euthamia leptocephala	no common name
Helenium amarum	bitterweed
Helianthus divaricatus	woodland sunflower
Helianthus hirsutus	stiff-haired sunflower
Heterotheca graminifolia	no common name
Hieracium gronovii	hawkweed
Hieracium longipilum	hawkweed
Hypericum drummondii	St. John's wort
Hypericum gentianoides	pine weed; orange grass
Hypericum hypericoides	St. Andrew's cross
Hypericum prolificum	shrubby St. John's wort
Hypoxis hirsuta	yellow star grass
Juncus tenuis	slender rush
Leersia virginica	whitegrass

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: savannas understory cont.	
Lespedeza procumbens	no common name
Lespedeza repens	no common name
Lespedeza virginica	slender bush clover
Liatris punctata	no common name
Luzula sp.	no common name
Muhlenbergia sobolifera	no common name
Oenothera linafolia	no common name
Oxalis stricta	yellow wood sorrell
Oxalis violacea	violet wood sorrel
Panicum dichotomiflorum	fall panic grass
Panicum sp.	panic grass
Parthenium hispidum	no common name
Passiflora lutea	yellow passion flower
Penstemon digitalis	foxglove beard-tongue
Phlox pilosa	prairie flox; downy phlox
Polypodium polypodioides	no common name
Psoralea psoralioides	no common name
Pycnanthemum temuifolium	narrowleaf mountain mint; common horsemint
Ranunculus arvensis	no common name
Ranunculus micranthus	no common name
Rhamnus caroliniana	Carolina buckthorn
Rhexia mariana	Maryland meadow beauty
Rhus aromatica	fragrant sumac
Rhus copallina	winged sumac; dwarf sumac
Rhus glabra	smooth sumac
Rubus flagellaris	no common name
Rubus sp.	raspberry; blackberry
Schizachyrium scoparium	no common name
Schrankia nuttallii	no common name
Scutellaria ovata	no common name
Senecio tomentosus	wooly ragwort
Smilax bona-nox	saw greenbriar
Smilax glauca	cat greenbriar
Solidago caesia	goldenrod spp.
Solidago nemoralis	old-field goldenrod
Solidago petiolaris	goldenrod spp.
Solidago ulmifolia	elm-leaved goldenrod
Spiranthes grayi	no common name
Stylosanthes biflora	pencil flower
Tephrosia virginiana	goat's rue
Tradescantia bracteata	no common name
Tradescantia hirsuticaulis	hairy spiderwort
Tridens flavus	no common name
Tridens strictus	no common name
Triodanis perfoliata	Venus' looking glass
Vaccinium arboreum	farkleberry; tree huckleberr
Vaccinium stamineum	deerberry
Vaccinium vacillans	no common name
Verbena simplex	no common name

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: savannas understory cont.	
Vernonia baldwinii	no common name
Vernonia texana	no common name
Viola pedata	bird's-foot violet
Vitis aestivalis	summer grape; possum grape
Habitat: wetlands overstory	
Acer rubrum	red maple
Acer saccharinum	silver maple
Aralia spinosa	devils-walkingstick
Cornus florida	flowering dogwood
Cornus foemina	no common name
Fraxinus americana	white ash
Ligustrum sinense	Chinese privet
Liquidambar styraciflua	sweet gum; red gum
Nyssa sylvatica	black gum; black tupelo
Pinus taeda	loblolly pine
Prunus serotina	black cherry
Quercus alba	white oak
Quercus falcata	southern red oak
Quercus nigra	water oak
Quercus phellos	willow oak
Quercus velutina	black oak
Sassafras albidum	sassafras
Ulmus rubra	slippery elm
Habitat: wetlands understory	
Acalypha virginica	three-seeded mercury
Agalinis tenuifolia	slender false-foxglove
Ambrosia artemisifolia	annual ragweed
Arisaema dracontium	green dragon
Berchemia scandens	Alabama supple-jack
Boehmeria cylindrica	false-netlle
Boltonia asteroides	white boltina
Campsis radicans	trumpet-creeper
Carex caroliniana	Carolina sedge; hirsute sedge
Carex cephalaphora	oval-leave sedge
Carex flaccosperma	thin-fruit sedge
Chasmanthium laxum	slender spikegrass
Cirsium carolinianum	purple thistle
Commelina virginica	Virginia dayflower
Cyperus esculentus	chufa
Cyperus retrorsus	retrorse flatsedge
Dicanthelium sphaerocarpon	round-seed panic grass
Dioscorea quaternata	four-leaf yam
Eupatorium coelestinum	wild ageratum; mistflower; blue boneset
Eupatorium perfoliatum	common boneset
Eupatorium serotinum	late boneset
Houstonia purpurea	no common name
Hypericum hypericoides	St. Andrew's cross
Impatiens capensis	spotted touch-me-not
Juncus tenuis var. dudleyi	slender rush var. dudleyi

Table H-1. Vascular Plant Species at LRAFB	
Scientific Name	**Common Name**
Habitat: wetlands understory cont.	
Leersia virginica	whitegrass
Ligustrum sinense	Chinese privet
Lobelia cardinalis	cardinal flower
Lonicera japonica	Japanese honeysuckle
Ludwigia alternifolia	seedbox
Lycopus rubellus	taper-leaf bugleweed
Mecardonia acuminata var acuminata	purple mecardonia
Monarda sp.	beebalm
Onoclea sensibilis	sensitive fern; bead fern
Oxalis stricta	yellow wood sorrell
Panicum anceps	beaked panic grass
Panicum dichotomiflorum	fall panic grass
Parthenocissus quinquefolia	Virginia creeper
Phlox pilosa	prairie flox; downy phlox
Pilea pumila	Canada clearweed
Plantago cordata	heart-leaf plantain
Podophylum peltatum	mayapple
Polygonum hydropiperoides	swamp smartweed
Polygonum persicaria	lady's thumb
Porteranthus stipulatus	no common name
Pteridium aquilinum	bracken fern
Pycnanthemum albescens	mountain mint
Pycnanthemum temuifolium	narrowleaf mountain mint; common horsemint
Sagittaria latifolia	broad-leaf arrow-head
Sambucus canadensis	American elder
Scirpus atrovirens	green bulrush
Scleria sp.	nutrush sp.
Smilax bona-nox	saw greenbriar
Smilax glauca	cat greenbriar
Smilax rotundifolia	common greenbriar
Toxicodendron radicans	poison ivy
Vaccinium stamineum	deerberry
Vernonia baldwinii	no common name
Vitis rotundifolia	muscadine; scuppernong
Woodwardia areolata	netted chain fern
"spagnum moss"	"spagnum moss"

Table H-2. Vascular Plant Species – Blackjack Drop Zone

Table H-2. Vascular Plant Species at Blackjack Drop Zone	
Scientific Name	**Common Name**
Habitat: pasture	
Acalypha gracilens	no common name
Achillea millefolium	common milfoil; yarrow
Allium canadense	wild garlic; wild onion
Ambrosia artemisifolia	annual ragweed
Ambrosia bidentata	ragweed
Andropogon virginicus	broomsedge
Aster patens	aster
Aster sp.	aster
Baptisia bracteata	cream wild indigo
Bidens sp.	no common name
Calamintha arkansana	Arkansas basil
Callicarpa americana	American beautyberry; French mulberry
Carex flaccosperma var. glaucodea	thing fruit sedge var. glaucodea
Carex frankii	Frank's sedge
Carya texana	black hickory
Cassia fasciculata	partridge pea
Ceanonthus americanus	New Jersey tea
Cephalanthus occidentalis	buttonbush
Chasmanthium latifolium	inland seaoats; upland seaoats; river oats
Cirsium vugare	bull thistle
Coreopsis grandiflora	tickseed
Coreopsis tinctoria	tickseed; calliopsis
Croton capitatus	no common name
Croton monanthogynus	no common name
Cunila origanoides	no common name
Cynodon dactylon	no common name
Cyperus croceus	sedge spp.
Cyperus pseudovegetus	sedge spp.
Cyperus strigosus	sedge spp.
Danthonia spicata	poverty oat grass
Desmodium sp.	tick trefoil; beggar's lice
Dicanthelium commutatum	no common name
Dicanthelium dichotomum	no common name
Dicanthelium scoparium	no common name
Diodia teres	poor joe
Diodia virginiana	buttonweed
Diospyros virginiana	persimmon
Eleocharis erythropoda	no common name
Elymus riparius	no common name
Eragrostis frankii	no common name
Erigeron strigosus	daisy fleabane
Eryngium prostratum	creeping eryngium
Eryngium yuccifolium	eryngo; rattlesnake master; button snakeroot
Eupatorium rugosum	white snakeroot
Euphorbia corollata	flowering spurge
Festuca elatior	no common name
Galactica regularis	no common name
Glandularia canadensis	no common name
Gnaphalium purpureum	purple cudweed

Table H-2. Vascular Plant Species at Blackjack Drop Zone, cont.	
Scientific Name	**Common Name**
Habitat: pasture cont.	
Hedyotis nigricans	no common name
Helenium amarum	bitterweed
Helenium flexuosum	purplehead sneezeweed
Helianthus hirsutus	stiff-haired sunflower
Helianthus mollis	ashy sunflower; hairy sunflower
Heterotheca villosa	no common name
Hieracium gronovii	hawkweed
Hypericum hypercoides	St. Andrew's cross
Hypericum mutilum	no common name
Hypericum prolificum	Shrubby St. John's-wort
Hypericum sphaerocarpum	no common name
Ilex verticillata	winterberry
Juncus brachycarpus	whtie-root rush
Juncus bufonius	toad rush
Juncus effuses	soft rush
Juncus interior	inland rush
Juncus marginatus	grass-leaf rush
Juncus tenuis	slender rush
Juniperus virginiana	eastern redcedar; cedarna
Lespedeza cuneata	serecia lespedeza
Lespedeza procumbens	no common name
Lespedeza repens	no common name
Lespedeza striata	no common name
Lobelia spicata	pale spiked lobelia; highbelia
Lonicera sp.	honeysuckle
Ludwigia alternifolia	seedobx
Luzula acuminata	no common name
Monarda fistulosa	beebalm; wild bergamot
Monarda russeliana	horesmint
Oenothera spachiana	no common name
Oxalis stricta	yellow wood sorrel
Panicum caapillare	old witchgrass
Paspalum dilatatum	dallasgrass
Paspalum laeve	no common name
Paspalum notatum	no common name
Paspalum setaceum	no common name
Pinus echinata	shortleaf pine; yellow pine
Plantago pusilla	no common name
Poa compressaa	Canada bluegrass
*Polygala incarnata**	pink milwort*
Polygonum hydropiperoides	swamp smartweed
Potentilla simplex	cinquefoil; five-finger
Prunella vurgaris	self-heal; heal-all
Ptilimnium capillaceum	no common name
Pycnanthemum albescens	mountain mint
Pycnanthemum tenuifolium	narrowleaf mountain mint; common horesmint
Pyrrhopappus carolinianus	false dandelion
Quercus alba	white oak
Quercus rubra	northern red oak

Table H-2. Vascular Plant Species at Blackjack Drop Zone, cont.	
Scientific Name	**Common Name**
Habitat: pasture cont.	
Quercus stellata	post oak
Ranunculus sp.	buttercup
Rhexia mariana	Maryland meadow beauty
Rhus copallina	winged sumac; dwarf sumac
Rhus glabra	smooth sumac
Rubus trivialis	southen dewberry
Rudbeckia hirta	black-eyed susan
Ruellia humilis	hairy petunia
Rumex acetosella	field sorrel
Rumex crispus	curly dock
Salix nigra	black willow
Salvia lyrata	cancer weed; lyre-leaved sage
Schizachyrium scoparium	no common name
Scirpus cyperinus	woolgrass; marsh bulrush; teddybear paws
Senecio obovatus	no common name
Setaria genticulata	no common name
Setaria glauca	no common name
Smilax bona-nox	saw greenbriar
Solanum carolinense	horse nettle; bull nettle
Sprianthes vernalis	no common name
Stylosanthes biflora	pencil flower
Taraxacum officinale	commone dandelion
Tephrosia virginiana	goat's rue
Toxicodendron radicans	poison ivy
Trifolium pratense	red clover
Triodanis perfoliata	Venus' looking glass
Ulmus alata	winged elm
Vaccinium arboreum	farkleberry; tree huckleberry
Verbascum blattaria	moth mullein
Vernonia baldwinii	no common name
Viola pedata	bird's-foot violet
Vitis aestivalis	summer grape; possum grape
Vitis rotundifolia	muscadine; scuppernong
"spagnum moss"	"spagnum moss"

Table H-3. Bird Species – LRAFB

Table H-3. Birds of LRAFB				
Common Name	**Scientific Name**	**Seasonal Status**	**Habitat**	**Abundance**
pied-billed grebe	**Podilymbus podiceps**	**W, (rare breeder here)**	**6**	**U**
double-crested cormorant	Phalacrocorax auritus	W	6	U
great egret	Ardea alba	M, Sr	6	O
great blue heron^	*Ardea herodias*	M, Sr	6	O
green heron	Butorides virescens	M, B	6	U
Canada goose	*Branta canadensis*	Pr, (feral)	6	C
wood duck	Aix sponsa	B	6	U
Mallard	*Anas platyrhynchos*	Pr, (feral)	6	C
blue-winged teal	Anas discors	M	6	O
American wigeon	Anas americana	M, W	6	O
lesser scaup	Aythya affinis	M, W	6	U
common goldeneye	Bucephala clangula	M, W	6	O
red-breasted merganser	Mergus serrator	M, W	6	O
ring-billed gull^	*Larus delawarensis*	M, W	6	O
interior least tern^	***Sterna antillarum antillarum***	**B**	**5, 6**	**F**
black vulture	Coragyps atratus	Pr?	1-6	O
turkey vulture	*Cathartes aura*	Pr	1-6	C
Mississippi kite	*Ictinia mississippiensis*	M, B?	1, 3-5	U
northern harrier^	***Circus cyaneus***	**W**	**4**	**U**
Cooper's hawk	*Accipiter cooperii*	Pr	1, 2	O
red-shouldered hawk	*Buteo lineatus*	Pr	1(w)	U
broad-winged hawk	*Buteo platypterus*	M, B	1	U
red-tailed hawk	Buteo jamaicensis	Pr	1, 3-5	F
American kestrel	***Falco sparverius***	**Pr**	**1, 3-5**	**U**
wild turkey	Meleagris gallopavo	Pr	1,4	U
northern bobwhite	Colinus virginianus	Pr	2-4	U
Sora	Porzana carolina	M	4, 6	O
American coot	Fulica americana	M, W	6	C
Killdeer	*Charadrius vociferus*	Pr	5	C
mourning dove	*Zenaida macroura*	Pr	1-3, 5	C
rock pigeon^*	*Columba livia*	Pr	5	F
Eurasian collared dove^*	*Streptopelia decaocto*	Pr	1-6	U
yellow-billed cuckoo	***Coccyzus americanus***	**M, B**	**1**	**F**
great horned owl	*Bubo virginianus*	Pr	1, 2	U
barred owl	*Strix varia*	Pr	1(w)	U
chuck-will's-widow	*Caprimulgus carolinensis*	M, B	1	U
common nighthawk^	***Chordeiles minor***	**M**	**1-3**	**O**
chimney swift	***Chaetura pelagica***	**M, B**	**1, 6**	**C**
ruby-throated hummingbird	*Archilochus colubris*	M, B	1, 3, 5	U
belted kingfisher^	*Megaceryle alcyon*	M, Sr	6	O
red-bellied woodpecker	*Melanerpes carolinus*	Pr	1, 5	C
yellow-bellied sapsucker	*Sphyrapicus varius*	W	1, 2	U

Table H-3. Birds of LRAFB, cont.				
Common Name	**Scientific Name**	**Seasonal Status**	**Habitat**	**Abundance**
red-headed woodpecker^	***Melanerpes erythrocephalus***	**M, B**	**1**	**U**
downy woodpecker	*Picoides pubescens*	Pr	1-3	F
hairy woodpecker	*Picoides villosus*	Pr	1	U
northern flicker	*Colaptes auratus*	Pr	1, 4, 5	U
pileated woodpecker	*Dryocopus pileatus*	Pr	1	U
eastern wood-pewee	*Contopus virens*	M, B	1, 2	F
Acadian flycatcher	*Empidonax virescens*	M, B	1	F
eastern phoebe	*Sayornis phoebe*	Pr	1-3, 5	F
great crested flycatcher	*Myiarchus crinitus*	M, B	1	F
eastern kingbird	*Tyrannus tyrannies*	M, B	3, 4	F
scissor-tailed flycatcher^	*Tyrannus forficatus*	M, B	4, 5	F
purple martin	*Progne subis*	B	5	C
tree swallow	Tachycineta bicolor	M	6	O
N. rough-winged swallow	Stelgidopteryx serripennis	M, Sr	6	O
cliff swallow	*Petrochelidon pyrrhonota*	M, Sr	6	O
barn swallow	*Hirundo rustica*	B	5, 6	F
blue jay	*Cyanocitta cristata*	Pr	1, 2, 6	C
American crow	*Corvus brachyrhynchos*	Pr	1-5	C
fish crow	*Corvus ossifragus*	Pr, B?	1-5	O
Carolina chickadee	*Poecile carolinensis*	Pr	1-3, 5	C
tufted titmouse	*Baeolophus bicolor*	Pr	1-3, 5	C
white-breasted nuthatch	*Sitta carolinensis*	Pr	1, 5	O
brown creeper	**Certhia americana**	**W**	**1, 2**	**O**
Carolina wren	*Thryothorus ludovicianus*	Pr	1-3, 5	C
winter wren	Troglodytes hiemalis	M, W	1, 2	U
golden-crowned kinglet	*Regulus satrapa*	M, W	2	U
ruby-crowned kinglet	*Regulus calendula*	M, W	1-3	C
blue-gray gnatcatcher	*Polioptila caerulea*	M, B	1-3	C
eastern bluebird	*Sialia sialis*	Pr	1, 5	C
gray-cheeked thrush	*Catharus minimus*	M	1	O
Swainson's thrush	*Catharus ustulatus*	M	1	U
hermit thrush	*Catharus guttatus*	M, W	1	U
wood thrush^	***Hylocichla mustelina***	**M, B**	**1**	**U**
American robin	*Turdus migratorius*	Pr	1, 5	C
gray catbird	*Dumetella carolinensis*	M, B?	1-3	O
northern mockingbird	*Mimus polyglottos*	Pr	1-3, 5	C
American pipit^	*Anthus rubescens*	M, W	4, 5	O
brown thrasher	*Toxostoma rufum*	Pr	1-3, 5	F
cedar waxwing	*Bombycilla cedrorum*	M, W	1-3, 5	F
loggerhead shrike	**Lanius ludovicianus**	**Pr**	**3, 4**	**U**
European starling*	*Sturnus vulgaris*	Pr	1, 5	C
white-eyed vireo	*Vireo griseus*	M, B	3	C

Table H-3. Birds of LRAFB, cont.				
Common Name	**Scientific Name**	**Seasonal Status**	**Habitat**	**Abundance**
warbling vireo	*Vireo gilvus*	M	1	O
Philadelphia vireo	*Vireo philadelphicus*	M	1	O
yellow-throated vireo^	*Vireo flavifrons*	M, B	1	O
red-eyed vireo	*Vireo olivaceus*	M, B	1	F
blue-winged warbler	***Vermivora cyanoptera***	**M**	**3**	**O**
Tennessee warbler	*Leiothlypis peregrina*	M	1, 2	F
Nashville warbler	*Leiothlypis ruficapilla*	M	1, 2	U
prothonotary warbler^	*Protonotaria citrea*	M	1, 2	O
northern parula	*Setophaga americana*	M, B	1(w)	U
yellow warbler	*Setophaga petechia*	M	3	O
chestnut-sided warbler	***Setophaga pensylvanica***	**M**	**3**	**O**
magnolia warbler	*Setophaga magnolia*	M	1, 2	O
yellow-rumped warbler	*Setophaga coronata*	W, M	1, 2	C
hooded warbler^	*Setophaga citrina*	M, B	1	U
black-throated green warbler	*Setophaga virens*	M	1	O
pine warbler	*Setophaga pinus*	Pr	2	F
prairie warbler	*Setophaga discolor*	M, B	3	O
black-and-white warbler	*Mniotilta varia*	M, B	1	U
American redstart	*Setophaga ruticilla*	M	1, 3	O
ovenbird^	*Seiurus aurocapilla*	M, B	1	U
Louisiana waterthrush	*Parkesia motacilla*	M, B	1 (w)	U
Kentucky warbler	*Geothlypis formosa*	M, B	1 (w)	F
common yellowthroat	*Geothlypis trichas*	M, B	1 (w), 6	F
yellow-breasted chat	*Icteria virens*	M, B	3	F
summer tanager	*Piranga rubra*	M, B	1	C
scarlet tanager	*Piranga olivacea*	M, B?	1	O
northern cardinal	*Cardinalis cardinalis*	Pr	1, 5	C
blue grosbeak	*Passerina caerulea*	M, B	3	U
indigo bunting	*Passerina cyanea*	M, B	1, 3	C
painted bunting	*Passerina ciris*	M, B	3	O
Dickcissel	*Spiza americana*	M, B	4	U
eastern towhee	*Pipilo erythrophthalmus*	Pr	3, 4	U
American tree sparrow	*Spizella arborea*	W	1	O
chipping sparrow	*Spizella passerina*	Pr	1, 2, 5	F
field sparrow	*Spizella pusilla*	Pr	3, 4	F
vesper sparrow	*Pooecetes gramineus*	M	3, 4	O
savannah sparrow	*Passerculus sandwichensis*	M, W	4	F
grasshopper sparrow	*Ammodramus savannarum*	M, B	4	O
fox sparrow	*Passerella iliaca*	M, W	1	F
song sparrow	*Melospiza melodia*	M, W	1-4, 6	F
Lincoln's sparrow	*Melospiza lincolnii*	M, W	1-4	O
swamp sparrow	*Melospiza georgiana*	M, W	1-4, 6	O
white-throated sparrow	*Zonotrichia albicollis*	M, W	1-4	C
dark-eyed junco	*Junco hyemalis*	M, W	1-4, 5	C

Table H-3. Birds of LRAFB, cont.				
Common Name	**Scientific Name**	**Seasonal Status**	**Habitat**	**Abundance**
Bobolink	***Dolichonyx oryzivorus***	**M**	**4**	**O**
red-winged blackbird	*Agelaius phoeniceus*	Pr	5, 6	F
eastern meadowlark	*Sturnella magna*	Pr	4	C
common grackle	*Quiscalus quiscula*	Pr	1, 5	C
brown-headed cowbird	*Molothrus ater*	Pr	1-5	C
orchard oriole	Icterus spurius	M, B	3	O
northern oriole	*Icterus galbula*	M, B	1	O
house finch	*Carpodacus mexicanus*	Pr	5	C
American goldfinch	*Spinus tristis*	M, W	3-5	U
house sparrow*	*Passer domesticus*	Pr	5	C

Sources: Peacock and Zollner 1997; Guilfoyle 2017

Seasonal status
Pr=permanent resident, although population numbers may change seasonally
B=breeding on base
Sr=species present in summer but not breeding on base
W=wintering
M=migrant
?=status uncertain

^=species added in 2018 (Guilfoyle 2017; K.N. Smith-Hicks personal obs.)
*=invasive/exotic species
Bold=species tracked by the Arkansas Natural Heritage Commission (ANHC 2018)

Habitats
1=deciduous forest/woodland/oak savanna (w=wet)
2=pine woodland/plantation
3=shrub/brush
4=grassland/old field
5=urban
6=lake/pond and margins

Abundance
C=common: likely to see every visit in suitable habitat and season
F=fairly common: usually found every visit, generally in low numbers
U=uncommon: usually present in suitable habitat and season but not likely to see every visit
O=occasional, not always present, likely to see 2 - 5 times per year in suitable habitat and season

Table H-4. Bird Species – Blackjack Drop Zone

Table H-4. Birds of Blackjack Drop Zone				
Common Name	**Scientific Name**	**Seasonal Status**	**Habitat**	**Abundance**
cattle egret	*Bubulcus ibis*	M, Sr	4	U
turkey vulture	*Cathartes aura*	Pr	1, 4	F
red-tailed hawk	Buteo jamaicensis	Pr	1, 4	C
American kestrel	***Falco sparverius***	**Pr**	**1, 4**	**F**
wild turkey	Meleagris gallopavo	Pr	1, 4	U
mourning dove	*Zenaida macroura*	Pr	1, 3, 4	C
yellow-billed cuckoo	***Coccyzus americanus***	**M, B**	**1**	**F**
eastern screech owl	Megascops asio	Pr	1	U
pileated woodpecker	*Dryocopus pileatus*	Pr	1	U
eastern wood-pewee	*Contopus virens*	M, B	1	U
eastern phoebe	*Sayornis phoebe*	Pr	1, 3	F
great crested flycatcher	*Myiarchus crinitus*	M, B	1	F
eastern kingbird	*Tyrannus tyrannies*	M, B	1, 3, 4	F
n. rough-winged swallow	Stelgidopteryx serripennis	Sr	4	U
barn swallow	*Hirundo rustica*	Sr	4	U
blue jay	*Cyanocitta cristata*	Pr	1	F
American crow	*Corvus brachyrhynchos*	Pr	1, 4	C
Carolina chickadee	*Poecile carolinensis*	Pr	1	C
tufted titmouse	*Baeolophus bicolor*	Pr	1	C
ruby-crowned kinglet	*Regulus calendula*	W	1	F
blue-gray gnatcatcher	*Polioptila caerulea*	M,B	1, 3	C
eastern bluebird	*Sialia sialis*	Pr	1, 4	C
Swainson's thrush	*Catharus ustulatus*	M	1	U
brown thrasher	*Toxostoma rufum*	Pr	3	F
white-eyed vireo	*Vireo griseus*	M,B	3	C
red-eyed vireo	*Vireo olivaceus*	M,B	1	F
Tennessee warbler	*Leiothlypis peregrina*	M	1	F
chestnut-sided warbler	***Setophaga pensylvanica***	**M**	**1**	**U**
magnolia warbler	*Setophaga magnolia*	M	1	U
ovenbird	*Seiurus aurocapilla*	M	1	U
yellow-breasted chat	*Icteria virens*	M,B	3	F
summer tanager	*Piranga rubra*	M,B	1	F
northern cardinal	*Cardinalis cardinalis*	Pr	1, 3	C
blue grosbeak	*Passerina caerulea*	M,B	1, 3	U
indigo bunting	*Passerina cyanea*	M,B	1, 3	C
painted bunting	*Passerina ciris*	M,B	3	O
dickcissel	*Spiza americana*	M,B	4	U
eastern towhee	*Pipilo erythrophthalmus*	Pr	3	U
Bachman's sparrow	***Peucaea aestivalis***	**M,B**	**1, 4**	**O**
field sparrow	*Spizella pusilla*	Pr	1, 3	F
lark sparrow	Chondestes grammacus	M,B	4	O

Table H-4. Birds of Blackjack Drop Zone, cont.				
Common Name	**Scientific Name**	**Seasonal Status**	**Habitat**	**Abundance**
savannah sparrow	*Passerculus sandwichensis*	W	4	F
grasshopper sparrow	*Ammodramus savannarum*	M,B	4	C
song sparrow	*Melospiza melodia*	W	3, 4	C
dark-eyed junco	*Junco hyemalis*	W	1, 3, 4	C
eastern meadowlark	*Sturnella magna*	Pr	4	C
brown-headed cowbird	*Molothrus ater*	Pr	1, 3, 4	C
purple finch	Haemorhous purpureus	W	1	O

Sources: Peacock and Zollner 1997

Seasonal status
Pr=permanent resident, although population numbers may change seasonally
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Abundance
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O=occasional, not always present, likely to see 2 - 5 times per year in suitable habitat and season

Table H-5. Terrestrial Mammal Species

Table H-5. Terrestrial Mammal Species at LRAFB and Blackjack Drop Zone			
Scientific Name	**Common Name**	**LRAFB**	**BJDZ**
Blarina carolinensis	short-tailed shrew	X	
Canis latrans	coyote	X	X
Castor canadensis	beaver	X	
Dasypus novemcinctus	nine-banded armadillo	X	
Didelphis virginiana	Opossum	X	
Glaucomys volans	southern flying squirrel	X	
Lynx rufus	bobcat		X
Mephitis mephitis	striped skunk	X	
Microtus pinetorum	pine vole	X	
Neotoma floridana	eastern woodrat	X	
Ochrotomys nuttalli	golden mouse	X	
Odocoileus virginianus	white-tail deer	X	X
Peromyscus gossypinus	cotton mouse	X	
Peromyscus leucopus	white-footed mouse	X	X
Peromyscus maniculatus	deer mouse	X	X
Procyon lotor	raccoon	X	X
Reithrodontomys fulvescens	fulvous harvest mouse	X	X
Scalopus aquaticus	eastern mole	X	X
Sciurus carolinensis	eastern gray squirrel	X	
Sciurus niger	eastern fox squirrel	X	
Sylvilagus floridanus	eastern cottontail rabbit	X	
Urocyon cinereoargenteus	gray fox		
Vulpes fulva	red fox		
Source: Phelps 1997			

Table H-6. Mammal Species - Bats

Table H-6. Bat Species at LRAFB and Blackjack Drop Zone	
Scientific Name	**Common Name**
Corynorhinus rafinesquii[2]	Rafinesque's bat
Eptesicus fuscus[1,2]	big brown bat
Lasionycteris noctivagans[2]	silver-haired bat
Lasiurus borealis[1,2]	red bat
Lasiurus cinereus[1,2]	hoary bat
Myotis lucifugus[2]	little brown bat
Nycticeius humeralis[1,2]	evening bat
Perimyotis subflavus[1,2]	tri-colored bat
Tadarida brasiliensis cynocephala[2]	Brazilian free-tailed bat
Sources: [1] Saugey 1997; [2] Hauer and Schwab 2017	

Table H-7. Herpetofauna Species

Table H-7. Herpetofauna Species at LRAFB and Blackjack Drop Zone	
Scientific Name	**Common Name**
Amphibians	
Ambystoma maculatum	spotted salamander
Ambystoma opacum	marbled salamander
Siren intermedia	lesser siren
Acris crepitans blanchardi	Blanchard's cricket frog
Bufo americanus charlesmithi	dwarf American toad
*Bufo woodhousei fowleri**	Fowler's toad*
Gastrophyrne carolinensis	narrowmouth toad
Pseudacris crucifer crucifer	northern spring peeper
Pseudacris triseriat feriarum	upland chorus frog
Hyla cinerea	green treefrog
Hyla versicolor	gray treefrog
Rana catesbeiana	bullfrog
Rana clamitans clamitans	bronze frog
Rana utricularia	southern leopard frog
Reptiles	
Anolis carolinensis	green anole
Cnemidophorus sexlineatus virilis?	prairie racerunner
Eumeces fasciatus	five-lined skink
Eumeces laticeps	broadhead skink
*Sceloperus undulatus hyacinthus**	northern fence lizard*
Scincilla lateralis	ground skink
Agkistrodon contortrix	copperhead
Agkistrodon piscivorous	cottonmouth
Coluber constrictor priapus	southern black racer
Elaphe obsoleta obsoleta	black rat snake
Heterodon platirhinos	eastern hognose snake
Lampropeltis getula hobrooki	speckled kingsnake
Nerodia erythrogaster flavigaster	yellowbelly water snake
Nerodia fasciata confluens	broad-banded water snake
Opheodrys aestivus	rough green snake
Storeria dekayi wrightorum	midland brown snake
Thamnophis sirtalis sirtalis	eastern garter snake
Virginia striatula	rough earth snake
Chelydra serpentina	common snapping turtle
Sternotherus odoratus	common musk turtle
Graptemys geographica	common map turtle
Macroclemmys temmincki	alligator snapping turtle
*Terrapene carolina triunguis**	three-toed box turtle*
Trachemys scripta elegans	red-eared slider
Source: Robison 1997a ** Species detected at Blackjack Drop Zone in White County, AR.*	

Table H-8. Aquatic Macroinvertebrate Species

Table H-8. Aquatic Macroinvertebrates at LRAFB	
Scientific Name	**Common Name**
Agabus sp.	no common name
Baetis sp.	no common name
Cheumatopsyche sp.	no common name
Chimarra aterrima	little black sedge
Coenagion sp.	no common name
Dugesia sp.	no common name
Enochrus sp.	no common name
Ferressia sp.	no common name
Gammarus sp.	no common name
Hyalella azteca	no common name
Hydrometra sp.	no common name
Isoperla ouachita	stonefly sp.
Lirceus sp.	no common name
Microvelia sp.	no common name
Perlesta sp.	no common name
Physella sp.	no common name
Rhyacophula sp.	no common name
Stenelmis sp.	no common name
Stenonema femoratum	cream cahill
Source: Walker 1997	

Table H-9. Invertebrate Species

Table H-9. Invertebrate Species of LRAFB						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Order **COLLEMBOLA**						
Family **Isotomidae**	C	C	-	-	-	-
Family **Poduridae**	C	C	-	-	-	-
Family **Sminthuridae**	-	U	U	U	-	-
Order **DIPLURA**						
Family **Campodeidae**	U	U	-	-	-	-
Order **EPHEMEROPTERA**						
Family **Baetidae**	C	C	C	-	-	-
Family **Heptageniidae**	C	C	C	-	-	-
Order **ODONATA**						
Family **Gomphidae**	U	U	-	-	-	-
Family **Aeshnidae**	C	C	C	C	C	C
Family **Libellulidae**	C	C	C	C	C	C
Family **Calopterygidae**	C	C	-	-	-	-
Family **Lestidae**	-	-	-	C	-	-
Family **Coenagrionidae**	C	C	-	C	-	-
Order **ORTHOPTERA**						
Family **Acrididae**						
Amblytropidea mysteca	-	-	U	-	-	-
Arphia sulphurea	-	-	U	-	-	-
Arphia nr. *granulata*	-	-	-	-	-	C
Boopedon auriventris	-	-	-	-	-	C
Chortiphaga viridifascia	U	C	C	C	C	C
Dissostera carolina	-	-	U	U	C	C
Hesperotettix viridis	-	U	C	C	-	-
Hippiscus ocelote	-	-	U	-	U	U
Melanoplus angustipennis	-	U	U	C	U	U
Melanoplus bivitattus	-	U	U	C	C	C
Melanoplus femur-rubrum	-	U	U	U	C	C
Melanoplus sanguinipes	-	U	U	U	C	C
Melanoplus "viridipes group"	-	U	U	U	-	-
Melanoplus spp.	U	U	C	C	U	C
Mermiria sp. (nymphs)	-	U	C	C	-	-
Pseudopomala brachyptera	-	U	C	C	-	-
Schistocera americana	-	-	U	-	U	U
Family **Tettigoniidae**						
Amblycorpha rotundifolia	C	C	C	C	C	C
Atlanticus sp. (nymps)	-	-	C	-	-	-
Conocephalus spp. (nymps)	C	C	C	C	C	C
Microcentrum rhombifolium	C	C	C	C	C	C
Neoconcoephalus robustus	-	U	C	C	-	U
Orchelimum spp.	C	C	C	C	-	-
Pterophylla camellifolia	C	C	C	C	C	C

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Sudderia curvicauda	C	C	C	C	C	C
Family **Tetrigidae**						
Acridium ornatum	C	U	U	U	-	-
Nomettix cristatus	C	C	-	C	-	-
Tettigidae acuta	C	C	-	-	-	-
Tettigidea lateralis	U	C	U	-	-	-
Family **Gryllidae**						
Oecanthus spp.	C	C	C	C	C	U
Gryllus pennsylvanicus	C	C	C	C	C	C
Allonemobius spp.	C	C	C	C	U	C
Nemobius spp.	C	C	C	C	U	C
Family **Phasmatidae**						
Diapheromera blatchleyi	-	U	U	U	-	-
Diapheromera femorata	C	C	C	C	C	U
Family **Mantidae**						
Stagmomantis carolina	C	C	C	C	U	C
Family **Blatidae**						
Blattata orientalis	-	-	-	-	C	-
Family **Blatellidae**						
Blatella germanica	-	-	-	-	C	-
Order **DEMAPTERA**						
Family **Labiidae**	-	C	C	C	-	C
Order **ISOPTERA**						
Family **Rhinotermitidae**	C	C	C	-	-	-
Order **PLECOPTERA**						
Family **Pteronarcidae**	U	U	U	-	-	-
Family **Perlodidae**	U	U	U	-	-	-
Family **Perlidae**	U	U	U	-	-	-
Order **PSOCOPTERA**						
Family **Liposcelidae**	-	-	-			
Family **Psocidae**	U	U	U			
Order **THYSANOPTERA**						
Family **Thripidae**	-	C	C	C	-	-
Family **Phlaeothripidae**	-	C	C	C	-	-
Order **HEMIPTERA**						
Family **Corixidae**	C	-	-	-	-	-
Family **Notonectidae**	C	-	-	-	-	-
Family **Belostomatidae**	C	-	-	-	-	-
Family **Gelastocoridae**	U	-	-	-	-	-
Family **Gerridae**	C	-	-	-	-	-
Family **Anthocoridae**	-	U	U	U	-	U
Family **Miridae**	C	C	C	C	C	C
Family **Nabidae**	U	U	U	U	U	U

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Family **Reduviidae**	U	U	U	U	U	U
Family **Phymatidae**	U	C	C	C	U	U
Family **Tingidae**	U	U	U	U	U	U
Family **Aradidae**	-	U	U	U	-	-
Family **Lygaeidae**	C	C	C	C	C	C
Family **Berytidae**	-	U	U	U	-	U
Family **Largidae**	-	-	U	-	-	-
Family **Pyrrhocoridae**	-	-	U	-	-	-
Family **Coreidae**	U	U	U	U	U	U
Family R**hopalidae**	U	U	U	U	-	-
Family **Alydidae**	-	U	U	U	-	-
Family **Scutelleridae**	U	U	U	U	-	U
Family **Pentatomidae**	C	C	C	C	U	C
Family **Corimelanenidae**	U	U	U	U	U	U
Order **HOMOPTERA**						
Family **Cicadellidae**						
Aceratagallia sanguinolenta	U	C	C	C	A	C
Acinopterus acuminatus	U	C	C	C	-	U
Agallia constricta	U	C	C	C	C	C
Balaclutha abdominalis	U	C	C	C	C	C
Chlorotettix filametnus	U	U	-	U	-	-
Chlorotettix galabanatus	U	-	-	C	-	-
Chlorotettix nr. Borelais	-	-	U	U	-	-
Chlorotettix spatulatus	-	-	U	U	-	-
Chlorotettix trunicatus	U	U	U	U	-	U
Chlorotettix viridius	-	C	-	C	-	-
Cloanthanus frontalis	-	C	U	U	-	C
Clloanthanus spp. (Female)	-	C	U	U	C	C
Cuerna lateralis	U	U	U	U	U	A
Dorydiella kansana	-	-	-	U	-	-
Draecucephala spp.	C	C	C	C	C	C
Driotura gammaroides	-	-	C	U	-	-
Empoasca spp.	C	C	C	C	C	C
Erythroneura spp.	C	C	C	C	C	C
Exitianus exitosus	-	C	U	C	-	C
Extrusanus extrusanus	-	-	C	C	C	-
Flexamia areolata	-	-	U	-	-	-
Flexamia picta	-	-	C	-	-	-
Flexamia pyrops	-	-	U	U	-	-
Flexamia sandersi	-	-	A	C	-	-
Graminella nigrifrons	A	A	A	A	A	A
Graphocehala coccinea	C	C	C	C	C	C
Graphocephala versuta	C	C	C	C	C	C

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Gyponana sp.	C	C	U	U	-	U
Hecalus flavidus	-	C	C	C	-	U
Helochara communis	U		U	U	-	-
Idiocerus sp.	U	U	-	U	-	-
Idiodonuls sp.	-	-	U	-	-	-
Jassus olitorius	U	U	U	-	-	-
Kolla bifida	A	A	A	C	C	U
Holla geometrica	C	C	C	U	C	U
Laevicephalus sylvestris	U	U	U	U	-	-
Latalus sayi	U	U	U	U	U	-
Macosteles quadrilineatus	A	A	A	A	A	A
Menosoma cincta	A	A	A	A	U	U
Neocoelidia tumidifrons	U	U	U	U	-	-
Nesosteles neglectus	C	C	C	C	C	C
Norvellina sp.	-	-	U	-	-	-
Ohiola anthracina	-	-	C	U	-	-
Osbornellus consors	-	-	U	U	-	-
Osbornellus unicolor	-	-	U	U	-	-
Paraphelpsius brunneus	-	U	-	-	-	-
Pendarus nr. Aurolabus	-	-	U	-	-	-
Polyamia apicata	C	C	C	-	-	-
Polyamia dilata	-	U	-	-	-	-
Polyamia herbida	-	U	C	-	-	-
Polyamia weedi	C	C	C	C	-	-
Ponana sp.	C	U	-	U	-	-
Prairiana nr. Kansana	-	-	U	-	-	-
Scaphoideus spp.	C	C	C	C	-	-
Stirellus bicolor	C	C	C	C	C	C
Texananus decorus	-	-	U	-	-	-
Xestocephalus pulicarius	U	U	U	U	-	U
Family **Cercopidae**						
Aphorophora spp.	-	-	-	-	U	-
Lepyronia quadrangularis	-	C	C	C	-	C
Philaenus spunarius	C	C	C	C	A	A
Family **Cicadidae**						
Tibicen spp.	A	A	A	A	A	A
Family **Flatidae**						
sp. 1	U	U	U	U	-	-
Family **Delphacidae**						
sp.1	U	U	U	U	-	-
Family **Cixiidae**						
sp. 1	U	U	U	U	-	-
Family **Fulgoridae**						

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
*Bruchomorpha*spp.	U	C	A	C	-	U
Family **Membracidae**						
Campylenchia latipes	C	C	C	C	C	C
Stictocephala bubalis	C	C	C	C	C	C
Order **NEUROPTERA**						
Family **Corydalidae**	U	U	-	-	-	-
Family **Mantispidae**	U	U	U	U	-	U
Family **Hemerobiidae**	U	U	U	U	-	U
Family **Chrysopidae**	C	C	C	C	C	C
Family **Myrmeleontidae**	C	C	C	C	-	C
Family **Acalaphidae**	C	C	C	C	-	-
Order **COLEOPTERA**						
Family **Cicindelidae**	U	U	C	U	U	C
Family **Carabidae**	C	C	C	C	U	C
Family **Dytiscidae**	C	C	C	-	-	-
Family **Gyrinidae**	C	C	-	C	-	-
Family **Hydrophilidae**	C	C	C	-	-	-
Family **Histeridae**		U	U	U	-	U
Family **Staphylinidae**	C	C	C	U	-	U
Family **Silphidae**	U	U	U	-	-	-
Family **Leucanidae**	U	C	U	-	-	-
Family **Passalidae**	-	U	-	-	-	-
Family **Scarabaeidae**	C	U	C	C	U	
Family **Buprestidae**	U	U	C	C	-	U
Family **Elateridae**	C	C	C	U	U	C
Family **Phengodidae**	U	C	U	-	-	
Family **Lampyridae**	C	C	C	C	C	C
Family **Cantharidae**	-	U	U	U	-	C
Family **Lycidae**	-	U	-	-	-	-
Family **Demestidae**	-	-	-	-	C	-
Family **Anobiidae**	C	C	C	-	-	-
Family **Bostrichidae**	C	C	C	-	-	-
Family **Cantharidae**	-	U	U	U	-	U
Family **Melyridae**	-	U	U	U	-	U
Family **Nitidulidae**	C	C	C	C	C	C
Family **Cucujidae**	U	U	U	-	-	-
Family **Erotylidae**	U	U	-	-	-	-
Family **Phalacridae**	-	U	U	-	-	-
Family **Coccinellide**	C	C	C	C	C	C
Family **Endomychidae**	-	U	-	-	-	-
Family **Tenebrionidae**	U	U	U	-	-	-
Family **Mordellidae**	C	C	C	C	U	C
Family **Meloidae**	-	U	U	-	-	U

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Family **Anthicidae**	-	U	U	U	-	U
Family **Scydmaenidae**	-	-	U	-	-	-
Family **Cerambycidae**	C	C	C	C	-	C
Family **Bruchidae**	-	U	U	U	-	U
Family **Chrysomelidae**	C	C	C	C	U	C
Family **Brentidae**	-	U	-	-	-	-
Family **Curculionidae**	C	C	C	C	U	C
Family **Scolytidae**	C	C	-	-	-	-
Order **MECOPTERA**						
Family **Panorpidae**	C	C	U	-	-	-
Order **TRICHOPTERA**						
Family **Hydropschidae**	C	C	C	-	-	-
Family **Leptoceridae**	C	C	C	-	-	-
Family **Limnephilidae**	C	C	C	-	-	-
Order **LEPIDOPTERA**						
Family **Papilionidae**						
Battus philenor	-	-	U	-	-	-
Eurytides marcellus	U	-	U	-	-	-
Papilio glaucus	U		C	U	U	U
Papilio polyxenes	-	-	U	U	U	U
Papilio troilus	C	C	C	C	C	U
Family **Pieridae**						
Colias eurytheme	U	C	C	C	C	C
Colias philodice	-	C	C	C	C	C
Eurema lisa	U	C	U	U	U	C
Nathalis iole	-	C	U	U	U	U
Pheobis sennae	-	C	U	U	U	C
Pieris rapae	-	C	U	U	A	C
Family **Danaidae**						
Danaus plexippus	U	C	C	C	C	C
Family **Nymphalidae**						
Anaea andria	-	U	C	U	-	-
Asterocampa celtis	U	C	U	-	-	-
Asterocampa clyton	U	C	U	-	-	-
Cercyonis pegala	C	C	A	C	U	C
Chlosyne nycteis	U	C	C	C	-	U
Euptychia cymela	C	C	A	U	U	C
Limentis archippus	U	C	U	C	U	U
Limentitis arthemis astynax	-	C	U	U	U	-
Phyciodes tharos	C	C	A	C	C	C
Polygonia comma	U	U	U	-	-	-
Polygonia interrogationis	U	U	U	U	U	-
Speyeria cybele	U	C	C	C	C	U

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Speyeria diana	-	U	-	U	-	-
Vanessa atalanta	U	C	U	U	U	-
Vanessa cardui	-	C	U	U	C	-
Vanessa virginiensis	-	C	C	U	U	U
Family **Lycaenidae**						
Calycopis cecrops	-	-	U	-	-	-
Celastrina ladon	U	C	U	U	U	U
Everes comyntas	C	C	A	A	A	A
Harkenclenus titus	-	-	U	-	-	-
Lycaena phlaeas	U	U	U	-	U	I
Satyrium edwardsi	-	-	C	-	-	C
Satyrium falacer	U	C	C	-	U	U
Satyrium melinus	-	U	U	U	U	U
Family **Hesperiidae**						
Achalarus lyciades	-	-	C	-	-	-
Amblyscirtes vialis	U	U	C	-	-	-
Ancyloxypha numitor	C	C	-	-	-	-
Atalopedes campestris	U	C	C	C	C	C
Atrtonopsis hianna	-	-	C	-	-	-
Epargyreus clarus	-	C	A	C	C	U
Erynnis horatius	-	U	U	-	-	-
Erynnis icelus	U	-	C	-	-	-
Erynnis juvenalis	-	-	A	C	C	C
Lerodea eufala	-	-	U	-	-	-
Pholisora catullus	U	C	C	U	U	C
Poanes hobomok	U	C	A	C	C	C
Poanes zabulon	U	C	C	U	U	-
Polites peckius	U	C	C	C	C	C
Polites themistocles	U	C	C	C	C	C
Provlema byssus	U	U	-	U	-	-
Thorybes bathyllus	-	U	C	-	-	-
Thorybes pylades	-	-	C	-	-	U
Thymelicus lineoloa	U	C	U	C	C	U
Wallengrenia otho	U	C	C	C	-	C
Family **Noctuidae**						
Abagrotis alternata	-	U	U	U	-	-
Achatodes zeae	-	-	U	-	-	-
Aronycta dactylinea	U	-	-	-	-	-
Acronycta funeralis	-	-	U	-	-	-
Acronycta inclara	U	U	U	U	-	-
Acronycta interrupta	U	U	U	U	-	-
Acronycta longa	U	U	U	U	-	-
Acronycta noctivaga	U	-	-	-	-	-

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Acronycta oblinita	U	U	U	U	-	-
Acronycta ovata	C	C	C	C	-	-
Agriopodes fallax	-	-	U	-	-	-
Agrotis ypsilon	U	U	U	U	U	-
Allagrapha aerea	-	U	C	U	-	-
Allotria elonympha	C	C	C	C	-	-
Anorthodes tarda	C	C	C	C	-	-
Argyrostotis anilis	U	U	-	U	-	-
Arugisia latiorella	U	U	C	U	-	-
Autographa biloba	-	-	U	-	-	-
Autographa falcifera	C	C	C	C	C	C
Baileya levitans	U	U	U	U	-	-
Baileya ophthalmica	U	-	U	-	-	-
Balsa malana	C	C	C	C	-	-
Bleptina caradrinalis	C	C	C	C	-	-
Bleptina sangamonia	C	C	C	C	-	-
Bomalocha baltimoralis	C	C	C	C	-	-
Bomalocha bijugalis	U	U	-	U	-	-
Bomolocha deceptalis	C	C	C	C	-	-
Caenurgina chloropha	C	C	C	C	C	-
Caenurgina crassiuscula	C	C	C	C	C	C
Canurgina erechtea	C	C	C	C	C	C
Callopistria mollisima	-	-	C	-	-	-
Catocala amica	U	-	C	-	-	-
Catocala clintoni	-	-	C	-	-	-
Catocala coccinea	-	-	U	-	-	-
Catocala epione	-	-	U	-	-	-
Catocala ilia	-	-	U	-	-	-
Catocala mira	-	-	C	-	-	-
Catocala titania	-	-	C	-	-	-
Cerma cerintha	-	-	U	-	-	-
Chytonix palliatricula	U	U	U	U	-	-
Cirrhophanus triangulifer	U	U	U	U	-	-
Colobochyla interpuncta	U	U	U	U	-	-
Cosmia calami	U	U	U	U	-	-
Elaphria festivoides	C	C	C	C	-	-
Elaphria grata	U	U	C	U	-	-
Euagrotis illapsa	-	-	U	-	-	-
Euclidia cuspidea	-	U	C	-	-	-
Faronta diffusa	U	U	U	-	-	-
Gabara subnivosella	U	C	C	C	-	-
Galgula partita	U	U	C	U	C	-
Harrisimemna trisignata	-	-	U	-	-	-

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Heliothis zea	-	-	U	-	C	C
Hemeroplanis scopulepes	-	-	U	-	-	-
Hyperstrotia secta	U	U	C	U	-	-
Hyperstrotia pervertens	C	C	C	C	-	-
Hypsoropha hormos	U	U	C	U	-	-
Hypsoropha monilis	C	C	C	C	-	-
Idia aemual	C	C	C	C	-	-
Idia americalis	C	C	C	C	-	-
Idia diminuendis	C	C	C	C	-	-
Lacinipolia renigera	C	C	C	C	C	-
Lacinipolia sp.	-	-	U	-	-	-
Lacoria ambigulalis	U	U	U	U	-	-
Ledaea perditalis	U	U	U	U	-	-
Leucania inermis	U	U	U	U	-	-
Leucania linda	U	U	U	U	-	-
Leucania texana/extincta	U	U	U	U	-	-
Leuconycta diptheroides	U	U	U	U	-	-
Macrochilo absorptalis	C	C	-	C	-	-
Macrochilo orciferalis	C	C	-	C	-	-
Marathyssa inficita	C	C	C	C	-	-
Matigramma pulverilinea	C	C	C	C	-	-
Meganola minuscula	C	C	C	C	-	-
Metalectra tantillus	U	U	U	U	-	-
Morrisonia Confusa	-	-	U	-	-	-
Nedra ramosula	-	-	U	-	-	-
Nola nr. *cilicoides*	U	U	C	U	-	-
Orthodes crenulata	C	U	C	U	-	-
Orthodes cynica	-	-	U	-	-	-
Paectes abrostoloides	-	-	C	-	-	-
Paectes pygmaea	-	-	C	-	-	-
Palthis angulalis	C	C	C	C	-	-
Panopoda rufimargo	C	C	C	C	-	-
Peridroma saucia	U	-	U	-	U	-
Perigea xanthoides	C	C	C	C	-	-
Phytometra rhodarialis	C	U	C	U	-	-
Plathypena scabra	C	C	C	C	-	-
Platysenta mobilis	U	U	C	U	-	-
Platysenta vecors	C	C	C	C	-	-
Platysenta videns	U	U	C	U	-	-
Plusiodonta compressipalpis	-	U	U	U	-	-
Polygrammate hebraeicum	C	C	C	C	-	-
Proxenus miranda	U	U	C	U	-	-
Pseudaletia unipuncta	-	U	U	U	C	U

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Renia adspergillus	C	C	C	C	-	-
Renia discoloralis	C	C	C	C	-	-
Renia fraternalis	C	C	C	C	-	-
Renia nemoralis	C	C	C	C	-	-
Renia salusalis	C	C	C	C	-	-
Rivula propinqualis	C	C	C	C	-	-
Schinia lynx	-	U	C	U	-	-
Scolecocampa liburna	-	-	U	-	-	-
Spargaloma sexpunctata	-	-	U	-	-	-
Spodoptera frugiperda	C	C	C	C	-	-
Spodoptera ornithogalli	C	C	C	C	U	-
Sprageuia leo	-	U	C	U	-	-
Stiriodes obtusa	C	C	C	C	-	-
Tetanolita floridana	C	C	C	C	-	-
Tetanolita mynesalis	C	C	C	C	-	-
Tetanolita nigrofimbraria	U	C	C	C	-	-
Zale lunata	-	-	U	-	-	-
Zale undularis	-	-	U	-	-	-
Zanclognatha crurialis	C	C	C	C	-	-
Zanclognatha jacchusalis	-	U	U	U	-	-
Family **Arctiidae**						
Apantesis figurata	C	U	C	U	-	-
Apantesis phaelerata	C	C	C	C	U	-
Aphantesis virgo	C	C	C	C	U	-
Cisthene packardii	C	C	C	C	-	-
Clemensia albata	C	C	C	C	-	-
Ecpantherea scribona	U	-	U	-	-	-
Estigmene acraea	U	U	U	U	-	-
Euchaetes egle	U	U	U	U	-	-
Grammia arge	C	U	C	U	-	-
Grammia oithona	U	-	U	-	-	-
Halysidota maculata	C	C	C	C	-	-
Halysidota tessellata	A	A	A	A	C	-
Haploa colona	U	-	U	-	-	-
Haploa militiaris	C	U	U	U	-	-
Holomelina aurantiaca	C	C	C	C	U	-
Holomelina opella	A	C	C	C	-	-
Hyphantria cunea	A	C	C	C	C	-
Hypoprepia fucosa	A	C	C	C	C	-
Hypoprepia miniata	U	U	U	U	-	-
Isia isabella	C	C	U	C	C	-
Pagara simplex	C	C	C	C	-	-
Phragmatobia fulginosa	C	C	C	C	-	-

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Spilosoma congrua	C	C	C	C	C	-
Family **Notodontidae**						
Clostera inclusa	U	-	U	-	-	-
Dasylophia anguina	U	U	U	U	-	-
Datana contracta	U	U	U	U	-	-
Datana integerrima	U	U	U	U	-	-
Datana ministra	U	-	U	-	U	-
Furcula cinerea	U	-	U	-	-	-
Gluphisia septentrionalis	U	C	C	C	-	-
Heterocampa guttivitta	C	U	C	U	-	-
Heterocampa obliqua	U	U	C	U	-	-
Heterocampa sp.	C	U	U	U	-	-
Heterocampa subrotata	C	U	U	U	-	-
Hyperaeschra georgica	-	-	U	-	-	-
Lochmaeus bilineata	-	U	U	U	-	-
Macrurocampa marthesia	-	U	U	U	-	-
Nadata gibbosa	C	C	C	C	-	-
Nerice bidentata	U	-	U	-	-	-
Oligocentria lignicolor	U	-	U	-	-	-
Peridea angulosa	C	U	U	U	-	-
Peridea basitriens	C	U	U	U	-	-
Schizura ipomoeae	U	-	U	-	-	-
Schizura unicornis	U	-	U	-	-	-
Family **Saturniidae**						
Actias lunus	C	-	C	-	-	-
Anisota stigma	-	-	U	-	-	-
Automeris io	U	-	U	-	U	-
Callosamia promethea	U	U	-	U	-	-
Eacles imperialis	U	-	U	-	-	-
Hemileuca maia	-	-	U	-	-	-
Telea polyphemus	U	U	U	U	U	-
Family **Sphingidae**						
Amphion nessus	-	U	U	U	-	-
Ceratomia amyntor	-	-	U	-	-	-
Ceratomia hageni	-	-	U	-	-	-
Ceratmia undulosa	-	-	U	-	-	-
Darapsa myron	U	U	C	U	-	-
Darapsa pholus	U	U	C	U	-	-
Diedemia inscripta	-	-	U	-	-	-
Hemaris diffinis	-	C	C	C	U	-
Hemaris thysbe	-	C	C	C	-	-
Laothoe juglandis	-	-	U	-	-	-
Paonias excaecatus	U	C	C	C	U	-

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Paonias myops	C	C	C	C	-	-
Smerinthus jamaicemsis	U	U	C	U	-	-
Family **Lasiocampidae**						
Malacosoma disstria	C	C	C	C	C	-
Malacosoma americanum	C	C	C	C	C	-
Family **Lymantriidae**						
Dasychira basiflava	-	-	U	-	-	-
Orgyia leucostigma	U	C	C	C	-	-
Family **Limacodidae**						
Apoda y-inversum	U	U	U	U	-	-
Apoda biguttata	U	U	U	U	-	-
Prolimacodes badia	U	U	U	U	-	-
Euclea delphinii	U	U	C	U	-	-
Lithacodes fasciola	-	-	U	-	-	-
Family **Tortricdae**						
Ancylis comptana	-	-	U	-	-	-
Argyrotaenia quercifoliana	C	C	C	C	-	-
Betivia albicapitana	-	-	U	-	-	-
Choristoneura fumiferana	C	C	C	C	-	-
Choristoneura parallela	C	C	C	C	-	-
Epiblema strenuana	-	C	U	U	-	-
Platynota exasperatana	-	-	U	-	-	-
Platynota flavidana	C	C	C	C	-	-
Sparganothis sulfureana	C	C	C	C	-	-
Family **Olethrutidae**						
Ancylis burgessiana	U	C	U	U	-	-
Eucosma agricolana	-	C	U	U	-	-
Eucosma similana	U	U	U	U	-	-
Olethreutes new species	-	-	U	-	-	-
Olethreutes sp. 2 & 3	-	U	U	U	-	-
Phaneta striatana	C	C	C	C	-	-
Family **Agaristidae**						
Alypia octomaculata	U	U	U	U	-	-
Eudryas unio	U	U	U	U	-	-
Family **Pyralidae**						
Acrobasis demotella	C	C	C	C	-	-
Acrobasis indisinella	C	C	C	C	-	-
Chrysendenton nr. *Kimbelli*	U	U	U	U	-	-
Colomychus tialis	U	U	-	U	-	-
Compacta hirtalis	-	-	U	-	-	-
Condylolomia participalis	C	C	C	C	-	-
Crambus agitatellus	C	C	C	C	-	-
Crambus laqueatellus	C	C	C	C	-	-

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Crambus sp. 1	-	-	U	-	-	-
Desmia funeralis	U	C	C	C	-	-
Diacme elealis	C	U	C	U	-	-
Eustixia pupula	C	C	C	C	-	-
Herculia olinalis	U	U	U	U	-	-
Hypsopygia costalis	U	U	U	U	-	-
Microcrambus elegans	A	A	A	A	-	-
Munroessa gyralis	C	C	C	C	-	-
Munroessa icciusalis	C	C	C	C	-	-
Ostrinia nubilalis	C	C	C	C	-	-
Pantographa limata	C	C	C	C	-	-
Peoria aproximella	C	C	C	C	-	-
Pyrausta acrionalis	C	C	C	C	-	-
Pyrausta bicoloralis	C	C	C	C	-	-
Pyrausta signatalis	C	C	C	C	-	-
Synclita obliteralis	U	U	U	U	-	-
Tampa dimediatella	U	U	C	U	-	-
Udea rubigalis	-	-	U	-	-	-
Urola nivalis	C	C	C	C	-	-
Vaxi auratella	U	C	U	C	-	-
Family **Ctenuchidae**						
Cisseps fulvicollis	U	U	U	U	-	-
Ctenucha virginica	U	U	U	U	-	-
Family **Apatelodidae**						
Apatelodes torrefacta	-	-	U	-	-	-
Olceclostera angelica	-	U	-	-	-	-
Family **Drepanidae**						
Drepana arcuata	-	-	U	-	-	-
Oreta rosea	-	U	U	-	-	-
Family **Thyatiridae**						
Pseudothyatira cymatophoroides	U	-	-	-	-	-
Family **Geometridae**						
Anacamptodes spp.	U	C	C	C	-	-
Euchlaena sp. 1	C	C	C	C	-	-
Idaea furciferata	U	U	U	U	-	-
Metarrhanthis sp.	U	U	U	U	-	-
Nemoria bistriaria	-	U	U	U	-	-
Nemoria lixaria	U	U	U	U	-	-
Orthonama centrostrigaria	U	U	U	U	-	-
Plagodis spp.	C	C	C	C	-	-
Pleuroprucha insularia	U	U	C	U	-	-
Semiothisa spp.	C	C	C	C	-	-

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Family **Opostegidae**						
sp. 1	-	-	U	-	-	-
Family **Incurvariidae**						
sp. 1	-	-	U	-	-	-
Family **Nepticulidae**						
sp. 1	-	U	U	U	-	-
Family **Tineidae**						
sp. 1	U	U	U	U	-	-
Family **Psychidae**						
sp. 1	-	-	U	U	C	-
Family **Lyonetiidae**						
sp. 1	-	-	U	-	-	-
Family **Acrolophidae**						
Acrolophus propinquus	C	C	C	C	-	-
Acrolophus plumbifrontellus	C	C	C	C	-	-
Acrolophus propeanellus	C	C	C	C	-	-
Family **Gracilariidae**						
sp. 1	-	U	U	U	-	-
sp. 2	-	U	U	U	-	-
Family **Coleophoridae**						
sp. 1	U	U	U	U	-	-
Family **Elachistidae**						
sp.1	U	U	U	U	-	-
Family **Scythrididae**						
sp.1	U	U	U	U	-	-
Family **Yponomeutidae**						
sp. 1	U	U	U	U	-	-
Family **Agryesthiidae**						
sp. 1	U	U	U	U	-	-
Family **Cochylidae**						
sp. 1	C	C	C	C	-	-
sp. 2	C	C	C	C	-	-
sp. 3	C	C	C	C	-	-
Family **Sesiidae**						
Synanthedon arkansensis	U	-	U	-	-	-
Family **Glyphipterigidae**						
Glyphipteryx sp. 1	U	U	U	U	-	-
Family **Ethmiidae**						
sp. 1	U	U	U	U	-	-
Family **Stenomidae**						
sp. 1	U	U	U	U	-	-
Antaeottricha leucilliana	U	U	U	U	-	-
Family **Blastobastidae**						
sp. 1	U	U	U	U	-	-

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Family **Oecophoridae**						
Callima argenticinctella	U	U	U	U	-	-
Family **Gelechiidae**						
Telphusa sp. 1	-	-	U	-	-	-
Chionodes sp. 1	C	C	C	C	-	-
Chionodes sp. 2	C	C	C	C	-	-
sp. 1	A	A	A	A	-	-
Family **Comopterigidae**						
sp. 1	U	U	-	U	-	-
Family **Momphidae**						
sp. 1	-	-	U	-	-	-
sp. 2	-	-	U	-	-	-
Family **Cossidae**						
Prionoxystus robiniae	-	U	-	-	-	-
Family **Pterophoridae**						
sp. 1	U	U	U	U	-	-
Family **Thryididae**						
Thryris sepulchralis	-	-	U	-	-	-
Family **Megalopygidae**						
Megalopyge opercularis	C	C	C	C	-	-
Family **Micropteridgidae**						
sp. 1	U	A	-	U	-	-
Order **DIPTERA**						
Family **Tipulidae**	C	C	C	C	U	-
Family **Culicidae**	C	C	C	C	C	C
Family **Chironomidae**	C	C	C	C	-	-
Family **Bibionidae**	C	C	C	-	-	-
Family **Stratiomydiae**	-	U	U	U	-	U
Family **Tabanidae**	C	C	C	C	C	C
Family **Phagionidae**	U	U	-	U	-	-
Family **Asilidae**	U	U	C	C	-	C
Family **Leptogastridae**	U	U		U	-	-
Family **Bombyliidae**	U	U	U	U	U	U
Fmily **Dolichopodidae**	U	C	C	C	U	C
Family **Phoridae**	-	-	-	-	-	-
Family **Pipunculidae**	-	U	U	U	-	U
Family **Syrphidae**	C	C	C	C	U	C
Family **Otitidae**	U	U	C	C	-	C
Family **Pyrgotidae**	U	U	U	U	-	-
Family **Tephritidae**	U	C	C	C	C	C
Family **Sciomyzidae**	C	U	U	C	-	-
Family **Drosophilidae**	U	U	U	U	C	-
Family **Chloropidae**	A	A	A	A	A	A

Table H-9. Invertebrate Species of LRAFB, cont.						
TAXA	**Wetlands**	**Mesic Woodlands**	**Xeric Woodlands**	**Mesic Prarie**	**Man-Made Habitats**	**BJDZ**
Family **Anthomyiidae**	C	C	C	C	C	C
Family **Muscidae**	C	C	C	C	C	C
Family **Calliphoridae**	C	C	C	C	C	A
Family **Sacrophagidae**	C	C	C	C	C	C
Family **Tachinidae**	U	U	U	U	U	U
Order **HYMENOPTERA**						
Family **Tenthredinidae**	C	C	C	C	C	C
Family **Braconidae**	C	C	C	C	C	C
Family **Ichneumonidae**	C	C	C	C	C	C
Family **Trichogrammatidae**	-	U	U	U	U	U
Family **Eulophidae**	-	-	U	-	-	U
Family **Encyrtidae**	-	U	U	-	U	U
Family **Eupelmidae**	-	U	U	-	-	U
Family **Perilampidae**	-	U	U	-	U	U
Family **Peromalidae**	-	U	-	U	-	U
Family **Chalcididae**	U	U	U	U	-	U
Family **Cynipidae**	U	U	U	-	U	U
Family **Scelionidae**	-	U	U	U	-	U
Family **Chrysididae**	I	U	U	U	U	U
Family **Dryinidae**	-	U	U	U	-	U
Family **Tiphiidae**	-	U	U	U	U	U
Family **Scoliidae**	-	-	U	-	U	U
Family **Mutillidae**	-	-	U	-	U	U
Family **Formicidae**	C	C	C	C	C	U
Family **Vespidae**	C	C	C	C	C	U
Family **Pompilidae**	-	U	U	U	-	-
Family **Sphecidae**	C	C	C	C	C	U
Family **Colletidae**	U	U	U	U	U	-
Family **Halictidae**	C	C	C	C	C	C
Family **Andrenidae**	C	C	C	C	U	U
Family **Megachilidae**	U	U	U	U	U	U
Family **Anthophoridae**	U	U	U	U	U	U
Family **Apidae**	C	C	C	C	C	C

Table H-10. Crayfish Species

Table H-10. Crayfish at LRAFB	
Scientific Name	**Common Name**
Cambarus ludovicianus	painted devil crayfish
Fallicambarus fodiens	digger crayfish
Faxonella clypeata	ditch fencing crayfish
Orconectes palmeri longimanus	western painted crayfish
Orconectes ozarkae	Ozark crayfish
Procambarus acutus	White River crayfish
Procambarus clarkii	red swamp crayfish;
Source: Robison 1997b	

Table H-11. Fish Species

Table H-11. Fish Species at Little Rock AFB	
Scientific Name	**Common Name**
Ameiurus natalis[1]	yellow bullhead
Dorosoma cepedianum[1]	gizzard shad
Gambusia affinis[2]	mosquito fish
Ictalurus punctatus[1]	channel catfish
Lepomis cyanellus[1,2]	green sunfish
Lepomis gulosus[1,2]	warmouth
Lepomis humilis[2]	orange spotted sunfish
Lepomis marcrochirus[1,2]	bluegill
Lepomis megalotis[1,2]	longear sunfish
Lepomis microlophus[1,2]	redear sunfish
Micropterus punctatus[1]	spotted bass
Micropterus salmoides[1,2]	largemouth bass
Pomoxis annularis[2]	white crappie
Pomoxis nigromaculatus[1]	black crappie
Sources: [1] AGFC 2018; [2] TAMU 2018	

Appendix I. Environmental Impact Analysis

I.1. Overview

As discussed in Section 9.3.2, the adoption of this INRMP requires an EIAP in accordance with the NEPA, CEQ Regulations (40 CFR § 1500-1508), and 32 CFR Part 989. The purpose of the Proposed Action, implementation of the LRAFB INRMP, is to provide for the effective, long-term management of the site‘s natural resources while allowing the flight mission(s) to proceed. The INRMP is prepared to ensure natural resource conservation measures and military activities on mission land are integrated and consistent with federal stewardship requirements. The need for the Proposed Action is to ensure natural resources are managed effectively on LRAFB, while allowing both the federal and state mission(s) to be accomplished.

This analysis assesses known, potential, and reasonably foreseeable environmental consequences related to implementing the INRMP and managing natural resources at LRAFB. The following sections provide a description of the Proposed Action and alternatives considered (see Appendix I.2), an assessment of the environmental consequences associated with each alternative (see Appendix I.3), and an analysis of potential cumulative effects (see Appendix I.4). The analysis presented herein determines that an EIS is unnecessary for this Proposed Action and that a Finding of No Significant Impact (FONSI) is appropriate.

As discussed in Section 2.1, the LRAFB INRMP is a living document that provides a framework for natural resources management into the future and is reviewed annually. Management practices included in this INRMP have been developed without compromising long-range goals and objectives. As the INRMP is implemented and updated, additional environmental analyses might be required as new management activities are developed and specific projects are implemented. The EIAP for the implementation of the LRAFB INRMP does not include an analysis of effects for individual actions or projects described in Section 8.0 of the INRMP. Individual actions or projects that have the potential to impact the environment will be analyzed separately in accordance with the NEPA process described in Section 2.3.2.

I.2. Proposed Action and Alternatives

The Proposed Action includes the implementation of the LRAFB natural resources management program in its entirety as presented in Sections 7.0. A description of the goals and objectives used to develop management measures for each natural resource area’s issues and concerns and the rationale for why certain management measures were selected are provided in Section 7.0. As such, specific natural resources measures to be implemented under the Proposed Action, and evaluated in this analysis, are not repeated in this section.

The scope of this environmental impact analysis includes the evaluation of two alternatives, summarized as follows:

- Preferred Action Alternative – Implement the LRAFB INRMP (Proposed Action).
- No Action Alternative – Continue with operations as currently conducted and do not implement the Proposed Action. Existing conditions and management practices would continue, and no new initiatives would be established. The No Action Alternative is used as a baseline against which the action alternative may be compared. Inclusion of a No Action Alternative is required and will be carried forward for further analysis.

NEPA requires all reasonable alternatives to be explored and objectively evaluated. The development of proposed management strategies for the INRMP included a screening analysis of

resource-specific alternatives. The screening analysis involved the use of accepted criteria, standards, guidelines, and best professional judgment to identify management practices for achieving natural resource management objectives and included input from USFWS and AGFC. Other management alternatives were considered during the screening process and development of the INRMP, but were eliminated because they were not economically feasible, ecologically sound, or compatible with the requirements of the military mission.

I.3. Environmental Consequences

The existing physical, natural and human environment at LRAFB is described in Sections 4.0 and 5.0 as well as Appendices F through H. In accordance with NEPA, CEQ regulations, AFI 32-7061 and 32 CFR Part 989, the following resource areas were evaluated: climate, land use, air quality, noise, topography, geology, soils, water resources, biological resources, cultural resources, socioeconomics, environmental justice, infrastructure, and hazardous materials and waste.

Per 40 CFR Part 1501.7(a)(3), the CEQ recommends agencies identify and eliminate from detailed study any issues that are not significant or have been covered in another environmental review, narrowing the discussion to a brief presentation of why they will not have a significant effect on the human environment, or providing a reference to their coverage elsewhere. Resource areas considered but excluded from further analysis include: air quality, climate, noise, topography, geology, cultural resources, socioeconomics, environmental justice, and infrastructure. No impacts, positive or negative, are anticipated to occur to these resources as a result of the Preferred Action Alternative or No Action Alternative. Therefore, these resource areas have been eliminated from further discussion to keep the analysis relevant and concise.

Potential environmental consequences associated with the Preferred Action and No Action Alternatives for the remaining resource areas are provided below. A tabular summary of these potential environmental impacts is also presented in **Table I-1**.

I.3.1. Land Use

Preferred Action Alternative: No change in land use would occur as a result of INRMP implementation. Implementation of the INRMP would have long-term positive effects on the natural environment within LRAFB and, over time, ensure the sustainability of AF lands to support mission requirements and training activities (i.e., no net loss in training land). Due to the integration of mission requirements in the creation of this plan, no negative impacts to training activities would be anticipated.

No Action Alternative: Adoption of the No Action Alternative would mean that an INRMP would not be implemented and the existing level of natural resources management would continue. Implementation of the No Action Alternative could cause undeveloped training lands and existing natural resources to degrade over time. This could ultimately affect the military mission at the LRAFB, and result in a long-term negative impact.

I.3.2. Soils

Preferred Action Alternative: The LRAFB NR team would take a proactive approach to prevent soil damage such as erosion or compaction. Indirect, long-term positive impacts would be expected, as undesirable changes in localized topography caused by erosion would be prevented. By implementing an effective soil erosion and sedimentation program, impacts on soils associated

with erosion and sedimentation would be minimized, thereby resulting in long-term beneficial effects to LRAFB.

No Action Alternative: The No Action Alternative does not include the implementation of soil conservation measures, nor does it include a plan of action to prevent or minimize potential soil problems related to erosion and sedimentation before their occurrence. It would include continuing existing BMPs already in use on LRAFB. It would involve reactive management to problems after their occurrence, rather than managing the resource to prevent impacts. Therefore, implementation of the No Action Alternative could result in long-term negative impacts to LRAFB natural resources.

I.3.3. Water Resources

Preferred Action Alternative: No effect to groundwater resources is anticipated. Implementation of the Proposed Action would be expected to result in beneficial effects to area water resources (i.e., surface waters, wetlands, floodplains) and water quality. Maintenance of sensitive areas, riparian buffers, and low water crossings would protect streams and wetlands by intercepting sediments, fertilizers, and pest control chemical residue transported in storm events, thereby protecting water quality on LRAFB and adjacent water resources. In addition, proactive soil management practices and erosion control projects could prevent adverse impacts to water quality.

Implementation of the Preferred Action Alternative would protect wetlands through proactive planning, conservation and preservation. It would promote environmental awareness of LRAFB personnel about jurisdictional waters (including wetlands), their value, and requirements for their protection. Increased understanding of the laws and regulations by LRAFB personnel would help ensure LRAFB remains in compliance and obtains the necessary permits prior to initiating work with the potential to impact water resources. Overall, implementation of the INRMP would be anticipated to result in several long-term positive effects to water resources and water quality.

No Action Alternative: Implementation of the No Action Alternative could result in major, long-term negative impacts to water resources due to a lack of information and environmental awareness regarding surface waters, floodplains, and wetlands at LRAFB and applicable laws and regulations. If appropriate permits are not obtained due to lack of knowledge of water resources present, this could result in a violation of the CWA as well as other federal and state regulations, which could indirectly harm the mission of LRAFB. Typically, however, all necessary permits would be obtained even without the INRMP. No effect to groundwater resources is anticipated under this alternative.

I.3.4. Biological Resources

Preferred Action Alternative: Implementation of the INRMP would provide long- term beneficial effects to biological resources by maintaining and improving habitat conditions on LRAFB. Maintaining and enhancing wetland habitat would provide beneficial effects to native species, including rare species. Implementation of the INRMP would benefit listed species at LRAFB due to enhanced environmental awareness of protection and management measures for these species. However, responsibilities for protection of federally- listed species under the ESA would not change.

The National Defense Authorization Act (NDAA) of 2004 made a significant revision to the ESA. NDAA stated 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 INRMP prepared under section 101 of the Sikes Act (16 USC § 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation. Under the 2004 NDAA, a military installation may have its INRMP obviate the need for critical habitat designation if the INRMP provides a benefit to listed species, and manages for long-term conservation of the species. To date, no critical habitat has been designated or has been proposed at LRAFB. Interior Least Tern, a federally endangered bird has been documented as nesting at LRAFB. Additionally, the Rattlesnake-master Borer Moth, an ESA candidate species, and its associated host plant has been documented at LRAFB. These have all been identified as priority species for LRAFB and management recommendations are included in this INRMP. If critical habitat for these or other species is proposed in the future within LRAFB, the INRMP would be used to gain an exemption from such a designation.

No Action Alternative: Implementation of the No Action Alternative could result in direct, long-term adverse effects to native vegetative communities and biodiversity as a result of habitat degradation.

Under the No Action Alternative, responsibilities for protection of federally-listed species under the ESA would not change. However, the USFWS could, if appropriate, designate critical habitat for federally listed species within LRAFB boundaries, as no protection under the NDAA would be available to the LRAFB.

I.3.5. Hazardous Materials and Waste

Preferred Action Alternative: INRMP implementation would result in a more proactive approach to vegetation management at LRAFB, resulting in more effective and decreased use of herbicides. A minor, beneficial impact associated with a reduction in hazardous materials use could be recognized as a result of the Proposed Action.

No Action Alternative: No change to the existing use of hazardous and toxic materials and waste generation would result. The LRAFB personnel would continue to use pesticides and herbicides in accordance with the IPMP and applicable laws and regulations.

Table I-1. Summary of Environmental Consequences		
Impact Issue	**Preferred Action Alternative**	**No Action Alternative**
Climate	○	○
Land Use	+	⊘
Air Quality	○	○
Noise	○	○
Topography	○	○
Geology	○	○
Soils	+	⊙
Water Resources	+	⊘
Biological Resources	+	⊘
Cultural Resources	○	○
Socioeconomics	○	○
Environmental Justice	○	○
Infrastructure	○	○
Hazardous and Toxic Materials/Wastes	+	○

LEGEND:

○ = No Impact
⊙ = Less-than-Significant Short-term Adverse Impact
⊘ = Less-than-Significant Long-term Adverse Impact
\+ = Beneficial Impact

I.4. Cumulative Effects

Cumulative impacts on environmental resources result from incremental impacts of the Proposed Action when combined with other past, present, and reasonably foreseeable future projects in an affected area. Cumulative impacts can result from minor but collectively substantial actions undertaken over a period of time by various agencies (federal, state, or local) or persons. In accordance with NEPA, a discussion of cumulative impacts resulting from projects that are proposed, ongoing, recently completed, or anticipated to be implemented in the near future is required.

I.4.1 Preferred Action Alternative

Implementation of the INRMP would result in a comprehensive natural resources management strategy for the LRAFB that includes compliance, enhancement, restoration, prevention, and conservation of military training lands. The goals and objectives of the INRMP, if implemented, would improve the existing management approach for natural resources on the installation, and meet legal and policy requirements consistent with natural resources management philosophies. Implementation of the INRMP would have long-term positive effects on the natural environment within LRAFB and, over time, ensure the sustainability of AF land to support mission requirements and training activities. Due to the integration of mission requirements in the creation of this plan, no negative impacts to training activities would be anticipated.

I.4.2. No Action Alternative

Adoption of the No Action Alternative would mean that an INRMP would not be implemented and the existing level of natural resources management would continue. Regional cumulative benefits associated with implementing activities consistent with regional plans would not be recognized. The LRAFB personnel would not be in compliance with the Sikes Act and DoD policy which requires that all facilities with significant natural resources prepare and implement an INRMP.

I.5. Conclusions

The environmental analysis performed concludes there would be no significant impact, either individually or cumulatively, to the local environment or quality of life as a result of implementing the Preferred Action Alternative. This determination is based on thorough review and analysis of existing resource information, and coordination with knowledgeable, responsible personnel from the LRAFB and other relevant local, state, and federal agencies.

Generally, the potential environmental consequences associated with implementing the Preferred Action Alternative, as proposed, would be expected to result in either a positive effect or no effect to the natural, cultural, and socioeconomic environments. Overall, through its emphasis on resource avoidance, repair and/or monitoring, implementation of the INRMP is anticipated to result in net positive effects by sustaining and enhancing extant on-site natural resources while allowing training to proceed, and has been determined to be the best, most appropriate, and most practicable alternative.

Adoption of the No Action Alternative would mean that an INRMP would not be implemented and the existing level of natural resources management would continue. Implementation of the No Action Alternative could cause undeveloped land and existing natural resources to degrade over time. This could ultimately affect the military mission at the LRAFB. Implementation of the No Action Alternative would therefore be expected to result in a long-term negative impact.

Appendix J. Cooperative Agreements for Natural Resource Management

Intra- and inter-agency cooperation, coordination, and communication at the federal, state and local levels (e.g., USFWS and AGFC) are requisite to the success of the INRMP. The USFWS and AGFC review the INRMP and its implementation. Specialized expertise is required to adequately manage natural resources at the LRAFB. Technical assistance will be sought from federal and state agencies, universities, and special interest groups.

A Cooperative Agreement for Fish and Wildlife Management was entered into in 1992, by and between the DOD, functioning through the Support Group Commander at LRAFB; the DOI, functioning through the Regional Director of the USFWS; and the State of Arkansas, functioning through the Director of the AGFC (Appendix B). As outlined in the tripartite agreement, "it is the mutual desire of the Air Force, the Service, and the Commission to work in harmony for the common purpose of developing, maintaining and managing the fish and wildlife resources at LRAFB for the best interest of the people of Arkansas and the United States." Further pursuant to the agreement, the Service and Commission will act in an advisory capacity to LRAFB in these matters. Assistance to LRAFB under the agreement has included sampling, stocking, and recommendations for improvement of the base lake fishery by the AGFC. A copy of the agreement can be found in Section 12.

Federal Laws

American Indian Religious Freedom Act of 1978 (Public Law 95-341; 42 United States Code [USC] §1196) – requires the US, where appropriate, to protect and preserve religious rights of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.

Animal Damage Control Act of 1931 (7 USC §426 et seq.) – provides broad authority for investigation, demonstrations and control of mammalian predators, rodents and birds.

Anti-Deficiency Act of 1982 (31 USC §1341 et seq.) - provides that no federal official or employee may obligate the government for the expenditure of funds before funds have been authorized and appropriated by Congress for that purpose.

American Antiquities Act of 1906 (Public Law 59-209; 16 USC §431-433) – authorizes the President to designate historic and natural resources of national significance, located on federal lands, as National Monuments for the purpose of protecting items of archeological significance.

Archeological and Historical Preservation Act of 1974 (Public Law 95-96; 16 USC §469 et seq.) – provides for the preservation of historical and archeological data, including relics and specimens, threatened by federally funded or assisted construction projects.

Archeological Resources Protection Act of 1979 (16 USC §470 et seq.) – prohibits the excavation or removal from federal or Indian lands any archeological resources without a permit.

Bald Eagle Protection Act of 1940 (Public Law 87-884; 16 USC §668a-d) – prohibits the taking or harming (i.e. harassment, sale, or transportation) of bald eagles or golden eagles, including their eggs, nests, or young, without appropriate permit.

Clean Air Act of 1970 (42 USC §7401 et seq.) – regulates air emissions from stationary, area, and mobile sources. This law authorizes the US Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment.

Clean Water Act of 1972 (Public Law 92-500; 33 USC §1251 et seq.) – aims to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Under Section 401, states have authority to review federal permits that may result in a discharge to wetlands or water bodies under state jurisdiction. Under section 404, a program is established to regulate the discharge of dredged or fill material into the Nation's waters, including wetlands.

Coastal Zone Management Act of 1972 (Public Law 92-583; 16 USC §1451 et seq.) – provides incentives for coastal states to develop coastal zone management programs. Federal actions that impact the coastal zone must be consistent to the maximum extent practicable with the state program.

Conservation and Rehabilitation Program on Military and Public Lands (Public Law 93-452; 16 USC §670 et seq.) – provides for fish and wildlife habitat improvements, range rehabilitation, and control of off-road vehicles on federal lands.

Conservation Programs on Military Reservations (Public Law 90-465; 16 USC §670 et seq.) – Requires each military department to manage natural resources and to ensure that services are provided which are necessary for management of fish and wildlife resources on each installation; to provide their personnel with professional training in fish and wildlife management; and to give priority to contracting work with federal and state agencies that have responsibility for conservation or management of fish and wildlife. In addition it authorizes cooperative agreements (with states, local governments, non-governmental

organizations, and individuals) which call for each party to provide matching funds or services to carry out natural resources projects or initiatives.

Endangered Species Act of 1973, as amended (16 USC §1531 et seq.) – provides for the identification and protection of threatened and endangered plants and animals, including their critical habitats. Requires federal agencies to conserve threatened and endangered species and cooperate with state and local authorities to resolve water resources issues in concert with the conservation of threatened and endangered species. This law establishes a consultation process involving federal agencies to facilitate avoidance of agency action that would adversely affect species or habitat. Further, it prohibits all persons subject to US jurisdiction from taking, including any harm or harassment, endangered species.

Federal Insecticide, Fungicide, and Rodenticide Act of 1947 (Public Law 92-516; 7 USC §136 et seq.) – governs the use and application of pesticides in natural resource management programs. This law provides the principal means for preventing environmental pollution from pesticides through product registration and applicator certification.

Federal Land Policy and Management Act of 1976 (43 USC §1701) – establishes public land policy and guidelines for its administration and provides for the management, protection, development, and enhancement of the public lands.

Federal Noxious Weed Act of 1974 (Public Law 93-629; 7 USC §2801) – provides for the control and eradication of noxious weeds and their regulation in interstate and foreign commerce.

Fish and Wildlife Conservation Act of 1980 (Public Law 96-366; 16 USC §2901 et seq.) – encourages management of non-game species and provides for conservation, protection, restoration, and propagation of certain species, including migratory birds threatened with extinction.

Fish and Wildlife Coordination Act of 1934 (16 USC §661 et seq.) – provides a mechanism for wildlife conservation to receive equal consideration and coordinate with water-resource development programs.

Land and Water Conservation Act of 1965 (16 USC §4601 et seq.) – assists in preserving, developing, and assuring accessibility to outdoor recreation resources.

Migratory Bird Conservation Act of 1929 (16 USC §715 et seq.) – establishes a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds.

Migratory Bird Treaty Act of 1918 (Public Law 65-186; 16 USC §703 et seq.) – provides for regulations to control taking of migratory birds, their nests, eggs, parts, or products without the appropriate permit and provides enforcement authority and penalties for violations.

National Environmental Policy Act of 1969 (Public Law 91-190; 42 USC §4321 et seq.) – mandates federal agencies to consider and document environmental impacts of proposed actions and legislation. In addition it mandates preparation of comprehensive environmental impact statements where proposed action is “major” and significantly affects the quality of the human environment.

Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601; 25 USC §§3001-3013) – addresses the recovery, treatment, and repatriation of Native American and Native Hawaiian cultural items by federal agencies and museums. It includes provisions for data gathering, reporting, consultation, and issuance of permits.

Resource Conservation and Recovery Act of 1976 (42 USC §6901 et seq.) – establishes a comprehensive program which manages solid and hazardous waste. Subtitle C, Hazardous Waste Management, sets up a framework for managing hazardous waste from its initial generation to its final disposal. Waste pesticides and equipment/containers contaminated by pesticides are included under hazardous waste management requirements.

Sikes Act Improvement Act of 1997 (Public Law 105-85; 16 USC §670a et seq.) – amends the Sikes Act of 1960 to mandate the development of an integrated natural resources management plan through cooperation with the Department of the Interior (through the US Fish and Wildlife Service [USFWS]), Department of Defense, and each state fish and wildlife agency for each military installation supporting natural resources.

Soil Conservation Act of 1935 (16 USC §590a et seq.) – provides for soil conservation practices on federal lands.

Federal Regulations

40 Code of Federal Regulations [CFR] 1500-1508 – Council on Environmental Quality (CEQ) Regulations on Implementing National Environmental Policy Act (NEPA) Procedures

40 CFR 6 – USEPA Regulations on Implementation of NEPA Procedures

40 CFR 162 – USEPA Regulations on Insecticide, Fungicide, and Rodenticide Use

15 CFR 930 – Federal Consistency with Approved Coastal Management Programs

50 CFR 17 – USFWS list of Endangered and Threatened Wildlife

50 CFR 10.13 – List of Migratory Birds

32 CFR 190 – Natural Resources Management Program

Federal Executive Orders (EOs)

Environmental Safeguard for Activities for Animal Damage Control on Federal Lands (EO 11870) - restricts the use of chemical toxicants for mammal and bird control.

Exotic Organisms (EO 11987) – restricts federal agencies in the use of exotic plant species in any landscape and erosion control measures.

Energy Efficiencies and Water Conservation at Federal Facilities (EO 12902) – federal agency use of energy and water resources is directed towards the goals of increased conservation and efficiency.

Floodplain Management (EO 11988) – specifies that agencies shall encourage and provide appropriate guidance to applicant to evaluate the effects of their proposals in floodplains prior to submitting applications. This includes wetlands that are within the 100-year floodplain and especially discourages filling.

Greening the Government through Leadership in Environmental Management (EO 13148) – requires the head of each federal agency to be responsible for ensuring that all necessary actions are taken to integrate environmental accountability into agency day-to-day decision making and long-term planning processes across all agency missions, activities, and functions.

Indian Sacred Sites (EO 13007) – provides for the protection of and access to Indian sacred sites.

Invasive Species (EO 13112) – directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.

Protection and Enhancement of Environmental Quality (EO 11514) – provides for environmental protection of federal lands and enforces requirements of NEPA.

Protection of Wetlands (EO 11990) – directs all federal agencies to take action to minimize the destruction loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. This applies to the acquisition, management, and disposal of federal lands and facilities; to construction or improvements undertaken, financed, or assisted by the federal government; and to the conduct of federal activities and programs which affect land use.

Responsibilities of Federal Entities to Protect Migratory Birds (EO 13186) – directs all federal agencies taking actions that have a potential to negatively affect migratory bird

populations to develop and implement a Memorandum of Understanding with the USFWS by January 2003 that shall promote the conservation of migratory bird populations.

Department of Defense Instructions (DoDI), Air Force Instructions (AFI), & Air Force Pamphlets (PAM)

DoDI 4715.03 – Natural Resources Conservation Program
DoDI 4165.57 – Air Installations Compatible Use Zones
DoDI 4150.07 – Pest Management Program
DoDI 6055.06 – Fire and Emergency Services Program
AFI 32-7061 – Environmental Impact Analysis Process
AFI 32-7064 – Integrated Natural Resources Management
AFI 32-1053 – Integrated Pest Management Program
AFI 32-7062 – Air Force Comprehensive Planning
AFI 32-7065 – Cultural Resources Management
AFPAM 91-212 – BASH Techniques

Department of Defense Memoranda

Memorandum, Assistant Deputy Under Secretary of Defense (Environment, Safety and Occupational Health), 20 Sept 11, Subject: Interim Policy on Management of White Nose Syndrome in Bats.

Memorandum, Assistant Deputy Under Secretary of Defense (Environment, Safety and Occupational Health), 3 Apr 07, Subject: Guidance to Implement the Memorandum of Understanding to Promote the Conservation of Migratory Birds.

Memorandum, Assistant Deputy Under Secretary of Defense (Environment, Safety and Occupational Health), 14 Aug 06, Subject: Integrated Natural Resource Management Plan (INRMP) Template

Memorandum, Assistant Deputy Under Secretary of Defense (Environment, Safety and Occupational Health), 17 May 05, Subject: Implementation of Sikes Act Improvement Amendments: Supplemental Guidance concerning Leased Lands

Memorandum, Assistant Deputy Under Secretary of Defense (Environment, Safety and Occupational Health), 1 Nov 04, Subject: Implementation of Sikes Act Improvement Amendments: Supplemental Guidance concerning INRMP Reviews

Memorandum, Deputy Under Secretary of Defense (Installations and Environment), 10 Oct 02, Subject: Implementation of Sikes Act Improvement Act: Updated Guidance

Memorandum, Assistant Deputy Under Secretary of Defense (Environment), 5 Aug 02, Subject: Access to Outdoor Recreation Programs on Military Installations for Persons with Disabilities.

Memorandum, Assistant Secretary of Army (Environment, Safety and Occupational Health), Deputy Assistant Secretary of the Navy (Environment), Deputy Assistant Secretary of the Air Force (Environment, Safety and Occupational Health), 20 Sep 11, Subject: Interim Policy on Management of White Nose Syndrome in Bats.

Arkansas

Arkansas Waters and Pollution Control Act (Ark. Code Ann. § 8-4-101)
Solid Waste Management Act, Ark. Code Ann. § 8-6-201
Arkansas Hazardous Waste Act, Code Ann. § 8-6-202

Implementation of this INRMP also involves the combined efforts of agencies outside of the 19th AW. Other Federal agencies involved in implementing the INRMP are the U.S. Forest Service (USFS) (forest inventory and management recommendations); the US Corps of Engineers (USACE) (wetland delineation); and the US Fish and Wildlife Service (USFWS) (cooperating agency, INRMP signatory agency). At the State level, the Arkansas Game and Fish Commission (AGFC) assists in development and implementation of the INRMP and is also a signatory agency for the INRMP. LRAFB currently holds air quality and stormwater runoff permits issued by Arkansas Department of Environmental Quality (ADEQ). The Arkansas Natural Heritage Commission has conducted surveys and assessments of natural resources on LRAFB. LRAFB currently holds air quality and stormwater runoff permits issued by Arkansas Department of Environmental Quality (ADEQ). The Nature Conservancy, a non-governmental organization, has also provided Natural Resources management support in the form of surveys, assessments, and prescribed burns.

The base has engaged the services of the AGFC in an advisory capacity to optimize the fishery. The State has recommended a program of routine fertilization, which would increase nutrients and build the basic food supply. The prescribed increase in nutrients will result in an increase in phytoplankton, temporarily imparting a greenish cast to the water. The base is justifiably concerned that this program, while being good for the fishery, will degrade the general appearance of the water. The State's general rules for fertilizer applications are as follows: if you can see your hand clearly when it is placed in the water to elbow depth, then additional fertilizer is needed. The coloration of the water is in conflict with the general popular notion that a clear lake is an aesthetic lake. A balance needs to be struck between the base's aesthetic goals and the State's desire to achieve an optimum, self-sustaining fishery.

All hunting and fishing at LRAFB is in accordance with the game and fish laws/regulations of the State of Arkansas. In addition, all personnel who hunt or fish on base are required to purchase a base license, which must be attached to the State of Arkansas license.

AGFC game wardens and USFWS agents have access to LRAFB for enforcement of State and Federal wildlife laws as per the Cooperative Agreement for Fish and Wildlife Management at LRAFB, Arkansas found in Section 12. The base has a bird depredation permit from the USFWS and a deer and coyote depredation permit from the AGFC.